ROBOT DESIGN AND APPLICATIONS

1	Course Title:	ROBOT DESIGN AND APPLICATIONS
2	Course Code:	BMB4019
3	Type of Course:	Optional
4	Level of Course:	First Cycle
5	Year of Study:	4
6	Semester:	7
7	ECTS Credits Allocated:	5.00
8	Theoretical (hour/week):	3.00
9	Practice (hour/week):	0.00
10	Laboratory (hour/week):	0
11	Prerequisites:	None
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Dr. Ögr. Üyesi CEYDA NUR ÖZTÜRK
15	Course Lecturers:	
16	Contact information of the Course Coordinator:	ceydanur@uludag.edu.tr
17	Website:	
18	Objective of the Course:	To teach kinematic calculations, trajectory planning, and various control methods for designing robots of manipulator or rover type. To have theoretical information and functions of different sensors and actuators comprehended with applications to be developed on available robotic systems.
19	Contribution of the Course to Professional Development:	Engineering Science: 60%, Engineering Design: 40%
20	Learning Outcomes:	

	1	Being able to perform forward or inverse position calculations for different robot configurations
	2	Being able to perform forward or inverse velocity calculations through differential analysis
	3	Knowing techniques that are used for trajectory planning and motion, velocity, or force control
	4	Having knowledge about types and functions of sensors and actuators
	5	Being able to program robotic systems using proper interfaces
	6	Being able to develop controller software for a robotic system to run in real-time
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21	Course Content:	
	Course Content:	
Week	Theoretical	Practice
1	Robotic systems and application areas, common robot configurations	

2	Fundamentals of mathematical robot modeling, homogeneous coordinates and representation of transformations with matrices	
3	Forward and inverse kinematics for common robot configurations	
4	Programming different robots with interfaces of robot operating system	
5	Denavit-Hartenberg representation of forward and inverse kinematics	
6	Differential motion analysis, forward and inverse Jacobian calculations	
7	Dynamic analysis and forces	
8	Path and trajectory planning, trajectory planning with high-order polynomials and via points	
9	Motion, velocity, and force control, proportional, integral, and derivative controllers	
10	Vision-based control methods	
11	Fuzzy logic-based control methods	
12	Sensors: position, velocity, acceleration, pressure, light and proximity sensors, range scanners and camera systems	
13	Actuators: hydraulic and pneumatic devices, electric motors	

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	2.00	28.00
Homeworks	4	8.00	32.00
Projects	1	20.00	20.00
Field Studies	0	0.00	0.00
Midterm exams	1	10.00	10.00
Others	0	0.00	0.00
Final Exams	1	14.00	14.00
Total Work Load			156.00
Total work load/ 30 hr			4.87
ECTS Credit of the Course			5.00

Control, Applications, John Wiley and Sons, Inc., 2nd Edition, ISBN: 978-0-470-60446-5

2011. Introduction to Autonomous Mobile Robots , MIT Press, 2nd Edition, ISBN: 978-0262015356

TERM LEARNING ACTIVITIES	**NUMBE**	**WEIGHT**
Midterm Exam	1	20.00
Home work-project	4	20.00
Total	6	100.00

Success Grade	
Contribution of Final Exam to Success Grade	60.00
Total	100.00
Measurement and Evaluation Techniques Used in the Course	Programming and study assignments, project, presentation, written exams

24 ECTS / WORK LOAD TABLE

25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS

	PQ1	**PQ2**	**PQ3**	**PQ4**	**PQ5**	**PQ6**	**PQ7**	**PQ8**	**PQ9**	**PQ10**	**PQ11**	**PQ12**	**PQ13**	**PQ14**	**PQ15**	**PQ16**
ÖK1	5	5	3	3	1	2	2	1	0	1	0	0	0	0	0	0

ÖK2	5	5	3	3	1	2	2	1	0	1	0	0	0	0	0	0
ÖK3	5	5	3	3	1	2	2	1	0	1	0	0	0	0	0	0
ÖK4	4	2	1	3	1	2	1	1	2	0	0	0	0	0	0	0
ÖK5	3	1	4	5	3	5	3	3	4	3	1	0	0	0	0	0
ÖK6	5	3	5	5	4	5	3	3	3	3	1	1	0	0	0	0

LO: Learning Objectives PQ: Program Qualifications

Contribution Level:	**1 very low**	**2 low**	**3 Medium**	**4 High**	**5 Very High**