İzmir Institute of Technology

Faculty of Engineering
Mechanical Engineering BS

ME460	INTRODUCTION TO ROBOT TECHNOLOGY				
Semester	**Course Unit Code**	**Course Unit Title**	**L+P**	**Credit**	**Number of ECTS Credits**
7	ME460	INTRODUCTION TO ROBOT TECHNOLOGY	3	3	5

Mode of Delivery:
Face to Face
Language of Instruction:
English
Level of Course Unit:
First Cycle
Work Placement(s):
No
Department / Program:
Mechanical Engineering BS
Type of Course Unit:
Elective
Objectives of the Course:
This course aims to provide an overview of robot mechanisms, dynamics, and robot controls. Planar robotic manipulators are investigated for their workspaces, velocity and acceleration profiles, static force analysis, dynamic properties, and controls. The topics to be covered in order to perform such investigations are planar kinematics, motion planning, mechanism design for manipulators, multi-rigid-body dynamics, and control design.
Teaching Methods and Techniques:
- Forward and inverse robot kinematics analysis - Velocity and acceleration analyses of robots - Singularity analysis - Static force analysis of robots - Introduction to dynamic modelling of robots - Fundamentals of controller design
Prerequisites and co-requisities:

Course Coordinator:

Name of Lecturers:
Asist Prof.Dr. MEHMET İSMET CAN DEDE
Assistants:

Recommended or Required Reading

Resources	J. Duffy, "Statics and Kinematics Applications to Robotics," Cambridge University Press, 1st Edition, New York, 1996.,C.D. Crane III, and J. Duffy, "Kine

Weekly Detailed Course Contents

Week	Topics	Study Materials	Materials
1	Overview of the course and mechanisms		J. Duffy, "Statics and Kinematics Applica
2	Mobility of planar mechanisms and manipulators		J. Duffy, "Statics and Kinematics Applica
3	Direct and inverse kinematics analysis of two-link serial manipulators		J. Duffy, "Statics and Kinematics Applica
4	Direct and inverse kinematics analysis of three-link serial manipulators		J. Duffy, "Statics and Kinematics Applica
5	Direct and inverse velocity analysis		J. Duffy, "Statics and Kinematics Applica
6	Redundant robot direct and inverse velocity analysis		C.D. Crane III, and J. Duffy, "Kinematics
7	Acceleration Analysis Equilibrium of a robot under static loading		C.D. Crane III, and J. Duffy, "Kinematics
8	Midterm Exam #1		C.D. Crane III, and J. Duffy, "Kinematics
9	Dynamic model of a robot		J. J. Craig, "Introduction to Robotics: Me
10	State space model of a robot Numerical solution of ODEs		J. J. Craig, "Introduction to Robotics: Me
11	Linearization techniques		J. J. Craig, "Introduction to Robotics: Me
12	Midterm Exam #2		J. J. Craig, "Introduction to Robotics: Me
13	Computed torque method		J. J. Craig, "Introduction to Robotics: Me
14	Lyapunov s method to design a controller for nonlinear systems		J. J. Craig, "Introduction to Robotics: Me
15	Final 1st week		J. J. Craig, "Introduction to Robotics: Me
16	Final 2nd week		J. J. Craig, "Introduction to Robotics: Me

Course Learning Outcomes

No	Learning Outcomes
C01	To be able to formulate direct kinematics and dynamics equations for a planar serial manipulator to derive the model
C02	Ability to analyse the robot for inverse kinematics and dynamics for control design purpose
C03	To be able to construct the state space model of a robot
C04	To be able design a controller for a robot with nonlinear equation of motion

Program Learning Outcomes

No	Learning Outcome
P03	To have the ability to use modern technical tools which are necessary for engineering applications and to efficiently implement information technologies.
P02	To be able to design a complicated system or device that can satisfy the requirements under realistic conditions; to have the ability to use modern design methods for that purpose.
P04	To have the ability to detect, define, formulize and solve complicated engineering problems.
P06	To have the ability to design experiments, analyze and interpret results in order to examine engineering problems.
P05	To be able to choose and apply modeling and analysis methods for the encountered problems.
P01	To have the ability of modeling and solving engineering problems, using the acquired information about math, science and engineering subjects.
P08	To have the ability to construct verbal and written communication in educational language.
P07	To have the ability to work in disciplinary and interdisciplinary teams efficiently.
P09	To be able to act conscious for the necessity of innovation and lifetime-learning; to have the ability of self-renewal and to follow the progress.
P11	To be able to have tendency to the applications in professional life and creativity.
P10	To have the ability to act with a sense of professional and ethical responsibility; and with environmental and safety concerns.

Assessment Methods and Criteria

In-Term Studies	Quantity	Percentage
Midterm exams	2	%40
Quizzes	6	%30
Homeworks	0	%0
Other activities	0	%0
Laboratory works	0	%0
Projects	0	%0
Final examination	1	%30
Total		**%100**

ECTS Allocated Based on Student Workload

Activities	Quantity	Duration	Total Work Load
Weekly Course Time	1	36	36
Outside Activities About Course (Attendance, Presentation, Midterm exam,Final exam, Quiz etc.)	1	42	42
Application (Homework, Reading, Self Study etc.)	0	0	0
Laboratory	0	0	0
Exams and Exam Preparations	1	48	48
Total Work Load			**126**
ECTS Credit of the Course			**4**

Contribution of Learning Outcomes to Programme Outcomes

Contribution: 0: Null 1:Slight 2:Moderate 3:Significant 4:Very Significant

	P01	P03	P04	P05
C01	2	2	3	4
C02	2	2	3	4
C03	2	2	3	4
C04	2	2	3	4