İzmir Institute of Technology

Faculty of Engineering
Mechanical Engineering BS

ME352	SYSTEM ANALYSIS AND CONTROL				
Semester	**Course Unit Code**	**Course Unit Title**	**L+P**	**Credit**	**Number of ECTS Credits**
6	ME352	SYSTEM ANALYSIS AND CONTROL	4	4	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:
Required
Objectives of the Course:
End of this course, the student will able to •model a physical system with its internal dynamics and input-output relationships by means of block diagrams and transfer functions, • generate and use the basic feedback controllers (P,PD,PI,PID), •determine relationships between the parameters of a control system and its stability, accuracy, transient behavior, tracking and disturbance-rejection ability, and parameter sensitivity, •determine the control parameters under the time response for requirements of accuracy, relative stability, and response speed, •determine the frequency response of a control system for evaluating/adjusting the relative stability, response speed, tracking accuracy, and noise rejection ability of the system.
Teaching Methods and Techniques:
Modeling physical systems. Control system components. Transient response. Stability. Steady state response and error. Basic control actions and controllers. Frequency response.
Prerequisites and co-requisities:

Course Coordinator:

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

Recommended or Required Reading

Resources K. Ogata, "Modern Control Engineering," Prentice Hall, 5th Edition, New Jersey, 2010.,R.C. Dorf, R.H. Bishop, "Modern Control Systems," Pearson, 12th

Weekly Detailed Course Contents

Week	Topics	Study Materials	Materials
1	Introduction to Control Systems		R.C. Dorf, R.H. Bishop, "Modern Control
2	Laplace Transform		R.C. Dorf, R.H. Bishop, "Modern Control
3	System Dynamics with Electrical and Mechanical Components		R.C. Dorf, R.H. Bishop, "Modern Control
4	System Dynamics with Hydraulic and Thermal Components		R.C. Dorf, R.H. Bishop, "Modern Control
5	Transfer Function, Block Diagram, and Signal-Flow Graphs		R.C. Dorf, R.H. Bishop, "Modern Control
6	State Variable Models		R.C. Dorf, R.H. Bishop, "Modern Control
7	State Variable Models Midterm Exam 1		R.C. Dorf, R.H. Bishop, "Modern Control
8	Transient State Response, Control Parameters		R.C. Dorf, R.H. Bishop, "Modern Control
9	Feedback Control, Tuning Controllers		R.C. Dorf, R.H. Bishop, "Modern Control
10	Stability of Linear Feedback Systems		R.C. Dorf, R.H. Bishop, "Modern Control
11	Root Locus Method		R.C. Dorf, R.H. Bishop, "Modern Control
12	Root Locus Method Midterm Exam 2		R.C. Dorf, R.H. Bishop, "Modern Control
13	Frequency Response		R.C. Dorf, R.H. Bishop, "Modern Control
14	Stability in the Frequency Domain		R.C. Dorf, R.H. Bishop, "Modern Control
15	Final 1st week		R.C. Dorf, R.H. Bishop, "Modern Control
16	Final 2nd week		R.C. Dorf, R.H. Bishop, "Modern Control

Course Learning Outcomes

No	Learning Outcomes
C01	Ability to identify the components and the inputs of a physical system
C02	Ability to model the components of a system as linear elements and to write the constitutive and connectivity equations for them
C03	Ability to draw block diagrams and to obtain transfer functions
C04	Ability to choose from open-loop (OL) or feedback (FB) control architectures suitably for a specified task by acquiring the basic knowledge about them
C05	Ability to choose one of P, PD, PI, or PID control actions suitably for a specified task by acquiring the knowledge of the effects produced by them
C06	Ability to adjust the parameters of a PID controller and to construct one if necessary
C07	Ability to identify the parameters that the system is sensitive to
C08	Ability to check stability of a system and to find parameter ranges for a desired degree of stability
C09	Ability to determine the effect of a control action and its parameters on the accuracy
C10	Ability to determine the effect of a control action and its parameters on the transient response
C11	Ability to decide on a compromise between conflicting requirements
C12	Ability to design a P, PD, PI, or PID controller based on the transient and steady state response criteria
C13	Ability to determine the amplitude ratio and the phase shift between the input and output sinusoids
C14	Ability to relate the amplitude ratio and the phase angle variations to the time response of the system
C15	Ability to determine the control parameters to satisfy the requirements on the frequency response

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	3	%15
Homeworks	0	%0
Other activities	0	%0
Laboratory works	0	%0
Projects	1	%15
Final examination	1	%30
Total		**%100**

ECTS Allocated Based on Student Workload

Activities	Quantity	Duration	Total Work Load
Weekly Course Time	1	56	56
Outside Activities About Course (Attendance, Presentation, Midterm exam,Final exam, Quiz etc.)	1	52	52
Application (Homework, Reading, Self Study etc.)	0	0	0
Laboratory	0	0	0
Exams and Exam Preparations	1	12	12
Total Work Load			**120**
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	P02	P03	P04	P05
C01	4	3	2	2	2
C02	4	3	2	2	2
C03	2	2	2	4	3
C04	2	2	2	4	3
C05	2	2	2	4	3
C06	2	2	2	4	3
C07	2	2	2	4	3
C08	2	2	2	4	3
C09	2	2	2	4	3
C10	2	2	2	4	3
C11	2	2	2	4	3
C12	2	2	2	4	3
C13	2	2	2	4	3
C14	2	2	2	4	3
C15	2	2	2	4	3