İzmir Institute of Technology

INSTITUTE OF ENGINEERING AND SCIENCE(M.S.)
MECHANICAL ENGINEERING

ME589	MODERN CONTROL				
Semester	**Course Unit Code**	**Course Unit Title**	**L+P**	**Credit**	**Number of ECTS Credits**
2	ME589	MODERN CONTROL	3	3	7

Mode of Delivery:
Face to Face
Language of Instruction:
English
Level of Course Unit:
Second Cycle
Work Placement(s):
No
Department / Program:
MECHANICAL ENGINEERING
Type of Course Unit:
Elective
Objectives of the Course:
The main objective of this course is to introduce the students the fundamentals of modern control systems and to provide them with a background on the state variable approach.
Teaching Methods and Techniques:
- State Space Representation - Solution of State Equations - Controllability and Observability - Lyapunov Stability - Controller Design with State Feedback - Observer Design
Prerequisites and co-requisities:

Course Coordinator:

Name of Lecturers:
Asist Prof.Dr. Mehmet İsmet Can Dede
Assistants:

Recommended or Required Reading

Resources Dorf, R.C. and Bishop, R.H., Modern Control Systems, 12th Edition, Pearson - Prentice Hall, 2010.,Ogata, K., Modern Control Engineering, 5th Edition, F

Weekly Detailed Course Contents

Week	Topics	Study Materials	Materials
1	Introduction to Modern Control Engineering		Ogata, K., Modern Control Engineering,
2	State Space Representation: - State and Output Equations		Ogata, K., Modern Control Engineering,
3	State Space Representation: - State space representation for linear systems in various forms - Transfer function matrix and		Ogata, K., Modern Control Engineering,
4	State Space Representation:- Linear transformation - Decoupling state equations		Ogata, K., Modern Control Engineering,
5	Solution of State Equations:- State Transition Matrix (Homogeneous Solution) - State Transition Equation (Nonhomogeneou		Ogata, K., Modern Control Engineering,
6	Solution of State Equations: - Computation of state transition matrix - Response of linear time varying systems		Ogata, K., Modern Control Engineering,
7	Controllability and Observability: - State Controllability - State Observability		Ogata, K., Modern Control Engineering,
8	Controllability and Observability: - Decomposition of systems - State space representation from transfer functions - Output		Ogata, K., Modern Control Engineering,
9	Lyapunov Stability		Ogata, K., Modern Control Engineering,
10	Midterm Exam		
11	Controller Design with State Feedback:- Pole assignment using state feedback - State feedback for MIMO systems - Decou		Ogata, K., Modern Control Engineering,
12	Controller Design with State Feedback - Quadratic performance indices - Optimal regulator problem		Ogata, K., Modern Control Engineering,
13	Observer Design:- State reconstruction problem and separation principle - Full order observers		Ogata, K., Modern Control Engineering,
14	Observer Design:- Reduced order observers - Observer in a closed loop system		Ogata, K., Modern Control Engineering,
15	Final 1st week		
16	Final 2nd week		

Course Learning Outcomes

No	Learning Outcomes
C01	Ability to interpret and apply the basic concepts of state space representation of multi-input multi-output (MIMO) dynamical systems.
C02	Doğrusal sistemin zaman cevabı ve onun durum geçiş matrisini ilişkilendirme, verilen sistem matrisi için durum geçiş matrisini türetebilme, durum geçiş matrisini kullanarak zaman değişimli veya zam
C03	Ability to determine all equilibria for a given nonlinear system, demonstrate their understanding of various stability definitions, analyze the stability of a linear or nonlinear system about an equilibriu
C04	Ability to design linear state feedback controllers and linear quadratic regulators
C05	Ability to design state observers

Program Learning Outcomes

No	Learning Outcome
P05	To have advanced skills in scientific and technical writing and oral communication.
P06	To have the ability to present his/her study in national or international congresses, conferences and other scientific meetings.
P07	To have an appreciation of ethical values in scientific and technical studies.
P04	To have the ability to identify, model, formulate, and solve mechanical engineering problems in the field of research.
P01	To have advanced knowledge in the master thesis subject.
P02	To have the ability to carry out independent research and study.
P03	To have the ability to use the knowledge learned in the courses.

Assessment Methods and Criteria

In-Term Studies	Quantity	Percentage
Midterm exams	1	%25
Quizzes	5	%25
Homeworks	10	%25
Other activities	0	%0
Laboratory works	0	%0
Projects	0	%0
Final examination	1	%25
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	112	112
Application (Homework, Reading, Self Study etc.)	0	0	0
Laboratory	0	0	0
Exams and Exam Preparations	1	36	36
Total Work Load			**184**
ECTS Credit of the Course			**8**

Contribution of Learning Outcomes to Programme Outcomes

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

	P01	P02	P03	P04
C01	4	3	4	4
C02	4	3	4	4
C03	4	3	4	4
C04	4	3	4	4
C05	4	3	4	4