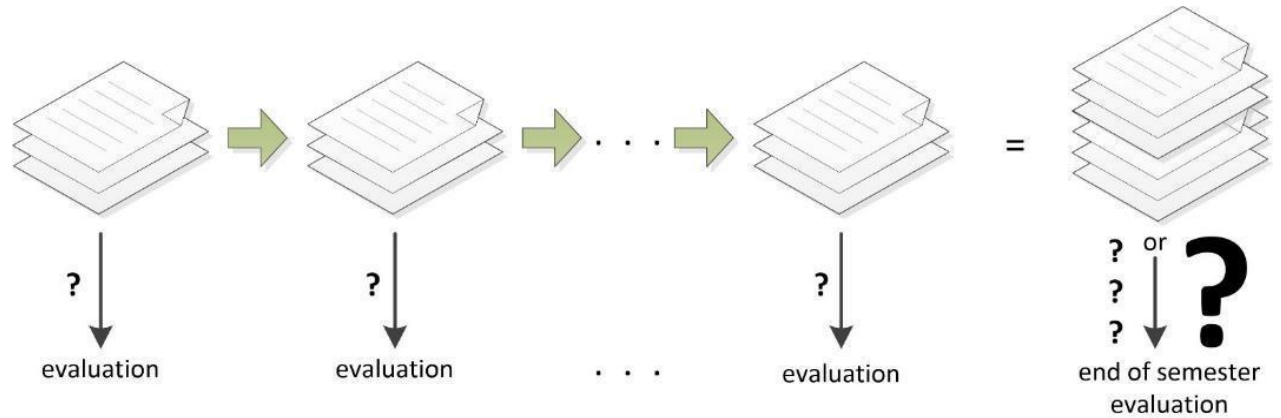


Project Based Learning: New Education Model at Kadir Has University

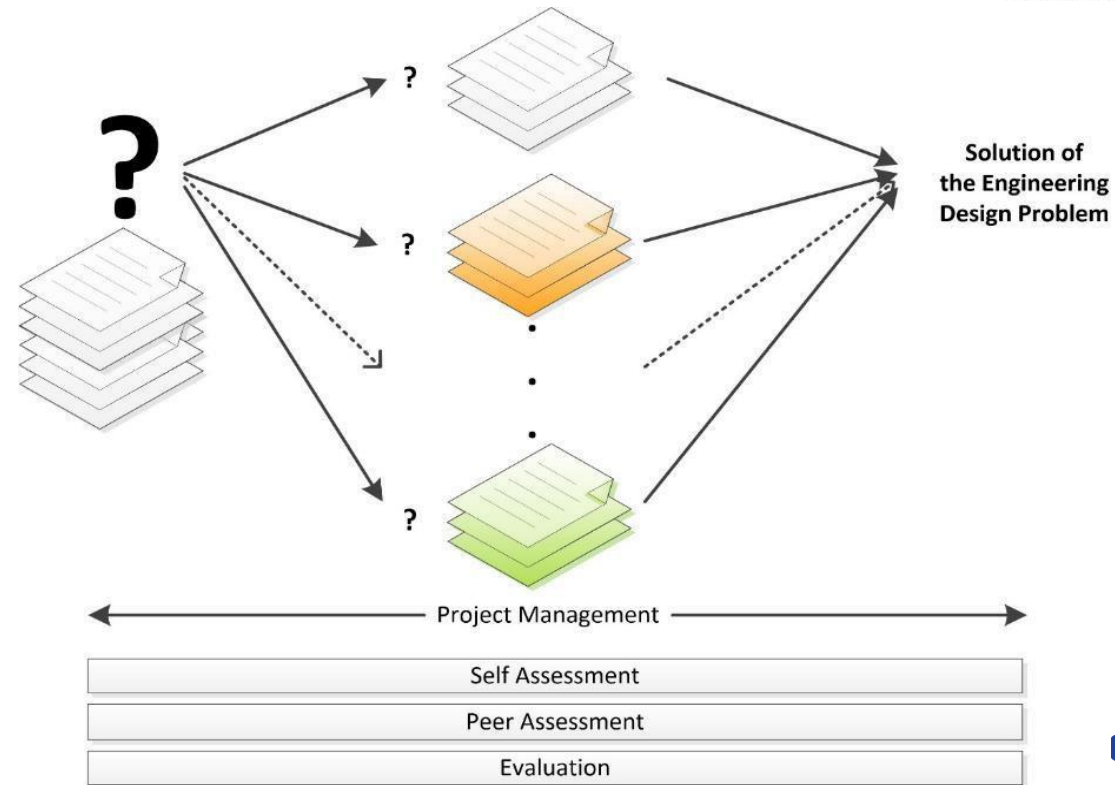


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Traditional Learning*



Project Based Learning*



*Arsan, Kepez, 2018

KHAS Project Based New Education Model Industrial Partners



Partners in contact:



Curriculum of Mechatronics Engineering Department

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
1	Güz	KHAS 101	Kökenler ve Sonuçları (Origins and Consequences)	3	0	0	5
		KHAS 103	İnsanlık Tarihi (History of Humankind)	3	0	0	5
		KHAS 105	İnsani Değerler ve Etik (Human Values and Ethics)	3	0	0	5
		KHAS 107	Tasarım (Design)	3	0	0	5
		KHAS 109	Hesaplamalı Düşünme (Computational Thinking)	3	0	0	5
		TLL 101	Türkçe Eleştirel Okuma ve Yazma I (Critical Reading and Writing in Turkish I)	2	0	0	3
Toplam				17	0	0	28
Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
1	Bahar	KHAS 102	Bilimsel Keşifler ve Mühendislik (Scientific Discoveries and Engineering)	3	0	0	5
		KHAS112	Matematiği Anlamak (Understanding Mathematics)	4	0	0	6
		TLL 102	Türkçe Eleştirel Okuma ve Yazma II (Critical Reading and Writing in Turkish II)	2	0	0	3
		KHAS	Birinci Sınıf Seçmeli-I (Freshman Elective-I)	3	0	0	5
		KHAS 110	Toplumsal Sorumluluk Projesi (Civic Responsibility Project)	1	0	0	2
		MTE 192	Robotik Başlangıç Projesi (Robotics Start-Up Project)	2	2	0	6
KHAS	Birinci Sınıf Seçmeli-II (Freshman Elective-II)	3	0	0	5		
Toplam				18	2	0	32

Core Curriculum



Curriculum of Mechatronics Engineering Department

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
1	Güz	KHAS 101	Kökenler ve Sonuçları (Origins and Consequences)	3	0	0	5
		KHAS 103	İnsanlık Tarihi (History of Humankind)	3	0	0	5
		KHAS 105	İnsani Değerler ve Etik (Human Values and Ethics)	3	0	0	5
		KHAS 107	Tasarım (Design)	3	0	0	5
		KHAS 109	Hesaplamalı Düşünme (Computational Thinking)	3	0	0	5
		TLL 101	Türkçe Eleştirel Okuma ve Yazma I (Critical Reading and Writing in Turkish I)	2	0	0	3
Toplam				17	0	0	28

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
2	Güz	HST 101	Modern Türkiye Tarihi I (History of Modern Turkey I)	2	0	0	2
		MTE 211	Teknik Çizim (Technical Drawing)	2	0	2	4
		FENS203	Malzemeler (Materials)	3	0	0	4
		MTE 291	Bilgisayar Oyunu Tasarım Projesi (Computer Game Design Project)	3	2	0	6
		MTE 293	Mantıksal Tasarım Projesi (Logic Design Project)	3	0	2	8
FENS 201	Uygulamalı Mühendislik Matematiği-I (Applied Engineering Mathematics-I)	3	2	0	6		
Toplam				16	4	4	30

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
1	Bahar	KHAS 102	Bilimsel Keşifler ve Mühendislik (Scientific Discoveries and Engineering)	3	0	0	5
		KHAS112	Matematiği Anlamak (Understanding Mathematics)	4	0	0	6
		TLL 102	Türkçe Eleştirel Okuma ve Yazma II (Critical Reading and Writing in Turkish II)	2	0	0	3
		KHAS	Birinci Sınıf Seçmeli-I (Freshman Elective-I)	3	0	0	5
		KHAS 110	Toplumsal Sorumluluk Projesi (Civic Responsibility Project)	1	0	0	2
		MTE 192	Robotik Başlangıç Projesi (Robotics Start-Up Project)	2	2	0	6
		KHAS	Birinci Sınıf Seçmeli-II (Freshman Elective-II)	3	0	0	5
Toplam				18	2	0	32

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
2	Bahar	HST 102	Modern Türkiye Tarihi II (History of Modern Turkey II)	2	0	0	2
		CIV102	Fiziksel Sistemlerin Dengesi (Equilibrium of Physical Systems)	2	4	0	6
		FENS 202	Uygulamalı Mühendislik Matematiği-II (Applied Engineering Mathematics-II)	3	2	0	6
		MTE 294	Mekanik Sistem Benzetim Projesi (Mechanical System Simulation Project)	5	4	0	10
		MTE 299	Staj I (Internship I)	0	0	0	6
Toplam				12	10	0	30

Curriculum of Mechatronics Engineering Department

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
3	Güz	CIV 263	Fiziksel Sistemlerin Dinamiği (Dynamics of Physical Systems)	3	0	0	4
		EEE 307	Signals and Systems (Sinyaller ve Sistemler)	2	0	2	5
		FENS 300	Sayısal Yöntemler (Numerical Methods)	2	2	0	5
		MTE 391	Yazılım Tasarım Projesi I (Software Design Project I)	3	0	2	6
		MTE 393	Gömülü Tasarım Projesi (Embedded Design Project)	3	0	2	8
Toplam				13	2	6	28

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
3	Bahar	MTE 312	Makina Elemanları (Machine Elements)	3	0	0	5
		FENS310	Mühendisler İçin Ekonomi (Economics for Engineers)	3	0	0	4
		MTE 392	Yazılım Tasarım Projesi II (Software Design Project II)	3	0	2	6
		MTE 394	Sistem Dinamiği ve Denetimi Projesi (System Dynamics and Control Project)	4	2	0	7
		MTE 399	Staj II (Internship II)	0	0	0	6
		FENS 200	Olasılık ve İstatistik (Probability and Statistics)	2	2	0	4
Toplam				15	4	2	32

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
4	Güz	FENS 401	Mühendislik Tasarım Projesi-I (Engineering Design Project-I)	1	2	0	6
			Alan Seçmeli I (Area Elective I)	3	0	0	6
		MTE 491	Robot Design Project (Robot Tasarım Projesi)	4	2	0	10
		MTE	Seçmeli Proje I (Elective Project I)	3	2	0	8
Toplam				11	6	0	30

Yıl	Dönem	Ders Kodu	Ders Adı	T	A	L	AKTS
4	Bahar		Alan Seçmeli II (Area Elective II)	3	0	0	6
			Serbest Seçmeli (Free Elective)	3	0	0	6
		MTE	Seçmeli Proje II (Elective Project II)	3	2	0	8
		FENS 400	Mühendislik Tasarım Projesi-II (Engineering Design Project-II)	0	8	0	10
Toplam				9	10	0	30
Toplam				111	38	12	240
				136			240

MTE 394 - System Dynamics and Control Project & EE 308 Control Systems Project

Course description and learning objectives

- 3rd Year
- 16 students (MTE 394) / 50 students (EE 308)
- Spring Semester



Tentative Course Outline

Tentative Course Plan		
Week 1 (14.02/18.02)	Introduction	
Week 2 (21.02/25.02)	Modeling physical systems and Laplace Transformation	Project # 1 Assign
Week 3 (28.02/04.03)	Transfer functions of linear systems, system poles	
Week 4 (07.03/11.03)	State transition matrices, block Diagrams	FIGES training
Week 5 (14.03/18.03)	Time response of continuous data systems, steady state error	Project # 1 Report
Week 6 (21.03/25.03)	Design of Control Systems, P, PD, PID Controllers, Routh arrays	Project # 2 Assign
Week 7 (28.03/01.04)	Design of Control Systems, P, PD, PID Controllers, Routh arrays	FIGES training
Week 8 (04.04/08.04)	Transient Responses, damping factor, overshoot, delay, rise time, settling time.	
Week 9 (11.04/15.04)	Root locus techniques	
Week 10 (18.04/22.04)	Root locus techniques	Project # 2 Report Project # 3 Assign FIGES training
Week 11 (25.04/29.04)	Frequency Domain Analysis	FIGES training
Week 12 (02.05/06.05)	Frequency Domain Analysis	
Week 13 (09.05/12.05)	REVIEW	Project # 3 Report

MTE 394 - System Dynamics and Control Project

Project Based Learning for adoption MATLAB and Simulink Tool

Participation:	Assignments & participation	10%
Project-I:	Dynamic System Modeling (DC motor)	15%
Project-II:	Controller Design (PID)	15%
Project-III:	Stability Analysis	15%
Final Project:	Complex System Modeling and Control	45%

Industry Partner



MİNE SARAÇ STROPPIA
DR. ÖĞR. ÜYESİ



ÖZKAN KARABACAK
DOÇ. DR.
MEKATRONİK MÜHENDİSLİĞİ BÖLÜM BAŞKANI



TANER ARSAN
DOÇ. DR.
BİLGİSAYAR MÜHENDİSLİĞİ
BÖLÜM BAŞKANI



FEZA KERESTECİOĞLU
PROF. DR.

Special Thanks to...



Silvan Schwaller -
Academic Customer
Success Engineer at
FIGES



Ammar Beğen– System
Modeling & Control
Engineer at FIGES



Tugay Semih
Demirkıran– Senior
System Modeling and
Control Engineer at
FIGES

MTE 394 - System Dynamics and Project Based Learning for adopt and Simulink Tool

1. MATLAB Tutorials

1. System Modelling

2. Control

3. System Analysis

4. Advanced Topics in Simulink

- Linearization
- System Identification
- Using Simulation Environment

Tentative Course Outline

Tentative Course Plan		
Week 1 (14.02/18.02)	Introduction	Acrome Project Intro
Week 2 (21.02/25.02)	Modeling physical systems and Laplace Transformation	Project # 1 Assign
Week 3 (28.02/04.03)	Transfer functions of linear systems, system poles	
Week 4 (07.03/11.03)	State transition matrices, block Diagrams	FIGES training
Week 5 (14.03/18.03)	Time response of continuous data systems, steady state error	Project # 1 Report
Week 6 (21.03/25.03)	Design of Control Systems, P, PD, PID Controllers, Routh arrays	Project # 2 Assign
Week 7 (28.03/01.04)	Design of Control Systems, P, PD, PID Controllers, Routh arrays	FIGES training
Week 8 (04.04/08.04)	Transient Responses, damping factor, overshoot, delay, rise time, settling time.	
Week 9 (11.04/15.04)	Root locus techniques	
Week 10 (18.04/22.04)	Root locus techniques	Project # 2 Report Project # 3 Assign FIGES training
Week 11 (25.04/29.04)	Frequency Domain Analysis	FIGES training
Week 12 (02.05/06.05)	Frequency Domain Analysis	
Week 13 (09.05/12.05)	REVIEW	Project # 3 Report

MTE 394 - System Dynamics and Control Project

Project Based Learning for adoption MATLAB and Simulink Tool

2. Assignments



Aircraft Angle of Attack Control

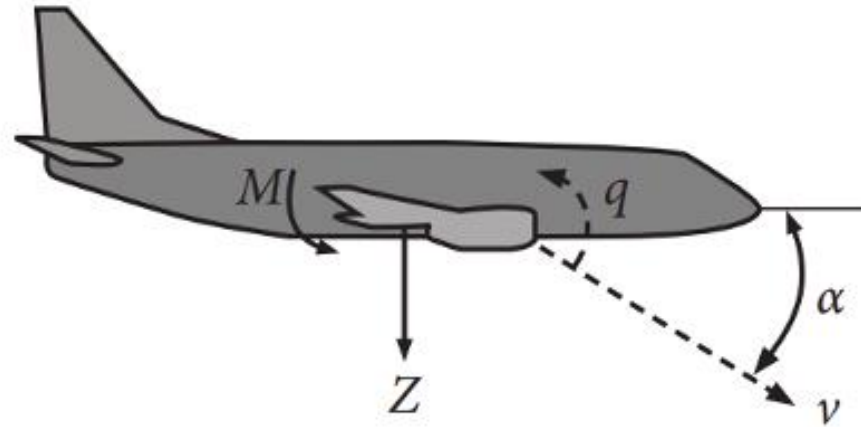


Fig 1. Variables of an aircraft in short period mode

MTE 394 - System Dynamics and Control Project

Project Based Learning for adoption MATLAB and Simulink Tool

3. Project Assignments

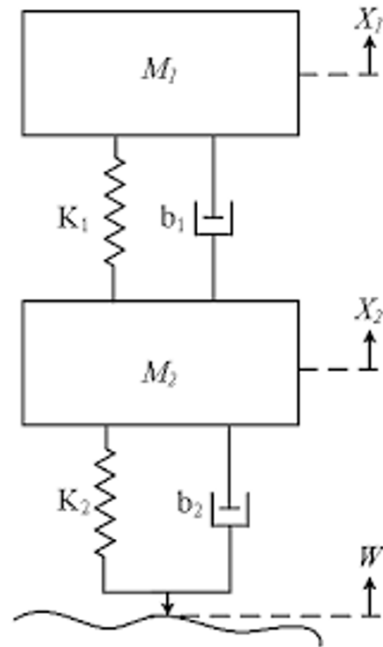


Figure.1 Schematic of an Active Suspension System

MTE 394 - System Dynamics and Control Project

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Your Tasks

3. Project Assignments

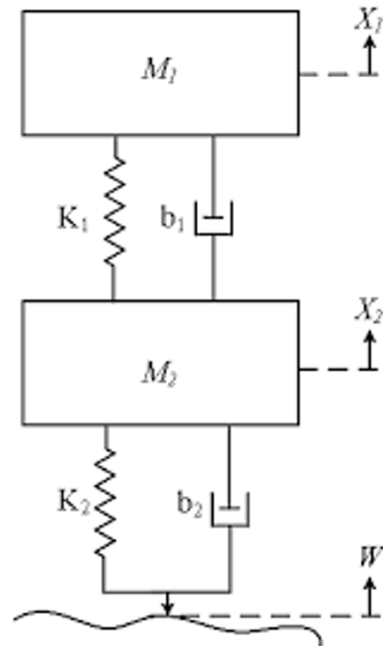


Figure.1 Schematic of an Active Suspension System

- Problem definition
 - Background information, motivation, challenges
- Modeling
 - Transfer functions related to the DC motor, plant and closed-loop system, detailed block diagram(s)
 - State-space model for the DC motor
 - Transfer function of the plant
- Analysis
 - Transient response and steady-state responses
 - Stability analysis of the closed loop system
 - Root-locus analysis with respect to the controller gain
 - Frequency response of the closed-loop system
- Design
 - PID controller to meet the given time-domain specifications

MTE 394 - System Dynamics and Control Project

Project Based Learning for adoption
MATLAB and Simulink Tool

3. Project Assignments

Report Submissions

Week 1	Introduction	
Week 2 (27.02 / 03.03)	Modeling physical systems and Laplace Transformation	Project Kick-off
Week 3 (06.03 / 10.03)	Transfer functions of linear systems, system poles	Project # 1 Assign
Week 4 (13.03 / 17.03)	State transition matrices, block Diagrams	
Week 5 (20.03 / 24.03)	Time response of continuous data systems, steady state error	
Week 6 (27.03 / 31.03)	Design of Control Systems, P, PD, PID Controllers, Routh arrays	
Week 7 (03.04 / 07.04)	Design of Control Systems, P, PD, PID Controllers, Routh arrays	Project # 1 Report
Week 8 (10.04 / 14.04)	Transient Responses, damping factor, overshoot, delay, rise time, settling time.	Project # 2 Assign
Week 9 (17.04 / 21.04)	Root locus techniques	
Week 10 (24.04 / 28.04)	Root locus techniques	
Week 11 (01.05 / 05.05)	Frequency Domain Analysis	Project # 2 Report Project # 3 Assign
Week 12 (08.05 / 12.05)	Frequency Domain Analysis	
Week 13 (15.05 / 19.05)	REVIEW	Project # 3 Report

MTE 394 - System Dynamics and Control Project

Project Based Learning for adoption

MATLAB and Simulink Tool

3. Project Assignments

	A
2	
3	Format (5)
4	
5	
6	Introduction (10):
7	Is there enough background Information?
8	If <u>applicable</u> , is there a summary of the previous group work (modeling/controller design)?
9	If there is not, is there a wider background information of the system?
10	Is there the importance of the task depending on the report (modeling/controller design/stability analysis)
11	What are the key aims and objectives of the paper?
12	Overview of the rest of the paper
13	What is the general overview of the discussion section?
14	Main Body (Modeling / Controller Design / Analysis) (30)
15	Are all the project questions answered?
16	Are figures/plots well-defined?
17	If <u>yes</u> , are they easily readable?
18	Are equations in the main body free of errors?
19	If <u>yes</u> , are they easy to follow

20	
21	Results / Discussion (20)
22	Is there the results section?
23	If <u>yes</u> , are the results from the main body discussed/commented on?
24	Are plots and/or equations from the main body addressed?
25	Are the results concluded from the point of motivation of the paper ?
26	
27	Conclusion (10):
28	Is the importance of the project revisited?
29	Is the motivation of the report highlighted?
30	Are the main points of the main body and/or results summarized?
31	Are there any future works ?
32	
33	References (5):
34	Are there at least 5 references?
35	If <u>yes</u> , are they in the correct reference template?
36	
37	Language and Clarity (10):
38	Is the article easy to read or free of grammar mistakes and typos?
39	
40	

MTE 394 - System Dynamics and Control Project

Project Based Learning for adoption MATLAB and Simulink Tool

3. Project Assignments

Report Submissions

Report Presentations and Oral Exam

Student comments and personal considerations

- Easy to implement, easy to learn
- Suitable for project-based learning
- Enjoyable
- Better comprehension of topics by MATLAB implementations

Thank you

Q&A – 5min

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