EEM 406 – Control System Design

Course Code	Course Name	Semester	
EEE 303	Digital System Design	Fall ☒ Spring ☐ Summer ☐	
Hours		**Credit**	**ECTS**
Theory	**Practice** / **Lab**	4	5
4	0 / 0		

Course Details	
Department	Electrical and Electronics Engineering
Course Language	Turkish
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☒ Elective ☐
Lecturer(s)	
Course Objectives	Course aims that student will be able to design control systems based on requirements
Course Content	• Mathematical model systems • Simulate systems • Design and tune PID controller • Transfer Functions, Root-Locus, Bode Plots • Implement Digital Controller
Course Method/ Techniques	Lecture ☒ Question & Answer ☐ Presentation ☐ Discussion ☐
Prerequisites/ Corequisites	

Work Placement(s)	

Textbook/References/Materials

Modern Control Systems 13th Edition by Richard Dorf, Robert Bishop

Course Category				
Mathematics and Basic Sciences	☒		Education	☐
Engineering	☒		Science	☒
Engineering Design	☒		Health	☐
Social Sciences	☐		Profession	☒

Weekly Schedule

No	Topics	Materials/Notes
1	Open-Loop and Closed Loop Systems	Chapter-1
2	Mathematical Model of First Order Systems	Chapter-2
3	Mathematical Model of Second Order Systems	Chapter-2
4	ON-OFF Controller	
5	PID Control of First Order Systems	Chapter-7
6	PID Control of Second Order Systems	Chapter-7
7	Review	
8	MIDTERM	
9	PID Tuning Methods	Chapter-7
10	PID Implementation	Chapter-7
11	Transfer Functions	Chapter-2
12	Root-Locus	Chapter-7
13	Bode Plots	Chapter-8
14	Digital Control	Chapter-13
15	Review	
16	FINAL	

Assessment Methods and Criteria		
In-term studies	**Quantity**	**Percentage**
Attendance		
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize		
Homework		
Presentation / Seminar		
Project	1	20%
Report		
Seminar		
Midterm Exam	1	20%
Final Exam	1	60%
	Total	**100%**
Contribution of Midterm Studies to Success Grade	1	40%
Contribution of End of Semester Studies to Success Grade	1	60%
	Total	**100%**

ECTS Allocated Based on Student Workload			
Activities	**Quantity**	**Duration (Hrs)**	**Total Workload**
Course Hours	16	3	48
Lab			
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time	16	5	80
Quiz/Studio/Criticize			
Homework			
Presentation / Seminar			
Project	1	50	50
Report			
Midterm Exam and Preparation for Midterm	1	23	23
Final Exam and Preparation for Final Exam	1	24	24
Total Workload			**225**
Total Workload / 25			**9**
"1ECTS Credit			**5**

Course Learning Outcomes	
No	**Outcome**
L1	Mathematical Modeling of Systems
L2	ON-OFF Controller
L3	PID Controller
L4	Transfer Functions
L5	Root-Locus, Bode Plots

Contribution of Course Learning Outcomes to Program Competencies/Outcomes

Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**					**Total**
L1	5	5	5	5	5	5	5	5	4	4	4					-
L2	5	5	5	5	5	5	5	5	4	4	4					-
L3	5	5	5	5	5	5	5	5	4	4	4					-
L4	5	5	5	5	5	5	5	5	4	4	4					-
L5	5	5	5	5	5	5	5	5	4	4	4					-
															Total	-

i. Sufficient knowledge in the fields of mathematics, natural sciences, and related engineering disciplines; the ability to apply theoretical and practical knowledge in solving complex engineering problems.

ii. The ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.

iii. The ability to design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.

iv. The ability to select and use modern techniques and tools required for the analysis and solution of complex problems encountered in engineering applications; the ability to effectively use information technologies.

v. The ability to design experiments, conduct experiments, collect data, analyze results, and interpret findings for the investigation of complex engineering problems or discipline-specific research topics.

vi. The ability to work effectively in intra-disciplinary and multidisciplinary teams; the ability to work independently.

vii. The ability to communicate effectively both orally and in writing; proficiency in at least one foreign language; the ability to write effective reports, understand written reports, prepare design and production reports, make effective presentations, and give and receive clear and understandable instructions.

viii. Awareness of the necessity of lifelong learning; the ability to access information, track developments in science and technology, and continuously renew oneself.

ix. Acting in accordance with ethical principles, knowledge of professional and ethical responsibilities, and the standards used in engineering applications.

x. Knowledge of business practices such as project management, risk management, and change management; awareness of entrepreneurship and innovation; knowledge of sustainable development.

xi. Knowledge of the impact of engineering practices on health, environment, and safety at global and societal levels, and awareness of contemporary engineering issues; awareness of the legal consequences of engineering solutions.