EEE450 Intelligent Control

Course Code	Course Name		Semester	
EEE450	Intelligent Control		Fall ☒ Spring ☐ Summer ☐	
Hours			Credit	ECTS
Theory	Practice	Lab	3	4
3	3	3		

Course Details	
Department	Electrical Electronics Engineering
Course Language	English
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☒ Elective ☐
Lecturer(s)	Dr. Hüseyin KÖSE
Course Objectives	The objective of this course is to learn the operation principles of control & intelligent control theory and its applications in our technologic words.
Course Content	In course; Basic characteristics and operation principles of electronic controlled system are investigated. P,PI,PID controlled circuits and their response behaviors are studied. Next step; software- based logic control algorithms and their applications on the electronic circuits are studied. As final step; fuzzy logic control theory, intelligent control theory and artificial intelligent control theory are studied. Industrial electronic control examples like air conditioner, heater etc. and power electronic control examples like power converters, electric car applications etc. are exampled during the course.
Course Method/ Techniques	Lecture ☒ Question & Answer ☒ Presentation ☒ Discussion ☒
Prerequisites/ Corequisites	Electrical Circuits1, Electronic1

Work Placement(s)	Classroom

Textbook/References/Materials

- 1. Control System Engineering; Norman S. NISE, EMEA edition, 2019.
  2. Lecturer Presentations and notes.

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

Weekly Schedule

No	Topics	Materials/Notes
1	Control Theory and Controlled Systems vs. Uncontrolled Systems.	Presentations, Lecturer notes
2	Proportionally Controlled systems and their example applications. (P)	Presentations, Lecturer notes
3	Proportionally & Integrated & Derivative Controlled systems and their example applications. (PI, PID)	Presentations, Lecturer notes
4	Embedded Software Based Controlled Systems and their example applications	Presentations, Lecturer notes
5	Writing a logic software using PID control theory and investigating examples in industry.	Presentations, Lecturer notes
6	Fuzzy Logic Control theory	Presentations, Lecturer notes
7	Fuzzy Logic examples using MATLAB	Presentations, Lecturer notes
8	Midterm Exam	
9	DC Motor speed control using software based PID control algorithm	Presentations, Lecturer notes
10	AC-DC and DC-DC converter control using software-based control algorithm.	Presentations, Lecturer notes
11	Fuzzy logic control example applications using MATLAB.	Presentations, Lecturer notes
12	Fuzzy logic control example applications using MATLAB.	Presentations, Lecturer notes
13	Fuzzy logic control example applications using MATLAB.	Presentations, Lecturer notes
14	Fuzzy logic control example applications using MATLAB.	Presentations, Lecturer notes
15	Fuzzy logic control example applications using MATLAB.	Presentations, Lecturer notes
16	Final Exam	

Assessment Methods and Criteria		
In-term studies	**Quantity**	**Percentage**
Attendance		
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize		
Homework	3	40%
Presentation / Seminar		
Project	1	60%
Report		
Seminar		
Midterm Exam		
Final Exam		
	Total	**100%**
Contribution of Midterm Studies to Success Grade		
Contribution of End of Semester Studies to Success Grade		
	Total	**100%**

ECTS Allocated Based on Student Workload			
Activities	**Quantity**	**Duration (Hrs)**	**Total Workload**
Course Hours	14	3	42
Lab			
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time			
Quiz/Studio/Criticize			
Homework	3	20	60
Presentation / Seminar			
Project	1	20	20
Report			
Midterm Exam and Preparation for Midterm			
Final Exam and Preparation for Final Exam			
Total Workload			**102**
Total Workload / 25			**102/25**
ECTS Credit			**4.08**

Course Learning Outcomes	
No	**Outcome**
L1	Understand the concept of control theory applications as PID, logic, software based, fuzzy logic, machine learning control based, artificial intelligent based.
L2	Understand the basic P, PI, PID, Fuzzy Logic control circuits and their applications.
L3	Can identify the Fuzzy controlled electronic circuits and their response behaviors.
L4	Can design PID controlled or fuzzy logic software controlled electronic circuits.
L5	Know the meaning and ideal values of certain parameters to evaluate the performance of controlled electronic circuits.

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	4	4	5	3	4											-20
L2	4	4	5	3	4											20-
L3	4	4	5	3	4											20-
L4	4	4	5	3	4											20-
L5	4	4	5	3	4											-20
															Total	-100

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.