ESOGU ELECTRICAL-ELECTRONICS ENGINEERING DEPARTMENT
COURSE INFORMATION FORM

Course Title	Course Code
DIGITAL SIGNAL PROCESSING	151225412

Semester in Program	Number of Course Hours per Week		ECTS Credit
	Theory	Practice	
5	3	0	6

Course ECTS Credit Distribution				
Basic Sciences	Engineering Sciences	Design	General Education	Social
	6			

Language of Instruction	Course Level	Course Type
English	Undergraduate	Required

Prerequisite	Signals and Systems
Objectives of the Course	The aim of this course is to teach the basic concepts of digital signal processing.
Brief Course Content	Discrete-time signals and systems and their properties, frequency domain analysis of discrete-time signals and systems, Z transform, frequency analysis of linear time-invariant systems, filter structures, FIR and IIR filter design, discrete Fourier transform (DFT) and fast Fourier transform (FFT) algorithms, DFT and Fourier analysis of signals.

	Learning Outcomes of the Course	Contributed POs	Teaching Methods *	Assessment Methods **
1	Knowledge about the types of discrete-time signals and systems, the convolution sum, impulse response, and frequency response of linear time-invariant (LTI) systems, the difference equations for LTI systems, the discrete-time Fourier transform (DFT), and the basic properties of the DFT.	1.c	1	A,B
2	Students will understand sampling of analog signals and the representation of the sampled analog signal in frequency domain	1.c	1	A,B
3	Students will comprehend the concepts of the z-transform and its inverse, the region of convergence, and their properties. They will perform simple transform calculations and understand the concept of the system function in relation to impulse and frequency responses.	1.c	1	A,B
4	Students will understand the basic properties of system functions and frequency responses of linear time-invariant (LTI) systems, including minimum-phase, all-pass, and linear-phase systems.	1.c	1	A,B
5	Students will learn about signal flow graph and block diagram representations of difference equations used to realize digital filters	1.c	1	A,B
6	The students will learn FIR and IIR filters, their frequency responses and characteristics.	1.c	1	A,B
7	The student will learn how to design and implement FIR and IIIR filters using different methods and tools used for designing digital filters.	1.c, 4.a	1,14	A,B
	The student will complete and demonstrate a design and implementation of DSP filter.			
8	The student will learn to work in a team to complete research and computer assignments and to prepare report.	6.b, 7.c	12,15	E
9	Students will understand the definitions and basic properties of discrete Fourier transform (DFT) and they will learn fast fast Four transform (FFT).	1.c	1	A,B

***Teaching Methods** **1:**Lecture, **2**:Discussion, **3:**Experiment, **4:**Simulation, **5:**Question-Answer, **6:**Tutorial, **7**:Observation, **8**:Case Study, **9:**Technical Visit, **10:**Problem Solving, **11:**Induvidual Work, **12**:Team/Group Work, **13**:Brain Storm, **14:**Project Design / Management, **15:**Report Preparation and/or Presentation

****Assessment Methods** **A:**Exam, **B:**Quiz, **C:**Oral Exam, **D:**Homework, **E:**Report, **F:**Article Examination, **G:**Presentation, **I:**Experimental Skill, **J:**Project Observation, **K**:Class Attendance; **L**:Jury Exam

Main Textbook	A.V. Oppenheim and R.W. Schafer, Discrete Time Signal Processing, Prentice Hall, 2010
Supplementary Resources	1. S. Mitra, Digital Signal Processing: A Computer-Based Approach, McGraw-Hill, 4. Edition, 2011 2. J. H. McClellan, R. W. Schafer, M. A. Yoder, Signal Processing First, Prentice Hall, 2003 3. J.G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, Prentice-Hall, NJ, Fourth Edition, 2007
Necessary Course Material	-

Course Weekly Schedule	
1	Discrete-time signals and systems
2	Discrete-time signals and systems
3	Linear time-invariant systems and their properties
4	Frequency domain analysis of discrete-time signal and systems
5	Periodic sampling and representation of sampling on the frequency domain
6	Changing the sampling rate using discrete-time process
7	Z-transform
8	Mid-Term Exams
9	Transform analysis of linear time-invariant systems
10	Structures for discrete time systems
11	IIR and FIR filter design techniques
12	IIR and FIR filter design techniques
13	The discrete time Fourier transform (DTFT)
14	Fast Fourier transform
15	Fourier analysis of signals using DTFT
16,17	Final Exams

Calculation of Course Workload			
Activities	**Count**	**Time (Hour)**	**Total Workload (Hour)**
Weekly classroom time	14	3	42
Weekly study time (review, reinforcing, preparation)	14	3	42
Homework			
Taking a quiz	4	1	4
Studying for a quiz	4	8	32
Oral exam			
Studying for an oral exam			
Report writing (Preparation and presentation time included)			
Project (Preparation and presentation time included)	1	16	16
Presentation (Preparation time included)			
Mid-Term Exam	1	2	2
Studying for Mid-Term Exam	1	12	12
Final Exam	1	2	2
Studying for Final Exam	1	16	16
		Total workload	**168**
		Total workload / 30	**5,6**
		Course ECTS Credit	**6**

Assessment	
Activity Type	**%**
Mid-term	30
Quiz	30
Project	10
Final Exam	30
Total	100

COURSE CONTRIBUTION TO THE PROGRAM OUTCOMES (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
NO	**PROGRAM OUTCOMES**	**Contribution**
1	a. Sufficient knowledge of mathematics	
	b. Sufficient knowledge of basic sciences	
	c. Sufficient basic engineering and Electrical-Electronics engineering knowledge	5
	d. Skill of applying all these knowledge and experience to complicated Electrical-Electronics engineering problems	
2	Skill of defining, identifying, formulating and solving the complicated problems in Electrical-Electronics engineering and related areas by applying appropriate analysis and modelling methods.	
3	Skill of designing a complicated process, system, equipment or product by applying modern design methods under realistic constraints and conditions.	
4	To analyze and solve the complicated engineering problems: a. skill of developing, selecting and applying the required techniques and devices	4
	b. skill of using information technologies effectively	4
5	To study the complicated on the complicated Electrical-Electronics engineering problems and research subjects: a. skill of experimental design	
	b. skill of performing the experiments, collecting the data and analyzing and interpreting the results	
6	a. Skill of performing individual studies	
	b. Skill of performing intra and interdisciplinary and multidisciplinary teamwork and studies	4
7	a. Skill of effective oral and writing communication in Turkish	
	b. Skill of improving and using foreign language knowledge	
	c. Skill of effective reporting, understanding the reports and preparing the design and production reports	4
	d. Skill of effective presentation and giving and getting clear and understandable instructions.	
8	Awareness of the necessity of life-long learning and skill of accessing to information and following the improvements in contemporary science and technology	
9	a. Awareness of necessity of behaving in accordance with the ethical principles and awareness of the importance of having professional ethical responsibilities	
	b. Knowledge about legal regulations and standards of engineering	
10	a. Knowledge about project management, risk management and change management	
	b. Awareness of the significance of entrepreneurship and innovation	
	c. Knowledge about sustainable development	
11	Knowledge about the effects of engineering applications and practices on the global and social health, ecology and safety, knowledge about the current problems in relation to the working areas of Electrical-Electronics engineering; and awareness of the legal issues resulting from engineering solutions	
12	Knowledge about modern problems in local and universal scale	

INSTRUCTORS				
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Date:11.07.2024