School of Engineering and Natural Sciences / Computer Engineering (English)

2022 - 2023 Academic Year

DIGITAL SIGNAL PROCESSING

Syllabus

Course Description					
Name	**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
DIGITAL SIGNAL PROCESSING	COE4210344	Spring Semester	3+0	3	6

Prerequisites Courses	SİNYALLER VE SİSTEMLER
Recommended Elective Courses	
Language of Instruction	English
Course Level	First Cycle (Bachelor's Degree)
Course Type	Elective
Course Coordinator	Lect. Mustafa AKTAN
Name of Lecturer(s)	Prof.Dr. Mehmet Kemal ÖZDEMİR, Lect. Mustafa AKTAN
Assistant(s)	
Aim	This is a fourth-year undergraduate course on the fundamentals of discrete-time signal processing (DSP). This course provides the students with a solid background in theory and design of DSP systems. Different transformation techniques, conversion from analog to digital and vice versa, digital filter structures, and their application to real systems are covered. The theory is realized via Matlab simulations.
Course Content	This course contains; Introduction to Discrete-Time Signals and Systems ,Discrete LTI Systems ,Z-Transform,Sampling of Continuous-Time Signals ,Multi-rate signal Processing and Introduction to Discrete Random Process ,Transform Analysis of LTI Systems – Part A ,Transform Analysis of LTI Systems – Part B ,Structure for Discrete-Time Systems : Block Diagrams and IIR Systems ,Structure for Discrete-Time Systems : FIR Systems and Quantization Effect ,Digital Filter Design Techniques – Part A ,Digital Filter Design Techniques – Part B,The Discrete Fourier Transform – Part A ,The Discrete Fourier Transform – Part B ,Discrete Stochastic Processes and Systems.

Course Learning Outcomes	**Teaching Methods**	**Assessment Methods**
Understand the basics of LTI systems and transformation approaches in analyzing LTI systems. □□□□□□	1, 9	A, C, D, E
Sample lowpass and bandpass signals	1, 9	A, C, D, E
Design of IIR and FIR filters.	1, 9	A, C, D, E
Use DFT and FFT techniques effectively.	1, 9	A, C, D, E
Analyze discrete stochastic systems.	1, 9	A, C, D, E

Teaching Methods	1: Lecture, 9: Simulation
Assessment Methods	A: Written Exam, C: Homework, D: Project / Design, E: Quiz

Lecture Schedule

Sequence	**Topics**	**Preliminary Preparation**
1	Introduction to Discrete-Time Signals and Systems □□□□	Notes and Oppenheim Chapters 1 & 2
2	Discrete LTI Systems □□	Notes and Oppenheim Chapter 2
3	Z-Transform	Notes and Oppenheim Chapter 3
4	Sampling of Continuous-Time Signals □□□	Notes and Oppenheim Chap. 4
5	Multi-rate signal Processing and Introduction to Discrete Random Process □□□□□□	Notes and Oppenheim Chap. 4
6	Transform Analysis of LTI Systems – Part A □□□□	Notes and Oppenheim Chap. 5
7	Transform Analysis of LTI Systems – Part B □□□□	Notes and Oppenheim Chap. 5
8	Structure for Discrete-Time Systems : Block Diagrams and IIR Systems □□□□□□	Notes and Oppenheim Chap. 6
9	Structure for Discrete-Time Systems : FIR Systems and Quantization Effect □□□□□□	Notes and Oppenheim Chap. 6
10	Digital Filter Design Techniques – Part A □□□□	Notes and Oppenheim Chap. 7
11	Digital Filter Design Techniques – Part B	Notes and Oppenheim Chap. 7
12	The Discrete Fourier Transform – Part A	Notes and Oppenheim Chap. 8
13	The Discrete Fourier Transform – Part B □□□□	Notes and Oppenheim Chap. 8
14	Discrete Stochastic Processes and Systems	Notes and Vetterli Chap. 3

Evaluation Methods	**Weight(%)**
Midterm Exam	30
General Exam	70

Resources

Discrete-Time Signal Processing by Alan V. Oppenheim and Ronald W. Schafer
Prentice Hall (Pearson) ISBN 978013 1988422
Foundations of Signal Processing, M. Vetterli, M. Kovacevic and V. Goyal , 2013, Cambridge University Press