

**School of Engineering and Natural Sciences / Biomedical Engineering (English)**

**2024 - 2025 Academic Year**

**DIGITAL SIGNAL PROCESSING**

**Syllabus**

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
DIGITAL SIGNAL PROCESSING	BME4210344	Spring Semester	3+0	3	6
<b>Prerequisites Courses</b>	SİNYALLER VE SİSTEMLER				
<b>Recommended Elective Courses</b>	Embedded Systems				
<b>Language of Instruction</b>	English				
<b>Course Level</b>	First Cycle (Bachelor's Degree)				
<b>Course Type</b>	Elective				
<b>Course Coordinator</b>	Prof.Dr. Mehmet Kemal ÖZDEMİR				
<b>Name of Lecturer(s)</b>	Prof.Dr. Mehmet Kemal ÖZDEMİR				
<b>Assistant(s)</b>	None.				
<b>Aim</b>	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.				
<b>Course Content</b>	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,Midterm overview,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.				
<b>Course Learning Outcomes</b>				<b>Teaching Methods</b>	<b>Assessment Methods</b>
1. Applies the basics of LTI systems and transformation approaches in analyzing LTI systems.				21, 9	A, E, F, G
2. Samples lowpass and bandpass signals.				21, 9	A, E, F, G
3. Designs LTI IIR and FIR filters.				21, 9	A, E, F, G
4. Uses DFT and FFT techniques effectively.				21, 9	A, E, F, G
5. Analyzes discrete stochastic systems.				21, 9	A, E, F, G
<b>Teaching Methods</b>	21: Simulation Technique, 9: Lecture Method				
<b>Assessment Methods</b>	A: Traditional Written Exam, E: Homework, F: Project Task, G: Quiz				
<b>Lecture Schedule</b>					
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	Midterm overview	Notes till Week 7 and textbook chapters 1-5			
9	Structure for Discrete-Time Systems : Block Diagrams and IIR Systems	Notes and Oppenheim Chap. 6			
10	Structure for Discrete-Time Systems : FIR Systems and Quantization Effect	Notes and Oppenheim Chap. 6			
11	Digital Filter Design Techniques – Part A	Notes and Oppenheim Chap. 7			
12	Digital Filter Design Techniques – Part B	Notes and Oppenheim Chap. 7			
13	The Discrete Fourier Transform – Part A	Notes and Oppenheim Chap. 8			
14	The Discrete Fourier Transform – Part B	Notes and Oppenheim Chap. 8			
15	Discrete Stochastic Processes and Systems	Notes and Vetterli Chap. 3			
<b>Evaluation Methods</b>		<b>Weight(%)</b>			
Midterm Exam		30			
General Exam		70			

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