

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

2023 - 2024 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 | Embedded Systems | | | | |
| Language of Instruction | English | | | | |
| Course Level | First Cycle (Bachelor's Degree) | | | | |
| Course Type | Elective | | | | |
| Course Coordinator | Assist.Prof. Mustafa AKTAN | | | | |
| Name of Lecturer(s) | Prof.Dr. Mehmet Kemal ÖZDEMİR | | | | |
| Assistant(s) | None. | | | | |
| 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,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. | | | | |
| Course Learning Outcomes | | | Teaching Methods | Assessment Methods | |
| 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. Uses IIR and FIR filters in LTI systems. | | | 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 | |
| Teaching Methods | 21: Simulation Technique, 9: Lecture Method | | | | |
| Assessment Methods | A: Traditional Written Exam, E: Homework, F: Project Task, G: 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 | 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 | | | |
| Evaluation Methods | | Weight(%) | | | |
| 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 | | | | | |