CENG 308 Introduction to Signal Processing for Computer Engineers

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Course Name	**Course Code**	**Semester**	**h/w**	**Appl.**	**Lab. h/w**	**Credit**	**ECTS**
Introduction to Signal Processing for Computer Engineers	CENG308	1	3	2	0	4	5

Prerequisites	No
Course Language	English
Course Type	Compulsory
Course Level	Undergraduate
Way of teaching	Face to face, online
Learning and teaching techniques	Expression, question answer, homework

Course Objectives

This course covers the fundamental theories in digital signal processing (DSP). Basic sequences encountered in DSP are presented, and the fundamentals of sampling and system responses are introduced. The differences between the processing of periodic and aperiodic signals are discussed and time domain methods such as convolution of two signals are developed. Frequency domain methods, such as the Discrete Fourier Transform and the Fast Fourier Transform are presented. The Z-Transform is introduced as a tool for discrete time signal processing.

Course Educational / Learning Outcomes

Students who can successfully complete this course will be able to;

1	express signal processing systems in mathematical form.
2	write Matlab code describing a signal processing system.
3	analyze signals in terms of their frequency content.
4	describe system behavior in terms of frequency content.
5	analyze linear system behavior in terms of Fourier transform and frequency response.
6	analyze mixed analog-digital systems with sampling operations and digital filters.
7	utilize the z-transform to analyze discrete-time systems in terms of poles and zeroes.
8	use complex exponential notation to describe signals and systems.
9	describe how signal processing is used in applications (e.g., audio and digital image processing).

Topics Covered

Signals and Systems, Sampling and quantization, Fourier analysis, Z-transform, Transform analysis of systems, Discrete Fourier transform, Fast Fourier transform, Implementation of discrete-time systems, Filter design, discrete-time signals and sampled data, linear time-invariant (LTI) systems, frequency response, convolution, spectrum analysis, non-recursive digital filters.

Weekly Topics and Releated Preparation Studies

Week	Topics	Preparation
1	Introduction to signal processing applications in computer engineering	

2	Continuous-time and discrete-time signals and systems	
3	Floating point representation, quantization errors	
4	Linear time-invariant systems; Convolution.	
5	Fourier Series representation of continuous-time and discrete-time periodic signals; properties of Fourier series; filtering concepts.	
6	The continuous time Fourier transform and its properties	
7	The Fourier transform for periodic signals.	
8	Midterm Exam	
9	Sampling and discretization of continuous-time signals.	
10	The z-transform and its properties	
11	Analysis of discrete-time systems using z-transform	
12	The discrete-time Fourier transform and its properties	
13	Midterm Exam	
14	Algorithms for signal and image processing	
15	Final Exam	
16		

Textbook
McClellan, Shafer, and Yoder, Signal Processing First, Prentice Hall, 2003.
"Digital Signal Processing; Principles, Algorithms and Applications," 4th Edition, by John G. Proakis and Dimitris G. Manolakis, Pearson Prentice Hall, 2007.

Assessment System		
Works	**Number**	**Contribution**
Attendance		
Laboratory	5	15
Practice		
Field Study		
Course-Specific Internship (if applicable)		
Quizzes		
Homework	4	10
Presentation		
Project		
Report		
Seminar		
Midterm Exams / Midterm Jury	2	35
Final Exam / Final Jury	1	40
	Total	**% 100**
Contribution to the success grade of semester studies		% 60
Contribution of the studies at the end of semester to the success grade		% 40
	Total	**% 100**

Course Category	
Basic Vocational Courses	X
Expertise / Field Courses	
Support Courses	
Communication and Management Skills Courses	
Transferable Skill Courses	

The Relationship between Course Learning Outcomes and Program Competencies						
No	Program Competencies / Outcomes	Contribution Level				
		1	2	3	4	5
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

ECTS/Workload Table			
Activities	Number	Time (h)	Total Workload
Course hours (Including exam week: 16 x total weekly course hoursi)	16	3	48
Laboratory	5	2	10
Application			
Course specific internship			
Field Study			
Out-of-class study time			
Presentation/Seminar Preparation			
Projects			
Reports			
Homeworks	4	2	8
Quizzes			
Preparation time for Midterm Exams / Midterm Jury	2	20	40
Preparation time for Final Exam / Final Jury	1	20	20
Total Workload			**126**