LAHORE COLLEGE FOR WOMEN UNIVERSITY

Jail Road, Lahore – Pakistan. Tel: 042-9203072,9203089, 9201950 Fax: 042-9203077

DEPARTMENT OF ELECTRICAL ENGINEERING
Course Descriptive File

1	Course Title	Signals and Systems
2	Course Code	EE 208
3	Credit Hours	4(3,1)
4	Pre-requisites	Complex Variables and Transforms
5	Co-requisites	Digital Signal Processing
6	Semester	IV
7	Resource Person	Ms. Aisha Jilani
8	Contact Hours (Theory)	3
9	Contact Hours (Lab)	3
10	Office Hours	8 am to 4 pm
11	Email	aishajilani90@yahoo.com

12	Course Outline as per Scheme of Studies (SoS)

Thoery Outline:

- Continuous time and discrete time signals
- Periodic signals, even and odd signals, exponential and sinusoidal signals, the unit impulse and unit step functions
- Continues time and discrete time systems
- Linear time invariant (LTI) systems, difference equation, causality, BIBO stability, convolution and correlation
- Discrete time Fourier transforms, time and frequency characterization of signals and systems
- Analysis and design of continuous time systems using Laplace transforms.
- The sampling theorem, aliasing, sampling the discrete time signals

Lab Work Outline:

- Develop and understanding of signal systems and transforms using MATLAB

13	Course Objectives as per SoS

1. To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.
3. To understand Sampling theorem, with time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform.

14	Books

Textbook

- V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and Systems", 2nd Edition, Prentice Hall, 1996

Reference Books

- M. J. Roberts, "Fundamentals of Signals and Systems", McGraw-Hill, 2007
- B. P. Lathi, "Linear Systems and Signals", 2nd Edition, Oxford, 2004
- S. Haykin and B. Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2002
- C. L. Phillips, J. M. Parr and E. A. Riskin, "Signals, Systems, and Transforms", 4th Edition, Prentice Hall, 2007.

15	Course Learning Outcomes (CLOs)

After successful completion, students will be able to:

Theory CLOs:

1. Express the concepts of signals and systems and their different types which can be used in a wide variety of disciplines in engineering and study properties such as causality, stability, linearity, and time invariance etc.
2. Use linear systems tools, especially transform analysis and convolution, to analyze and predict the behavior of linear systems.
3. Analyze continuous and discrete time signals and systems in the time/frequency-domain using Fourier, Laplace and z-transforms.
4. Concepts of sampling, sampling theorem and modulation and Gain an appreciation for the importance of linear systems analysis in communication systems.

Lab CLOs:

1. Confirm basic concepts of programming in MATLAB and explain use of built-in and user defined functions to perform assigned
2. Produce and process signals in time domain i.e. Sampling, Quantization, Convolution, Correlation in MATLAB
3. Learn tools for analysis of signals and system in the transform domain; through Fourier Transform, discrete time Fourier Transform and Z transform.

16	Marks Breakup

Theory

Quizzes	10%
Homework/assignments	10%
Midterm exam	25%
Terminal exam (3 hours)	30%
Total (theory)	75%

Lab

Lab Assessments	10%
Lab Sessional Exams (50% Lab performance + 50% Lab Assessments)	5%
Lab Terminal Exam (xx% Lab performance + xx% Lab Assessments)	10%
Total (lab)	25%

Final marks	Theory marks * 0.75 + Lab marks * 0.25

17

Week	Topic	CLO	Taxonomy Level	Specific Outcome	Contact Hours	Assessment
1	Continuous time and discrete time signals	1	C1	Students will be able to analyze the difference between continuous and discrete time signals and system using different transform domain techniques.	3	Lecture + Class Discussion
2	Periodic signals, even and odd signals	1	C1	Students will be able to define, use and cite some simple properties of these basic signals and can classify the signal as periodic and aperiodic.	3	
3	Exponential and sinusoidal signals, power and energy of signals.	1	C2	Students will be able to: i. Classify signals according to a variety of criteria including energy, power and duration. ii. Competently manipulate complex-valued signals.	3	
4	The unit impulse and unit step functions and properties of signals	1	C2	Students will be able to: i. Use common signal transformation operations and will be able to plot them as well. ii. Define state and identify system properties of linearity, time invariance, causality, memory and stability.	3	Lecture + Assignment 1
5	Linear time invariant (LTI) systems	1	C2	Students will be able to	3	

				formulate and solve differential equations describing linear, time invariant (LTI) systems, including both transient and steady-state responses.		
6	Difference equation, causality, BIBO stability	1	C2	Students will be able to: i. Analyze and synthesize systems as a composite of sub-systems through series, parallel and feedback combinations. ii. Describe causality and stability of system with examples.	3	
7	Convolution and correlation	2	C1, C3, C4	Students will be able to perform convolution of discrete time and continuous time signals.	3	Lecture + Quiz 1
8	Convolution and its properties	2	C3, C4	Students will be able to apply different properties of convolution such as commutative, associative and distributive and convolve the signals accordingly.	3	
9	Frequency characterization of signals and systems	3	C2	Students will be able to derive and interpret the spectra of signals and frequency responses of particular systems.	3	
10	Fourier Analysis	3	C2, C3, C4	Students will be able to: i. Compute Fourier analysis of different signals. ii. Implement impulse response, frequency response and Fourier	3	Lecture + Assignment 2

				methods in analyzing signals and systems in time and frequency domains		
11	Fourier Analysis	3	C2, C3, C4	Students will be able to: i. Apply Fourier analysis to periodic and aperiodic signals. ii. Describe the difference in properties of Fourier series and Fourier Transform.	3	Lecture + Quiz 2
12	Analysis of systems using Z transform.	3	C2, C3	Students will be able to define Z transforms and its interpretation in signals and systems.	3	
13	Analysis of systems using Laplace transform.	4	C2, C3	Students will be able to Define Laplace transforms and manipulate s-domain transfer functions.	3	Lecture + Assignment 3
14	The sampling and sampling theorem, and aliasing.	4	C2	Students will be able to explain the concept of sampling, sampling theorem, Nyquist criteria and aliasing.	3	
15	The sampling theorem, concepts and types of modulation.	4	C2	Students will be able to: i. Describe Sampling and its applications. ii. Describe Modulation concepts and techniques.	3	Quiz 3
16	Revision	3,4	C2			

- Every instructor have his/her plan for course material used for assignments and quizzes, table above is just a guideline.

18	Course Learning Outcomes (CLOs) and Assessment Plan

CLO / Activity	CLO 1	CLO2	CLO3	CLO4
Quiz 1		C2, C3		
Assignment 1	C1, C2	C3, C4		
MID TERM EXAM (Theory)	C2	C3, C4		
Quiz 2			C2, C3, C4	
Quiz 3			C3	C2
Assignment 2		C4	C3, C4	
Assignment 3			C3, C4	C2
FINAL TERM EXAM (Theory)	C1	C4	C2, C3, C4	C2