



BIRZEIT UNIVERSITY
Faculty of Engineering and Technology
Electrical and computer Engineering
Summer 2023-2024

SYLLABUS

Course number and name: ENEE2312- Signals & Systems

Credits and contact hours: Credit: 3 (Lectures: 3 hours)

Instructors:

- Jamal Siam, Masri 221

Office hours: announced on Ritaj

Textbook:

Signals and Systems, Continuous and Discrete, R. Ziemer, W. Tranter & R. Fannin, McMillan, 4th edition, 1998

Specific course information

- **Description:** Signals and Systems representation and transforms.
- **Prerequisites:** MATH331

Grading: four half hour exams	40 %
Quizzes+ Assignments	15%
Final Exam	45%

Specific goals for the course

1. To understand the concepts of signals and systems for both continuous and discrete case
2. To be able to define the proper signal model and to classify signals
3. To be able to classify the systems and their characteristics
4. To be able to determine and analyze system response for the elementary signals
5. To understand and apply the integral form of system solution(convolution)
6. To be able to understand and determine the Fourier series and transform
7. To be able to determine and analyze the system frequency response
8. To be able to understand discrete signals and systems models
9. To be able to define LTI discrete system using difference equations and transfer functions
10. To be able to convert between continuous and discrete signals and system models
11. To be able to understand the Z-transform and its applications in signal and systems
12. To be able to understand practical applications of signals and systems

Intended Learning Outcomes:

(a) Ability to apply mathematics, science and engineering principles.

(k) Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Brief list of topics to be covered

Continuous Signals and Systems

I. Signals

- Signals representation and classification in time domain.

- Mathematical expression and operations on signals
- Elementary signals (singularity signals, as step, ramp, delta)
- Representation of a signal as a convolution integral
- Phasor representation
- Frequency representation (signal spectrum)
- Signal distortion
- Orthogonality

II. Systems

- System representation and modeling
- Classification of systems
- System differential equation model
- Impulse response of LTI system
- System response in integral form (Convolution integral)
- Stability of LTI system in time domain
- Steady state response in time domain

Discrete Signals and Systems

I. Signals

- Discrete Signals and Systems
- Signal conversion(discretization)
- Sampling Theorem
- Reconstruction of a signal
- Discrete elementary signals
- Convolution sum

II. Systems

- Discrete system representation and modeling
- Classification of discrete systems
- System difference equation model
- Impulse response of LTI system
- LTI System response in convolution form (Convolution sum)
- IIR and FIR systems
- Stability of linear system
- Steady state response of discrete systems.
- System modeling and simulation(direct form)

III. Z-transform and applications

- Definition , properties and theorems
- Z-transform of elementary signals
- Relations between z-transform and Laplace transform
- Inverse z-transform of rational functions
- System transfer function in z-domain
- The frequency response of a discrete LTI system
- Impulse and frequency response by z-domain representation
- Stability of LTI systems in z-domain
- System modeling in z-domain(direct form)
- Discrete system frequency response