Course Description and Outcome Form
Department of Electrical and Electronic Engineering
BSRM School of Engineering
BRAC University

EEE 243: Signals and Systems

A. Course General Information

Course Code:	EEE 243
Course Title:	Signals and Systems
Credit Hours (Theory + Laboratory):	3 + 0
Contact Hours (Theory + Laboratory):	3 + 0
Category:	Program Core
Type:	Required, Engineering, Lecture
Prerequisites:	EEE 203 Electrical Circuits II EEE 203L Electrical Circuits II Laboratory MAT 216 Mathematics IV Linear Algebra and Fourier Analysis
Co-requisites:	None
Equivalent Course	ECE 243 Signals and Systems

B. Course Catalog Description (Content)

This is an introductory course in the field of communication engineering. It provides basic concepts of signals and systems and how different operations are done on the elementary signals. Students will learn to determine the output of the LTI system using the convolution technique. They will get an insight into frequency domain techniques for analyzing and manipulating continuous-time signals.

Students will learn to determine the Fourier series coefficient and Fourier transform of periodic and aperiodic time-domain signals. This learning is also extended to the Laplace transform. Using these frequency domain techniques, students will be able to design and analyze different types of systems.

C. Course Objective

The objectives of this course are to

a. introduce the fundamental concepts of signals and systems
b. enable students to find system output using the convolution integral
c. provide a basic understanding of frequency domain representation of signals
d. enable students to analyze systems using Fourier series, Fourier transform, and Laplace transform
e. develop techniques to design a system using frequency-domain methods
f. prepare students to take more advanced courses in the area of communications engineering

D. **Course Outcomes (COs)**

Upon successful completion of this course, students will be able to

Sl.	CO Description
CO1	**Explain** various types of *signals* (e.g., continuous and discrete, periodic and aperiodic, and power and energy) and *systems* (e.g., linear, time invariance, causal, memoryless, invertible, and BIBO stable)
CO2	**Analyze** various properties of *signals* and *systems*
CO3	**Apply** the basic properties of the Fourier series, Fourier transform and Laplace transform to analyze and solve problems
CO4	**Use** the frequency domain techniques to design systems meeting particular requirements

E. **Mapping of CO-PO-Taxonomy Domain & Level- Delivery-Assessment Tool**

Sl.	CO Description	POs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools (tentative)
CO1	**Explain** various types of *signals* (e.g., continuous and discrete, periodic and aperiodic, and power and energy) and *systems* (e.g., linear, time invariance, causal, memoryless, invertible, and BIBO stable)	a	Cognitive/ Understand	Lectures, notes	Quiz, Assignment, Exam
CO2	**Analyze** various properties of signals and systems	b	Cognitive/ Analyze	Lectures, notes	Quiz, Assignment, Exam
CO3	**Apply** the basic properties of the Fourier series, Fourier transform and Laplace transform to analyze and solve problems	a	Cognitive/ Apply	Lectures, notes	Quiz, Assignment, Exam
CO4	**Use** the frequency domain techniques to design systems that meet particular requirements	a	Cognitive/ Apply	Lectures, notes	Quiz, Assignment, Exam

F. **Course content**

Sl.	Topic	*Week
1	Introduction to signals and systems	1
2	Classification of signals Useful operations on signals Elementary signals	2-4
3	Classification of systems • Linear and Nonlinear Systems • Time-invariant and Time-Varying Systems • Instantaneous and Dynamic Systems • Causal and Noncausal Systems	5-6

	• Continuous-Time and Discrete-Time Systems • Analog and Digital Systems • Invertible and Noninvertible Systems • Stable and Unstable Systems	
4	Linear Time-Invariant (LTI) systems • Convolution Integral, • Graphical approach Properties of LTI systems Systems described by differential equations	7
	Mid-Term	
5	Fourier series Properties of Fourier series Fourier series for systems with periodic inputs The Gibbs phenomenon	8-9
6	Fourier transform Properties of Fourier transform Applications of Fourier transform The inverse of the Fourier transform Duration bandwidth relationship	10-11
7	Laplace Transform Properties of Laplace transform The inverse Laplace transform Applications of the Laplace transform	12-13
	Final Term	

*Tentative

G. Course materials

- Lecture notes and presentation slides
- Previous semester questions

- **Text and Reference Books**

  - **Alan V. Oppenheim, Alan S. Willsky, With S. Hamid, Syed Hamid Nawab, "Signals and Systems" Pearson, second edition.**
  - Samir S. Soliman, Mandyam D. Srinath "Continuous and discrete signals and systems," Prentice-Hall, second edition.
  - P. Lathi, "Linear Systems and Signals", Oxford University Press, Inc, second edition.
  - Calic, "Communication Systems". Online: < http://cnx.org/content/col10631/1.3/ >

H. Assessment Tools for Grading

Assessment Tools	Weightage
Class Performance	5%
Assignment	20%
Quiz	20%
Midterm Exam	25%
Final Exam	30%

I. CO Assessment Plan*

Assessment Tools	Course Outcomes			
	CO1	CO2	CO3	CO4
Assignment		x		x
Quiz	x		x	
Exam	x	x	x	x

**Tentative*.

J. CO Attainment Policy

As per the course outcome attainment policy of the Department of Electrical and Electronic Engineering

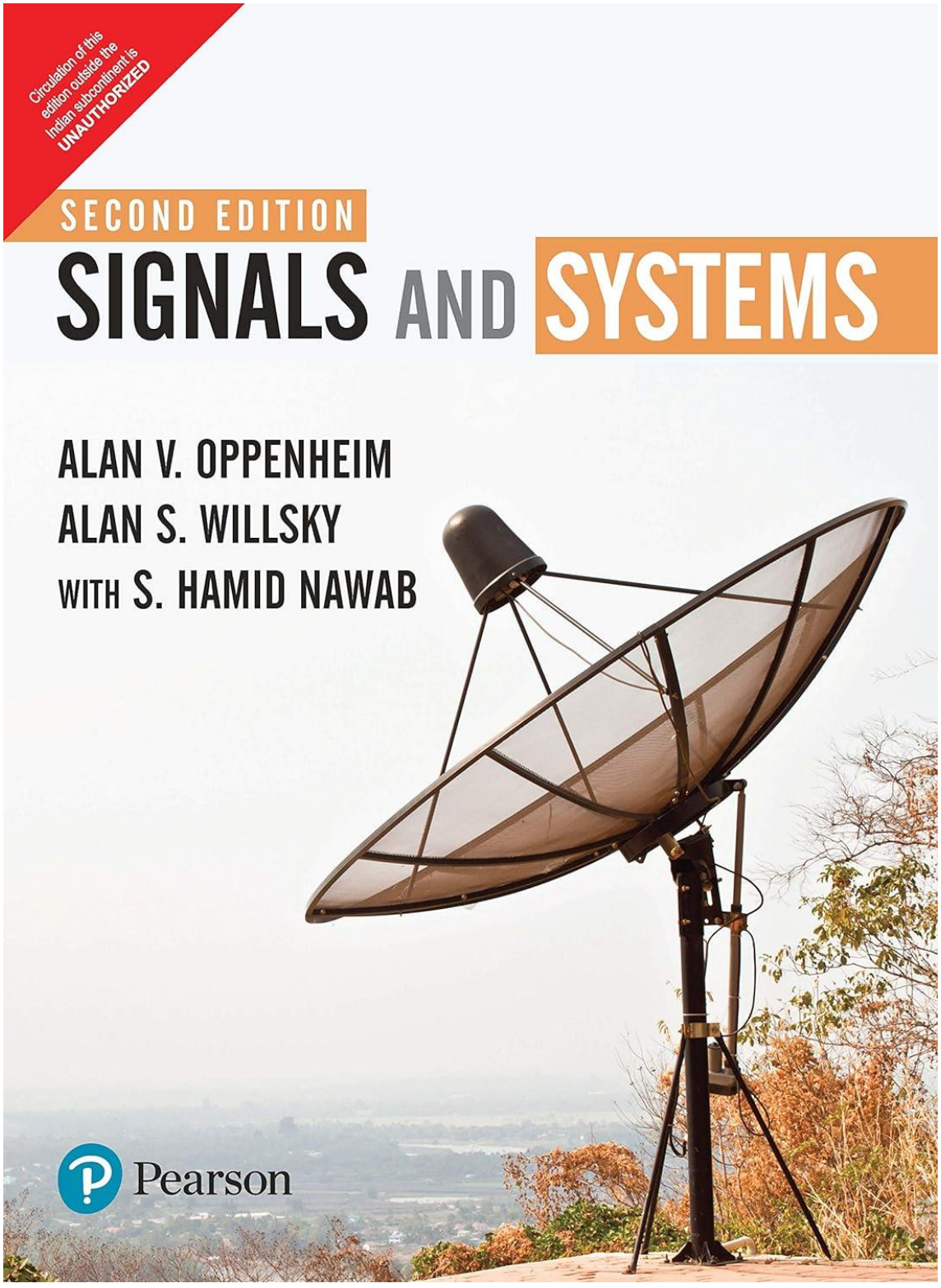
K. Grading policy

As per Brac University grading policy

L. Course Instructor

Rony K Saha, PhD (EE), MEng (ICT), BSc (EEE)
Research Scholar (Stanford, USA), Postdoc (KDDI Research, Japan)
IARIA Fellow (EU/USA), Associate Editor (Engineering Journal, Thailand)

Alan V. Oppenheim *et al.*



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