COURSE CODE: **EE-231**
COURSE NAME: **SIGNALS AND SYSTEMS**
CREDIT HOURS: Theory = 03
Practical = 00
Total = 03

CONTACT HOURS: Theory = 48
Practical = 00
Total = 48

PREREQUISITE: **Nil**

MODE OF TEACHING:

Instruction: Three hours of lecture per week 100%

COURSE DESCRIPTION:

This course covers the fundamentals of signal and system analysis, focusing on representations of discrete-time and continuous-time signals (singularity functions, complex exponentials and geometrics, Fourier representations, Laplace and Z transforms, sampling) and representations of linear, time-invariant systems (difference and differential equations, block diagrams, system functions, poles and zeros, convolution, impulse and step responses, frequency responses). Applications are drawn broadly from engineering and physics, including feedback and control, communications, and signal processing.

COURSE OBJECTIVES:

This course will provide an insight into how many physical processes, in various engineering disciplines, can be mathematically modeled as systems. We will learn about analytical techniques that allows us to model the behavior of the system and gain insight into the characteristics of signals. These techniques, in most cases, work by transforming signals into different domains providing alternative viewpoints which allow more intuitive/ simpler solutions to various engineering problems.

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students will achieve the PLOs:

1	Engineering Knowledge:	☑	7	Ethics:	☐
2	Problem Analysis:	☑	8	Individual and Collaborative Team Work:	☐
3	Design/Development of Solutions:	☐	9	Communication:	☐
4	Investigation:	☐	10	Project Management:	☐
5	Tool Usage:	☐	11	Lifelong Learning:	☐
6	The Engineer and Society:	☐			

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, the students will be able to:

S.No	CLO	Domain	Taxonomy Level	PLO
1	Define the fundamentals of continuous time and discrete time signals and systems both in time and frequency domains.	Cognitive	1	1
2	Describe the importance of linear systems analysis in analog filter designing, communications, feedback control systems.	Cognitive	2	1

3	Use linear systems tools, especially transform analysis and convolution, to analyze and predict the behavior of linear systems	Cognitive	3	2

TOPICS COVERED:

Theory:

No.	Topics
1	**Introduction to Signals and Systems:** Types of Signals, Types of Systems
2-3	Frequency Domain view of Signals and Systems
4-6	Linear Time-Invariant (LTI) Systems Theory
7-9	**Fourier Series:** Representation of periodic signals into sum of weighted sinusoids. Sinusoids interact with LTI systems in simple predictable ways leading to tractable modeling, analysis and design of signals and systems
10-12	**Fourier Transform:** Representation of aperiodic signals into integral of weighted sinusoids. Sinusoids interact with LTI systems in simple predictable ways leading to tractable modeling, analysis and design of signals and systems.
13-14	**Laplace Transform:** Representations of continuous time signals (some of which may not have a Fourier transform) as integral of scaled complex exponentials. Complex exponentials interact with LTI systems in simple predictable ways leading to tractable modeling, analysis and design of signals and systems.
15-16	**Z Transform:** Representation of discrete time signals (some of which may not have a Fourier transform) as sum of scaled complex exponentials. Complex exponentials interact with LTI systems in simple predictable ways leading to tractable modeling, analysis and design of signals and systems.
17-18	**ESE**

TEXT AND MATERIAL:

Textbook(s)

a. Signal and Systems by Alan V. Oppenheim, Alan S. Willsky and S. Hamid

Reference Books:

a. "Linear Systems and Signals" by B P Lathi

ASSESMENT SYSTEM:

1. **CLOs Assessment**

Cognitive	Psychomotor	Affective
Spreadsheet	-	-

2. **Relative Grading**

Theoretical / Instruction			100%
	Assignments 10%		
	Quizzes 10%		
	Mid Semester Exam 30%		
	End Semester Exam 50%		
Total			100%