Course Code	EEEB233
Course Title	Signals & Systems
Prerequisites	Circuit Analysis 1 (EEEB113), MATB 143 Differential Equation
Co-requisite	Circuit Analysis 2 (EEEB123)
Aims/Objectives	To introduce the concepts and techniques associated with the understanding of signals and systems. To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems. To provide with an appreciation of applications for the techniques and mathematics used in this course.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
1. Determine the mathematical representation of signals and systems, signal energy and power, transformation of signal independent variable, properties of periodic signals, even and odd signal, exponential and sinusoidal signal, unit impulse and unit step. Derive the equation describing the relationship between input and output of continuous-time and discrete-time systems. Determining basic system properties	3	3	3	2					3	1
2. Derive and calculate the convolution sum and integral of Linear Time-Invariant System. Determine the convolution properties of LTI systems. Determine the difference and differential equation of LTI systems.	3	3	3	2					3	1

3. Determine the Response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series, Properties of Continuous-Time Fourier Series, and Fourier Series Representation of Discrete-Time Periodic Signals.	3	3	3	2					3	1
4. Determine Continuous-Time Fourier Transform, Discrete-Time Fourier Transform for Aperiodic signals, convergence of Fourier transforms, Fourier Transform of periodic signal, properties of Fourier Transform,	3	3	3	2					3	1
5. Determine Time and Frequency Characteristics of signals & Systems. Determine the magnitude-Phase representation of the Fourier Transforms	3	3	3	2					3	1

6. Derive and determine Laplace Transform, region of convergence, their properties. Determine the inverse Laplace transform. Solve the differential equation using Laplace transform. Obtain system/transfer function through Laplace transform. Derive block diagram representation from system functions. Sketch Poles & Zeros plot. Evaluate Fourier Transform from Pole-Zero Plot.	3	3	3	2					3	1
7. Derive and determine z-Transform, region of convergence, their properties. Determine the inverse z-transform. Solve the difference equation using z-transform. Obtain system/transfer function through z-transform. Derive block diagram representation from system functions. Sketch Poles & Zeros plot. Evaluate Fourier Transform from Pole-Zero Plot.	3	3	3	2					3	1
Average PO	**3**	**3**	**3**	**2**					**3**	**1**

3 – total fulfillment of PO **with formal assessment**
2 – partial fulfillment of PO **with formal assessment**
1 – related to PO **without formal assessment**

Assessments Methods	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8	CO9	CO10
1. Final Exam	X	X	X	X	X	X	X			
2. Test	X	X	X	X						
3. Quizzes/Assignments	X	X	X	X	X	X	X			

No of assessment	**Final Exam=1** **Test = 1** **Quizzes /Assignments = 6**
Outline of Syllabus	1. Signal & System Representation
	2. Linear Time-Invariant Systems and Convolution.
	3. Fourier Series Representation of Periodic Signals
	4. The Continuous-Time and Discrete-Time Fourier Transform
	5. Time and Frequency Characterization of Signals and Systems
	6. Laplace Transform and z-transform
References	**Textbook:** Signals & Systems. Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab. Prentice-Hall International, Inc. Second Edition. 1997
	Reference: Signal and Linear System Analysis. Gordon E. Carlson. John Wiley & Sons, Inc. 1996