NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech.in Electronics and Instrumentation Engineering
Semester:	III
Course Code:	2EI801
Course Title:	Mathematics for Electronics and Instrumentation Engineers
Course Type:	Core
Year of Introduction:	2023-24

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. analyse the continuous and discrete time signals and systems in time domain (BL4)
2. inspect concepts of Laplace and Z transforms, analysis of properties and characterization of LTI systems. (BL4)
3. perform the analysis of a function and systems using Fourier Transform, Discrete time Fourier Transform, convolution and correlations. (BL5)
4. test the contents covered in theory sessions with software simulation (BL6)

Teaching Hours: 30

Unit	Syllabus	Teaching hours
Unit- I	**Signals and systems** Representation of discrete-time signals, Elementary signals, basic operations on signals, classification of systems.	05
Unit- II	**Laplace Transform** Region of convergence, Laplace transform of some commonly used signals, properties and theorems of Laplace Transform, Solution of differential equations using Laplace transform, Circuit Analysis using Laplace transform.	05
Unit- III	**Z -Transforms** Relation between Discrete Time Fourier Transform and Z -Transform, Z-transform of some common sequence, Z-transform and ROC of finite duration sequences, properties of Z- transform, inverse Z-transform, transform analysis of LTI systems, stability and causality, solution of differential equations using Z-transform.	07
Unit- IV	**Fourier transforms** Fourier transforms of standard signals, properties of continuous time Fourier transform, system analysis of with Fourier transform, Fourier transform of periodic signals, Exponential Fourier series, cosine representation, power representation, Fourier Spectrum, Properties of continuous-time Fourier series, discrete time Fourier transform, relation between Z-transform and Fourier Transform, properties of discrete time Fourier transform, transfer function, frequency response of discrete-time systems.	09

Unit- V **Convolution and correlation of signals** 04

Concept of convolution, properties of convolution, energy and power density spectrum, cross correlation, autocorrelation, detection of periodic signals in the presence of noise by correlation.

Laboratory Work:

This shall consist of at least 10 practicals based on the above syllabus.

Suggested Reading:

1. A. Anand Kumar, Signals and Systems, PHI
2. S. Pilani, Signals and Systems, Ane Books Pvt. Ltd.
3. Tarunkumar Rawat, Signals and Syatems, Oxford.

Suggested List of Experiments (not restricted to the following):
(Only for Information)

	Title of Experiment	Hrs.
1.	Generation of continuous time and discrete time signals	2
2.	Basic operations on continuous time and discrete signals	2
3.	Step response and frequency response of the given systems	2
4.	Generation of Fourier series of a periodic signals.	2
5.	Fourier transform and inverse Fourier transform of given sequences and signals	2
6.	Properties of continuous time Fourier series and discrete time Fourier transforms.	2
7.	Cross correlation, and Autocorrelation	2
8.	Convolution and Deconvolution	2
9.	Generation of Laplace transform inverse Laplace transform for given signals.	2
10.	Proporties of laplace transform.	2
11.	Generation of Z-transform and inverse Z-transform of given sequences	2
12.	Proporties of Z-transforms	2

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. the academic year 2023 - 24 and onwards