19BM211 SIGNALS AND SYSTEMS FOR BIOENGINEERS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	8	-	5	3	-

SOURCE:
https://www.google.com

COURSE DESCRIPTION AND OBJECTIVES:

This course explains the basic properties of signal and systems and the various methods of classification. Laplace transform and fourier transform and their properties. It is useful to know DTFT and their properties to characterize LTI systems in the time domain and various transform domains.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes	POs
1	Apply various properties of transform techniques to solve the continuous and discrete linear time invariant systems.	1
2	Analyze various methods to categorize the LTI systems and identify solutions for mathematical representation of systems.	2
3	Self-learning on enhanced topics of signals and systems through real time signals.	12
4	Perform experiments to verify various operations on signals and systems.	4, 5
5	Apply the convolution and correlation of signals in time and frequency domines and sampling theorem.	1

SKILLS :

- ✓ *Analyze different biopotential signals using Lab View/MATLAB.*
- ✓ *Test and design a stable system (ECG, EMG, EEG kit).*
- ✓ *By deeply understating the physiological signals and systems can design different vital monitoring systems.*

UNIT - I **L-9**

CLASSIFICATION OF SIGNALS AND SYSTEMS: Continuous time signals, Discrete time signals, Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - periodic and A periodic signals, deterministic and random signals, energy and power signals; CT systems and DT systems, Classification of systems - static and dynamic, linear and nonlinear, time-variant and time-invariant, causal and non-causal, stable and unstable.

UNIT - II **L-9**

ANALYSIS OF CONTINUOUS TIME SIGNALS: Fourier series analysis - spectrum of continuous time (CT) signals; Fourier and Laplace transforms in CT signal analysis.

UNIT - III **L-9**

LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS: Differential equation, Block diagram representation, Impulse response, Convolution Integrals.

LINEAR TIME INVARIANT- DISCRETE TIME SYSTEMS: Difference equations, Block diagram Representation, Convolution sum, DTFT.

UNIT - IV **L-9**

CONVOLUTION AND CORRELATION OF SIGNALS: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Cross correlation and auto correlation of functions, Power density spectrum, Relation between auto correlation function and power spectral density, Relation between convolution and correlation,

UNIT - V **L-9**

SAMPLING: Sampling theorem, Reconstruction of signal from its samples, Effect of under sampling - aliasing; Introduction to band pass sampling.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Introduction to MATLAB.
2. Vectors and matrices generation and operations on it.
3. Generation and plotting of trigonometric and exponential functions.
4. Standard signal generation (Impulse, Step, Ramp and Sinc).
5. Operations on signals (Folding, Shifting and Scaling).
6. Periodic and non-periodic signal generation.
7. Analysis of periodic signals.
8. Analysis of non-periodic signals.
9. Analysis of transfer function.
10. System analysis by using poles and zeroes.
11. Sampling theorem verification.
12. System Response.
13. Convolution of continuous signals.
14. Correlation of continuous signals.

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky, S.H.Nawab, “Signals and Systems”, 3rd edition, Pearson, 2007.

REFERENCE BOOKS:

1. B. P. Lathi, “Principles of Linear Systems and Signals”, 2nd edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals and Systems - Continuous and Discrete”, 4th edition, Pearson, 2007.
3. John Alan Stuller, “An Introduction to Signals and Systems”, 1st edition, Thomson, 2007.
4. M.J.Roberts, “Signals & Systems Analysis using Transform Methods and MATLAB”, 2nd edition, Tata McGraw Hill, 2007.