

Module No.	Unit No.	Topics	Hrs.
1.0		<b>Basic Concepts in Probability</b>	<b>04</b>
	1.1	Definitions of probability, joint, conditional, and total probability, Bayes' theorem, independence of events, binary symmetric communication channel analysis using Bayes' theorem.	
2.0		<b>Introduction to Random Variables</b>	<b>08</b>
	2.1	Continuous, discrete, and mixed random variables, probability density function, probability distribution function, and probability mass function, properties of PDF and CDF	
	2.2	Special distributions- Binomial, Poisson, Uniform, Gaussian and Rayleigh Distributions Mean, variance and moments of random variables	
3.0		<b>Operations on One Random Variable</b>	<b>08</b>
	3.1	Function of a random variable and their distribution and density functions.	
	3.2	Expectation, variance, moments, and characteristic function of random variable.	
	3.3	Transformation of a random variable, Markov and Chebyshev inequality, characteristic functions, moment theorem.	
4.0		<b>Multiple Random Variables and Convergence</b>	<b>08</b>
	4.1	Pairs of random variables, joint CDF and joint PDF.	
	4.2	One function of two random variables; joint moments, covariance and correlation-independent, uncorrelated and orthogonal random variables.	
	4.3	Central limit theorem and its significance	
5.0		<b>Random Processes</b>	<b>06</b>
	5.1	Definitions, statistics of stochastic processes, $n^{\text{th}}$ order distribution, second-order properties: mean and autocorrelation, Poisson process, normal processes, SSS, WSS.	
	5.2	Mean and correlation ergodic processes, transmission of WSS through LTI system, introduction to Markov process.	
6.0		<b>Introduction to Statistical Learning and Applications</b>	<b>05</b>
	6.1	Regression and model building, simple linear regression, multiple linear regression, least square estimation of the coefficients, residual calculations.	
	6.2	Applications of simple linear regression in prediction of new observations.	
		<b>Total</b>	<b>39</b>

**Text Books:**

1. T. Veerarajan, "Probability, Statistics and Random Process", Tata McGraw Hill Education, Third Edition (2018).
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables, and Stochastic Processes", Tata McGraw Hill Education
3. Henry Stark & John Woods, "Probability, Statistics, and Random Processes for Engineers, 4th Edition, Pearson Education, 2012