

**LOK JAGRUTI UNIVERSITY (LJU)**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**Department of Computer science & Design (703)**

**Bachelor of Engineering (B.E.) – Semester – III**

<b>Course Code:</b>	<b>017031391</b>
<b>Course Name:</b>	<b>Introduction to Probability Theory and Stochastic Processes</b>
<b>Category of Course:</b>	Basic Science Course (BSC)
<b>Prerequisite Course:</b>	Mathematics- I (017031191), Mathematics- II (017031291)

Teaching Scheme				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Total Hours
3	2	0	5	50

Syllabus				
Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	<b>Basic Probability</b>			<b>6 (11%)</b>
	1.1 Basic Definitions: Random Experiment, Outcome, Trial, Event, Exhaustive Event, Mutually Exclusive Event, Equally Likely Event, Independent Events, Favorable Events.	---	---	
	1.2 Definitions of Probability: Classical & Axiomatic, Sample Space, Theorems on Probability: De Morgan's Laws, Addition Theorem, Examples.	---	---	
	1.3 Conditional probability, Multiplicative Theorem for Independent Events, Bayes' Theorem, Examples.	---	---	
02	<b>Random Variables</b>			<b>6 (9%)</b>
	2.1 Random variables, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Mathematical Expectation, Variance.	Basic Differentiation and Integration (017031191-Unit-3.4)	---	
	2.2 Continuous Random Variable, Probability Density Function, Continuous Distribution Function, Mathematical Expectation, Variance.	Probability Density Function (017031391-Unit-2)	---	
	2.3 Two Dimensional Discrete Random Variables, Joint Probability Mass Function, Cumulative Distribution Function, Marginal Probability Function, Conditional Probability Function.	Multiple Integral (017031191-Unit-7.1)	---	
03	<b>Basic Statistics</b>			<b>5 (10%)</b>
	3.1 Measure of Central Tendency: Mean, Median and Mode.	---	---	
	3.2 Mean: Mean for Individual Observations, Mean for Discrete Frequency Distribution, Mean for Continuous Frequency Distribution, Mean from Assumed Mean, Mean from Step Deviation.	---	---	
	3.3 Median: Median for Individual Observations, Median for Discrete Frequency Distribution, Median for Continuous Frequency Distribution (Less than and Greater than types)	---	---	
	3.4 Mode: Mode for Individual Observations, Mode for Discrete Frequency Distribution, Mode for Continuous Frequency Distribution.	---	---	
	3.5 Measures of Dispersion: Standard Deviation & Variance.	---	---	
	3.6 Moments: Row Moments, Central Moments, Relation Between Row and Central Moments.	---	---	
	3.7 Skewness, Karl- Pearson's Co-efficient of Skewness, Kurtosis.	---	---	
04	<b>Correlation and Regression</b>			<b>6 (10%)</b>
	4.1 Correlation, Types of Correlation, Karl Pearson's Correlation Co-efficient, Properties of Correlation Co-efficient.	---	---	
	4.2 Rank correlation, Spearman's Rank Correlation Co-efficient, Tied Rank.	---	---	
	4.3 Regression, Types of Regression, Lines of Regression, Regression Co-efficient, Properties of Regression Co-efficient & Regression Lines.	---	---	
05	<b>Binomial and Poisson Distributions</b>			<b>4 (10%)</b>
	5.1 Binomial Distribution, Conditions for Binomial Distribution, Bernoulli's Trail, Recurrence Relation for Binomial Distribution, Binomial Frequency Distribution.	---	---	
	5.2 Poisson Distribution, Conditions for Poisson Distribution, Recurrence Relation for Poisson Distribution, Poisson Frequency Distribution.	---	---	
06	<b>Normal and Exponential Distributions</b>			<b>4 (9%)</b>
	6.1 Introduction to Normal Distribution.	---	---	
	6.2 Normal Distribution, Examples.	---	---	

	6.3 Properties of Normal Distribution.	Basic Differentiation and Integration (017031191-Unit-3.4)	---	
	6.4 Introduction to Exponential Distribution.		---	
	6.5 Exponential Distribution, Examples.		---	
07	<b>Applied Statistics: Testing of Hypothesis for Large Samples</b>			
	7.1 Formation of Hypothesis, Null Hypothesis, Alternative Hypothesis, Terms Related to Test of Hypothesis, Procedure for Testing of Hypothesis.	---	---	5 (11%)
	7.2 Test of significance for Large Samples: Single Proportion, Difference of Proportions.	---	---	
7.3 Test of significance for Large Samples: Single Mean, Difference of Means, Difference of Standard Deviations.	---	---		
08	<b>Applied Statistics: Testing of Hypothesis for Small Samples</b>			
	8.1 Student's t- Distribution, t- Test of significance: Single mean, Difference of Means, Correlation Co- efficient.	---	---	5 (10%)
	8.2 Snedecor's F- test for Ratio of Variances.	---	---	
8.3 Chi-square Test for Goodness of Fit and independence of Attributes.	---	---		
09	<b>Curve fitting by the Numerical Method</b>			
	9.1 Introduction, Least Square Method, Fitting of Linear Curves.	Matrices (017031291-Unit-1.3)	---	4 (11%)
	9.2 Fitting of Quadratic Curves.		---	
10	<b>Introduction to Stochastic Processes</b>			
	10.1 Definitions and Properties.	---	---	5 (9%)
	10.2 Discrete Markov Chain, Continuous Markov Chain.	---	---	
	10.3 Stochastic Gradient Descent.	---	---	

**Proposed Theory + Practical Evaluation Scheme by Academicians  
(% Weightage Category Wise and it's Marks Distribution)**

**L: 3 T: 2 P: 0**

**Note: In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.  
Each Test will be of 25 Marks.  
Each Test Syllabus Weightage: Range should be 20% - 30%**

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage	
Theory	5	4	MCQ	25%	25	
Theory			Theory Descriptive	0%	0	
Theory			Formulas and Derivation	0%	0	
Theory			Numerical	75%	75	
<b>Expected Theory %</b>	<b>100%</b>			<b>Calculated Theory %</b>	<b>100%</b>	<b>100</b>
Practical	0		Individual Project	0%	0	
Practical			Group Project	0%	0	
Practical			Internal Practical Evaluation (IPE)	0%	0	
Practical			Viva	0%	0	
Practical			Seminar	0%	0	
<b>Expected Practical %</b>	<b>0%</b>		<b>Calculated Practical %</b>	<b>0%</b>	<b>0</b>	
<b>Overall %</b>	<b>100%</b>			<b>100%</b>	<b>100</b>	

**Course Outcome**

1	Understand the basic Definitions of Random Experiment, Mutually Exclusive Event, Equally Likely Event, Independent Events, Favorable Events. Definitions of Probability: Classical & Axiomatic, Sample Space, Theorems on Probability: De Morgan's Laws. Conditional probability, Multiplicative Theorem for Independent Events, Bayes' Theorem, Understand the Random variables, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Mathematical Expectation, Variance. Two Dimensional Discrete Random Variables, Joint Probability Mass Function, Cumulative Distribution Function, Marginal Probability Function, Conditional Probability Function. Measure of Central Tendency: Understand the Basic Statistics, Mean, Median and Mode. Measures of Dispersion, Moments, Skewness and Kurtosis.
2	Understand the basic Definitions of Correlation and Regression, Properties of Correlation Co-efficient. Rank correlation, Tied Rank. Properties of Regression Co-efficient & Regression Lines. Introduction to Binomial and Poisson Distributions, Binomial and Poisson Frequency Distribution.
3	Introduction to Normal and Exponential Distributions and its properties, Applied Statistics: Testing of Hypothesis for Large Samples, Formation of Hypothesis, Null Hypothesis, Alternative Hypothesis, Test of significance for Large Samples: Single Proportion, Difference of Proportions. Single Mean, Difference of Means, Difference of Standard Deviations.
4	Introduction to Applied Statistics: Testing of Hypothesis for Small Samples, Student's t- Distribution, t- Test of significance: Single mean, Difference of Means, Correlation Co- efficient. Snedecor's F- test for Ratio of Variances. Chi-square Test for Goodness of Fit and independence of Attributes. Understand the fitting of various curves by method of least square and Understand the Stochastic processes, Definitions and Properties of Discrete Markov Chain, Continuous Markov Chain. Stochastic Gradient Descent.

**Suggested Reference Books**

1	P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
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2	S. Ross, A First Course in Probability, 6th Ed., Pearson Education India.
3	W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
4	L. Castaneda, V. Arunachalam, D. Dharmaraja, Introduction to Probability and Stochastic Processes with Applications, Wiley.

<b>List of Open Source Software/Learning website</b>	
1	<a href="https://nptel.ac.in">https://nptel.ac.in</a>