

**Department of Liberal Education**  
**Era University, Lucknow**  
**Course Outline**  
**Effective From: 2023-24**

<b>Name of the Program</b>	<b>B.A. / B.Sc. (LIBERAL EDUCATION)</b>			<b>Year/ Semester:</b>	<b>1<sup>st</sup> / 2<sup>nd</sup></b>
<b>Course Name</b>	<b>Probability &amp; Probability Distributions</b>	<b>Course Code:</b>	<b>ST102</b>	<b>Type:</b>	<b>Theory</b>
<b>Credits</b>	<b>05</b>			<b>Total Sessions Hours:</b>	<b>75 Hours</b>
<b>Evaluation Spread</b>	<b>Internal Continuous Assessment:</b>	<b>50 Marks</b>		<b>End Term Exam:</b>	<b>50 Marks</b>
<b>Type of Course</b>	<input type="radio"/> Compulsory	<input checked="" type="radio"/> Core	<input type="radio"/> Creative	<input type="radio"/> Life Skill	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>Understand the fundamental concepts of probability and apply them to analyze random experiments and events.</li> <li>Apply different approaches to probability, including classical, relative frequency, and axiomatic approaches, to solve probability problems.</li> <li>Analyze and calculate probabilities using various probability theorems, including conditional probability and Bayes' theorem.</li> <li>Understand and analyze discrete and continuous random variables, including their probability distributions and expectations.</li> <li>Apply probability distributions, such as Bernoulli, Binomial, Poisson, Uniform, Normal, and Standard Normal distributions, to real-life data analysis.</li> </ol>				
<b>Course Outcomes (CO):</b> <i>After the successful course completion, learners will develop following attributes:</i>					
<b>Course Outcome (CO)</b>	<b>Attributes</b>				
<b>CO1</b>	Demonstrate understanding of fundamental probability concepts and apply them to analyze random experiments and events.				
<b>CO2</b>	Apply probability concepts and theorems, such as conditional probability and Bayes' theorem, to solve real-life probability problems.				
<b>CO3</b>	Calculate and interpret probability distributions, expectations, and properties of random variables in both discrete and continuous settings.				
<b>CO4</b>	Analyze and interpret various discrete and continuous probability distributions, and apply them to solve numerical problems and analyze real-life data.				
<b>Pedagogy</b>	Interactive, discussion-bases, student-centered, presentation.				
<b>Internal Evaluation Mode</b>	Mid-term Examination: 20 Marks Activity: 10 Marks Class test: 05 Marks Online Test/Objective Test: 05 Marks Assignments/Presentation: 05 Marks Attendance: 05 Marks				
<b>Session Details</b>	<b>Topic</b>			<b>Hours</b>	<b>Mapped CO</b>
<b>Unit 1</b>	Random experiment, Trial, Sample point and Sample space,			15	CO1

	Events, Operations of events, Concept of equally likely, Mutually exclusive and Exhaustive events. Definition of Probability: Classical, Relative frequency and Axiomatic approaches.													
<b>Activity (Unit-1)</b>	Make a Probability Tree Model of Tossing a coin twice and rolling two dice.													
<b>Unit 2</b>	Discrete Probability Space, Properties of Probability under Set Theory Approach, Independence of Events, Conditional Probability, Total and Compound Probability theorems, Bayes theorem and its Applications.								20	CO2				
<b>Activity (Unit-2)</b>	Demonstration on “Applications of Baye’s Theorem” in real life.													
<b>Unit 3</b>	Random Variables – Discrete and Continuous, Probability Mass Function (pmf) and Probability density function (pdf), Cumulative distribution function (cdf). Expectation of a random variable and its properties, Expectation of sum of random variables and product of independent random variables.								20	CO3				
<b>Activity (Unit-3)</b>	Practical application of “Expectation of sum of random variables”.													
<b>Unit 4</b>	Discrete probability distributions: Bernoulli, Binomial and Poisson & their mean, mode and variance. Continuous probability distribution: Uniform, Normal and Standard normal, numerical based on these distributions.								20	CO4				
<b>Activity (Unit-4)</b>	Application of Normal and Standard normal distribution using data collected from the students of the department.													
<b>CO-PO and PSO Mapping</b>														
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>
CO1				2		3			1		3	3		
CO2		2	3	3		2			2					
CO3		1	3	2		3					3	3		
CO4				3		3					2	2		
<i>Strong contribution-3, Average contribution-2, Low contribution-1,</i>														
<b>Suggested Readings:</b>														
<b>Text- Books</b>	<ol style="list-style-type: none"> <li>Goon, A.M., Gupta, M.K. and Dasgupta, B. (2013). Fundamental of Statistics, Vol II, World Press, Kolkata.</li> <li>David, S. (1994). Elementary Probability, Cambridge University Press.</li> <li>Meyer, P. (2017). Introductory Probability and Statistical Applications (2nd ed.), New Delhi, Oxford &amp; IBH Publishing Co. Pvt. Ltd.</li> </ol>													
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>Gupta, S.C. and Kapoor, V.K. (2000). Fundamentals of Mathematical Statistics (10th ed.), Sultan Chand and Sons.</li> <li>Rohatgi, V.K. and Saleh, A.E. (2008). An introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.</li> </ol>													

<b>Para Text</b>	Unit 1: 1. <a href="https://www.youtube.com/watch?v=uzkc-qNVoOk">https://www.youtube.com/watch?v=uzkc-qNVoOk</a> 2. <a href="https://www.youtube.com/watch?v=xvR7C0FK3NQ">https://www.youtube.com/watch?v=xvR7C0FK3NQ</a>  Unit 2: 1. <a href="https://www.youtube.com/watch?v=PrkiRVcrxOs">https://www.youtube.com/watch?v=PrkiRVcrxOs</a> 2. <a href="https://www.youtube.com/watch?v=84uU7B_Z7S4">https://www.youtube.com/watch?v=84uU7B_Z7S4</a>  Unit 3: 1. <a href="https://www.youtube.com/watch?v=rPM8WWvhtAU">https://www.youtube.com/watch?v=rPM8WWvhtAU</a> 2. <a href="https://www.youtube.com/watch?v=FyecSH9XkxQ">https://www.youtube.com/watch?v=FyecSH9XkxQ</a>  Unit 4: 1. <a href="https://www.youtube.com/watch?v=Q7HVOVBqUzw">https://www.youtube.com/watch?v=Q7HVOVBqUzw</a> 2. <a href="https://www.youtube.com/watch?v=9RFSqkL0kR0">https://www.youtube.com/watch?v=9RFSqkL0kR0</a>	
<b>Recapitulation &amp; Examination Pattern</b>		
<b>Internal Continuous Assessment:</b>		
<b>Component</b>	<b>Marks</b>	<b>Pattern</b>
<b>Mid Semester</b>	20	<b>Section A:</b> Contains <b>10</b> MCQs/Fill in the blanks/One Word Answer/ True-False type of questions. Each question carries <b>0.5</b> mark. <b>Section B:</b> Contains <b>07</b> descriptive questions out of which <b>05</b> questions are to be attempted. Each question carries <b>03</b> marks.
<b>Activity</b>	10	Will be decided by subject teacher
<b>Class Test</b>	05	Contains <b>05</b> descriptive questions. Each question carries <b>01</b> mark.
<b>Online Test/ Objective Test</b>	05	Contains <b>10</b> multiple choice questions. Each question carries <b>0.5</b> mark.
<b>Assignment/ Presentation</b>	05	Assignment to be made on topics and instruction given by subject teacher
<b>Attendance</b>	05	As per policy
<b>Total Marks</b>	<b>50</b>	

Course created by: **Dr. Abdul Quddoos**  
**Dr. Nazia Naqvi**

Signature:

Approved by: **Prof. Shashi Bhushan**

Signature:

*Shashi Bhushan*