



Statistics Paper -II
Mathematical Statistics
[CORE COURSE]

Semester I	Credits: 2	Subject Code: BS12006	Lectures : 40
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Course outcomes:

At the end of this course, the learner will be able to:

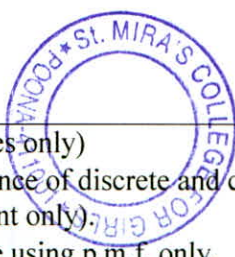
- Apply methods of Counting Principles, Permutation, and Combination to real life situations.
- Ability to apply concepts of experiments, sample space, events required in the calculation of probabilities.
- Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events.
- Translate real-world problems into probability models.
- Calculate conditional probabilities of random variables.
- Apply discrete and continuous probability distributions to various real life problems.

Unit 1: Theory of Probability	10
<ul style="list-style-type: none"> • Counting Principles, Permutation, and Combination. • Deterministic and non-determination models. • Random Experiment, Sample Spaces (Discrete and continuous) • Events: Types of events, Operations on events. • Probability - classical definition, probability models, axioms of probability, Probability of an event. • Theorems of probability (without proof) <ul style="list-style-type: none"> i) $0 \leq P(A) \leq 1$ ii) $P(A) + P(A^c) = 1$ iii) $P(\Phi) = 0$ iv) $P(A) \leq P(B)$ when $A \subset B$ iv) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ • Numerical problems related to real life situations. 	

Unit 2: Conditional Probability and Independence	08
<ul style="list-style-type: none"> • Concepts and definitions of conditional probability, multiplication theorem $P(A \cap B) = P(A) \cdot P(B A)$ • Bayes' theorem (without proof). True positive, false positive and sensitivity of test as application of Bayes' theorem. • Concept of Posterior probability, problems on posterior probability. • Concept and definition of independence of two events. • Numerical problems related to real life situations. 	

Unit 3: Random variable	10
<ul style="list-style-type: none"> • Definition of random variable (r.v.), discrete and continuous random variable. • Definition of probability mass function (p.m.f.) of discrete r.v. and Probability density function of continuous r.v.. • Cumulative distribution function (c.d.f.) of discrete and continuous r.v. and their 	

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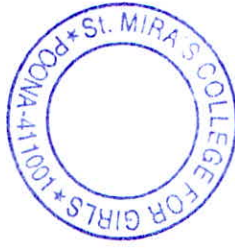
<p>properties. (Characteristic properties only)</p> <ul style="list-style-type: none"> • Definition of expectation and variance of discrete and continuous r.v., theorem on expectation and variance (statement only). • Determination of median and mode using p.m.f. only. • Numerical problems related to real life situations. 	
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Unit 4: Standard Discrete Distributions	12
<ul style="list-style-type: none"> • Discrete Uniform Distribution: definition, mean, variance. • Binomial Distribution: definition, mean, variance, additive property, Bernoulli distribution as a particular case with $n=1$. • Geometric Distribution (p.m.f $p(x) = pq^x$, $x=0,1,2,\dots$): definition, mean, variance. • Poisson Distribution: definition, mean, variance, mode, additive property, limiting Case of $B(n, p)$, Illustration of real life situations. • Numerical problems related to real life situations. • Only statement of mean and variance, derivation is not expected. 	

Recommended Text Books:
<ul style="list-style-type: none"> • Gupta S. C. and Kapoor V. K. 1987, <i>Fundamentals of Applied Statistics (3rd Edition)</i> S. Chand and Sons, New Delhi. • Kulkarni M.B., Ghatpande S.B., Gore S.D. 1999; <i>Common Statistical Tests</i>, Satyajeet Prakashan, Pune • Kulkarni M.B., Ghatpande S.B. 2007, <i>Introduction to Discrete Probability and Probability Distributions</i> SIPF Academy • Sarma K.V.S. 2001 <i>Statistics Made Simple. Do it Yourself on P.C.</i> Prentice Hall

Reference Books:
<ul style="list-style-type: none"> • Agarwal B. L., <i>Programmed Statistics</i>, New Age International Publishers. • Freund J.E., <i>Modern Elementary Statistics</i>, Pearson Publication 2005. • Kulkarni M.B., Ghatpande S.B., <i>Introduction to Discrete Probability and Probability Distributions</i>, SIPF Academy, 2007. • Medhi J., <i>Statistical Methods (An Introductory Text)</i>, New Age International, 1992. • Mukhopadhyay P. <i>Mathematical Statistics (3rd Edition)</i>, Books And Allied (P), Ltd 2015. • Probability, Statistics, <i>Design of Experiments and Queuing Theory with Applications of Computer Science</i>, Trivedi K.S., Prentice Hall of India, New Delhi 2001. • Sheldon Ross, <i>A First course in Probability</i>, Pearson Education Inc.

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Chairman(HoD)	Ms. Anjali Kale	<i>Anjali Kale</i> 21/7/20
Faculty	Ms. Amrita Basu	<i>Basu</i> 21/7/20
Subject Expert(Outside SPPU)	Dr. Sharvari Shukla	<i>Dr. Sharvari Shukla</i> 21/7/20
Subject Expert(Outside SPPU)	Dr. Suresh Pathare	<i>Suresh Pathare</i> 21/7/20
V.C. Nominee(SPPU)	Dr. Mohan Kale	<i>M. Kale</i> 21/7/20
Industry Expert	Dr. Saikat Roy	<i>Saikat Roy</i> 21/7/20
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