Statistics Paper -II
Mathematical Statistics
[CORE COURSE]

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

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**
• 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) i) $0 \leq P(A) \leq 1$ ii) $P(A) + P(A') = 1$ 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**
• Concepts and definitions of conditional probability, multiplication theorem $P(A \cap B)=P(A).P(B\|A)$ • 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**
• 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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properties. (Characteristic properties only) • 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.	

Unit 4: Standard Discrete Distributions	**12**
• 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) = pqx , x=0,1,2.): 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:

- Gupta S. C.and Kapoor V. K. 1987, *Fundamentals of Applied Statistics (3rd Edition)* S. Chand and Sons, New Delhi.
- Kulkarni M.B., GhatpandeS.B.,Gore S.D. 1999, *Common Statistical Tests,* Satyajeet Prakashan, Pune
- Kulkarni M.B., Ghatpande S.B. 2007, *Introduction to Discrete Probability and Probability Distributions* SIPF Academy
- Sarma K.V.S. 2001 *Statistics Made Simple. Do it Yourself on P.C.* Prentice Hall

Reference Books:

- Agarwal B. L., *Programmed Statistics*, New Age International Publishers.
- Freund J.E., *Modern Elementary Statistics,* Pearson Publication 2005.
- Kulkarni M.B., Ghatpande S.B., *Introduction to Discrete Probability and Probability Distributions,* SIPF Academy, 2007.
- Medhi J., *Statistical Methods (An Introductory Text),* New AgeInternational, 1992.
- Mukhpadhyay P. *Mathematical Statistics (3rd Edition*), Books And Allied (P), Ltd 2015.
- Probability, Statistics, *Design of Experiments and Queuing Theory with Applications of Computer Science*, Trivedi *K.S.,* Prentice Hall of India, New Delhi 2001.
- Sheldon Ross, *A First course in Probability,* Pearson Education Inc.

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Chairman(HoD)	Ms. Anjali Kale	21/7/20	
Faculty	Ms. Amrita Basu		21/7/20
Subject Expert(Outside SPPU)	Dr. Sharvari Shukla	21/7/2020	
Subject Expert(Outside SPPU)	Dr. Suresh Pathare		21/7/20
V.C. Nominee(SPPU)	Dr. Mohan Kale	21/7/20	
Industry Expert	Dr. Saikat Roy		21/7/20
Alumni	Anuja	21/7/20	

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