Statistics Paper-II
Continuous probability distributions and testing of hypothesis
[CORE COURSE]

Semester II	Credits:2	Subject Code: BS22006	Lectures : 40

Course Outcomes:

At the end of this course, the learner will be able to:
Apply the knowledge of standard continuous probability distributions to solve real life problems by calculating probabilities.
- Apply the concepts and definitions related to testing of hypothesis.
- Perform Test of Hypothesis for a population parameter for single sample and two sample cases. Understand the concept of p-values.
- To generate model sample from given distributions.
- Apply the knowledge of concepts of hypothesis testing, parametric and non-parametric tests in research methodology at higher level studies and applications.

Unit 1: Standard Continuous Probability Distributions	10
- Uniform Distribution: statement of p.d.f., mean, variance, nature of probability curve. Theorem (without proof): The distribution function of any continuous r.v. if it is invertible follows $U(0, 1)$ distribution - Exponential Distribution: statement of p.d.f. of the form, $f(x) = (1/\theta) e(-x/\theta)$, mean, variance, nature of probability curve, lack of memory property.(with proof) - Parato distribution: Form of p.d.f. $f(x) = \alpha / x(\alpha+1)$; $x \geq 1$, $\alpha > 0$. Mean, variance, symmetry, applications - Normal Distribution: statement of p.d.f., identification of parameters, nature of probability density curve, standard normal distribution, symmetry, distribution of $aX+b$, $aX+bY+c$ where X and Y are independent normal variables, computations of probabilities using normal probability table, normal approximation to binomial and Poisson distribution, central limit theorem (statement only), normal probability plot. Box Muller transformation. - Numerical problems related to real life situations.	

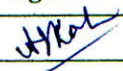| Unit 2: Concepts and definitions related to testing of hypothesis	4
- Concepts and definitions related to testing of hypothesis - Definitions: population, statistic, SRSWR, SRSWOR, random sample from a probability distribution, parameter, statistic, standard error of estimator. - Concept of null hypothesis and alternative hypothesis, critical region, level of significance, type I and type II error, one sided and two side dtests, p-value.	

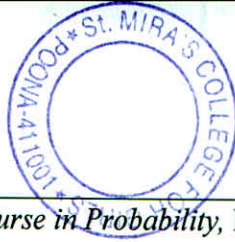| Board of studies	Name	Signature
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Unit 3: Parametric and Non-parametric Tests	20
- Large Sample Tests $H_0: \mu = \mu_0$ Vs $H_1: \mu \neq \mu_0$ (two sided tests) $H_0: \mu_1 = \mu_2$ Vs $H_1: \mu_1 \neq \mu_2$ (two sided tests) $H_0: P = P_0$ Vs $H_1: P \neq P_0$ (sided and two sided tests)$H_0: P_1 = P_2$ Vs $H_1: P_1 \neq P_2$ (two sided tests) - Test based on F- distribution: F-test for testing significance of equality of two population variances. - Tests based on t –distribution: $H_0: \mu_1 = \mu_2$ Vs $H_1: \mu_1 \neq \mu_2$, $\mu_1 < \mu_2$, $\mu_1 > \mu_2$ (One sided and two sided tests), Paired t-test. - Tests based on Chi square distribution - Chi-square test for goodness of fit - Test for independence of attributes (mxn and 2x2) - Kolmogorov - Smirnov test - Run test for testing randomness of the sample and sign test for testing symmetry of the sample - Numerical problems related to real life situations.	

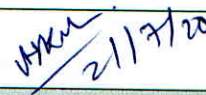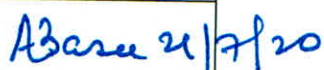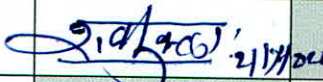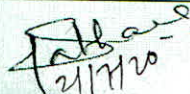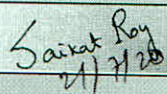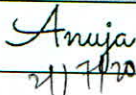| Unit 4: Simulation	06
- Introduction, concept of simulation, random numbers, pseudo random numbers, Advantages, Disadvantages of Simulation. Applications - Methods of simulation, Linear congruential generator and simulation from continuous Uniform, Exponential and Normal Distribution.	

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,* SatyajeetPrakashan, Pune
- Kulkarni M.B., Ghatpande S.B. 2007, *Introduction to Discrete Probability and ProbabilityDistributions* 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.
- Ghatpande S.B., Gore S.D., Kulkarni M.B., *Common Statistical Tests* Satyajeet Prakashan, 1999.
- Law A. M. and Kelton W.D., *Simulation Modeling and Analysis*, Tata McGraw Hill, 2007.
- Medhi J., *Statistical Methods (An Introductory Text)*, New AgeInternational1992.
- Mukhopadhyay P., *Mathematical Statistics (3rdEdition),*Books And Allied (P),Ltd., 2015.
- Trivedi K.S., Probability, Statistics, *Design of Experiments and Queuing Theory with Applications of Computer Science*, Prentice Hall of India, New Delhi, 2001.

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- Ross Sheldon, *A First course in Probability,* Pearson Education Inc.

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Subject Expert (Outside SPPU)	Dr. Sharvari Shukla,	*[signature]* 21/7/2020	
Subject Expert (Outside SPPU)	Dr. Suresh Pathare		*[signature]* 21/7/20
V.C. Nominee(SPPU)	Dr. Mohan Kale	MKale 21/7/20	
Industry Expert	Dr. Saikat Roy		Saikat Roy 21/7/20
Alumni	Ms. Anuja	Anuja 21/7/20	

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