Name of Department: Statistics

Name of Programme: M.Sc. Statistics

Vision
To Develop the Department as an Excellent Center to get best knowledge of Statistics both in the field of theory and Data Analysis.
Mission
To Start the Courses in the Emerging Areas (as per UGC guidelines) Like Big Data Analysis, Data Mining, Statistical Softwares and its Applications in Engineering.

Program Outcomes (PO)
. PO1 To develop methods for knowledge of Statistics in theoretical and experimental fields under different specializations. . PO2 To encourage students to solve problems in in Statistical theory and Practicals using critical thinking. . PO3 To enable students to apply some statistical softwares for the data analysis. . PO4 To encourage students to look for real life situations for various statistical models developed in the study. . PO5 To develop analytical and independent thinking in the students through Various assignments . PO6 To inculcate academic and social ethical values among the students
Program Specific Outcomes (PSO)
PSO1 The courses are so designed that students get the basic knowledge in the field of Statistics which helps them in various competitive examinations. PSO2 The knowledge of various Computer based courses like R and S-Plus workshops on SPSS etcis meant to help students in the emerging fields of Statistical Analysis of Data PSO3 The Statistical Courses and the knowledge of various Models is really crucial in most of the private and Public Organisations which do need the application of statistical Tools. PSO4 The students having exposure to statistical methods and Various softwares get good opportunities for placements in Good Companies. PSO5 The students get motivation for critical and independent thinking and are encouraged to follow academic ethics .

Course Code	Course Title	Course Outcome
Stat-101	Linear Algebra	1. Students are able to understand the techniques of linear algebra useful in solving various statistics problems. 2. Students are able to learn the results of matric theory that are useful in design of experiment, linear inference and estimation &testing. 3. Students will be well equipped to apply these techniques in the areas of Multivariate Analysis and Operations Research. 4. Students are being trained to solve simultaneous equation (with k-equations) with techniques of Linear Algebra
Stat-102	Distribution Theory	1. laying the foundation to probability theory and Statistical modeling of outcomes of real life random experiments 2. developing problem-solving techniques needed to accurately calculate probabilities; 3. introduction to the concept of one dimensional and two dimensional random variables; 4. distinguishing between discrete and continuous set ups and handling problems pertaining to real life situations; 5. applications of Chebyshev's, Markov's and Jensen's inequalities; 6. applyingvarious probability distributions to solve problems; 7. gaining knowledge about order statistics; 8. getting introduced to Central Limit Theorems.
Stat-103	Statistical Methods with Packages	1. Students are able to get familiar with various techniques used in summarization and analysis of data. 2. Students will learn both theoretical as well as practical concepts by solving problems. 3. Students are being trained through software's like R and SPSS. 4. Students are also learning techniques of official statistics including index numbers, vital statistics and time series
Stat-104	Real Analysis	1. Students are able to understand set theory and sequence of sets. 2. Students are able to understand the concept of function of bounded variation and Fourier series. 3. Students are able to understand Riemann-Stieltjes integral and mean value theorem. 4. Students are able to understand and solve the problems related to real analysis for NET, GATE exam.
Stat-105	Course selected from module	Course selected from module

Stat-201	Numerical Techniques using C	1. This course introduces Basic Computer Concepts and programming language -'C'. 2. Students learn to implement numerical methods being studied in theory using 'C' programming languageon computers. 3. Numerical algorithms are studies for mathematical calculations using computers.
Stat-202	Estimation and Testing of Hypotheses	1. Students are able to understand the different methods of the concept of point estimation and testing. 2. Students will learn to find the critical region by using Neyman Pearson theory of testing. 3. Students will be well equipped to apply these techniques in each subject of statistics. This subject is called as backbone of statistics. 4. Students are being trained to estimate parameters of population by using statistics of sample.
Stat-203	Sampling Theory and Official Statistics	1. Students are able to understand the importance of sampling over census. 2. Students are able to understand the implementation of various sampling scheme along with their merits and demerits. 3. Students are able to understand role of various statistical organizations in national development. 4. Students are able to understand and solve the problems related to sampling theory for NET, GATE and ISS exam.
Stat-204	Complex Analysis	1. This course provides help to understand the mathematical concept of convergence and its mathematical formulation. 2. Students will have knowledge of the special character of functions of a complex variable and their properties during this course. 3. This course is a part of CSIR/UGC examination.
Stat-205		Course selected from module
Stat-301	Nonparametric Inference	1. Students are able to understand about various techniques of hypothesis testing when the assumptions of parametric set up are not fulfilled. 2. Students are able to understand about various non-parametric analogues to one, two and c-sample location/scale problems. 3. Students are able to understand the procedure of comparing the relative efficiency of various tests. 4. Students are able to understand about various bias reduction techniques.
Stat-302	Statistical Process and Quality Control	1. The paper shows the applications of Statistics to maintain quality in Engineering and industrial set up. 2. The theory of control charts, sampling plans and process capability indices is the basis for judging whether the process is in statistical control or not. 3. The topics are quite helpful during industrial training/placements of MSc. Students. 4. The students get exposure to the various Statistical control tools and cont limits.

Stat-303	Linear Inference	1. The students will get familiar with the need of modelling random responses using independent predictors through linear and logistic (for binary responses) models in real life situations. 2. Students will learn both theoretical as well as practical concepts by solving problems. 3. Students are also learning Least square estimation of parameters of these models will be discussed along with their statistical significance. 4. Students are being trained through software's like R and SPSS.
Stat-304		Course selected from module
Stat-401	Multivariate Analysis	1. Students are able to understand about the statistical estimation and testing problems when the underlying structure is not univariate but multivariate in nature. 2. Students are able understand about various multivariate techniques (estimation and testing) required to handle two or more correlated response variables under multivariate normal setting. 3. Students are able to understand about the testing procedure associated with one sample, two sample and c-sample multivariate normal mean vectors and variance covariance matrices. 4. Students are able to understand about various dimension reduction techniques.
Stat-402	Design and Analysis of Experiments	1. To provide orientation of statistics while designing statistical experiments particularly in agricultural set up and in pharmaceutical production proce 2. Students get exposure to various statistical designs leading to the analys variance. 3. Students will understand the concept of eliminating heterogeneity of dat the corresponding analysis . 4. The construction of varioustypes of designs will also be done using differ techniques.
Stat-403		Course selected from module
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Stat-405	Project	1. The students will know the practical applications of the subject. 2. The students will learn to use the various statistical softwares. 3. The students will learn methods to collect the data and compile it. 4. The project work will help them in their placements.

Modules		
M 1	ACTUARIAL STATISTICS	1. Providing the students with a foundation into the applications of Statistics and Probability for important calculations in insurance, pension plans and other investment areas. 2. Understanding that Statistical methods help in dealing with uncertain risks faced by the people. 3. Knowing how to use Laws of probability for estimation of possible losses to the insured person. 4. Introduction to Statistical tables called mortality/life tables on basis of which Life insurance premiums are mainly determined. 5. Gaining expertise in Actuarial Statistics which isglobally appreciated and provides opportunities for employment in insurance and financial sector. 6. Preparing students with adequate background in actuarial science so that they can be in great demand at the national and international level and get lucrative jobs.
M 2	Categorical data Analysis	1. Students will learn and understand how to handle categorical data. 2. Students are able to understand the techniques of estimation and testing techniques related to categorical data. 3. Students are made familiar with various advance models are including log-linear models, Poisson regression, generalized linear models etc. 4. Fitting of models and strategies in model selection are being introduced to the students.
M3	Econometrics	1. This course introduces the theory and applications of econometrics the application of statistical methods to economic data. 2. The methods introduced in this course are also used in business, finance and many other disciplines. 3. Modelling techniques are also utilized for hypothesis testing and economic forecasting. 4. Students will learn how to construct econometric models, estimate the parameters of those models and interpret the parameter estimates.

M4	Economic Statistics	1. The objective of this course is to acquaint students with the basic concepts of Microeconomic theory and the analysis of Statistical concepts used in the context of economic set up.
		2. The students will get exposure to concept of utility theory and indifference curves.
		3. The students will learn the ideas of theory of firm and various types of production functions and their properties.
		4. The students will learn about market equilibrium, various income distributions and idea of income inequality.
M5	Advanced Inference	1. Students are able to understand about the advanced applications of statistical inference and the higher probability concepts.
		2. Students are able to understand about the properties of various estimators used in inference such as consistent asymptotic normal (CAN) estimator, invariance of CAN under differentiable transformation etc.
		3. Students are able to understand about the estimation procedure in censored and truncated distributions.
		4. Students are able to understand about the technique of variance stabilizing transformation.
M6	Measure and Probability Theory	1. ablility to understand analysis of probability models.
		2. understanding basic requirement for Kolmogorov probability model.
		3. solving the problems related to Classes of sets, fields, sigma-fields, minimal sigma-field, Borel field in R^k
		4. knowledge of sequence of random variables.
		5. gaining insight into measurable functions
M7	Operations Research	1. Be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
		2. Be able to build and solve Transportation Models and Assignment Models.
		3. Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems and solving the problems using special solution algorithms.
		4. Helps students propose the best strategy using decision making methods under uncertainty and game theory.

M8	Reliability	1. Coverage of the main statistical methods used in reliabilityand life data analysis.
		2. Overview of main distributions used in reliability data analysis.
		3. Exploration of various ageing properties of different distributions viz IFR, IFRA, DMRL, NBU, NBUE and HNBUE.
		4. Ability to handle *probabilistic* modeling of reliability of systems with multiple components and *statistical* modeling of reliability of individual components based on lifetime data.
		5. Getting introduced to stochastic comparison between two random variables using Stochastic, Failure rate and Mean Residual Life orderings.
M 9	Simultaneous Inference	1. Students will learn and understand demoralization of two sample problems to multi-sample (k-sample) problem.
		2. Students are able to understand the techniques of estimation and testing techniques related to multi-sample problems at a pre-specified level.
		3. Students are made familiar with construction of simultaneous confidence intervals at a pre-specified confidence level for various parametric functions.
M10	Statistical Simulation and Computation using R	1. This course introduces programming language R and Students learn to write R programs for the algorithms described in Simulation.
		2. Students also learn Pattern Recognition using Statistical Concepts and they are encouraged to give seminars from this.
		3. The study of Simulation is done using Computers.
M 11	Stochastic Processes	1. Understanding the definition of a stochastic process and in particular, a Markov process;
		2. Classification of a stochastic process and examples of each type of process;
		3. Describing a Markov chain and its transition matrix;
		4. Calculation of distribution of a Markov chain at a given time;
		5. Classifying states of a Markov chain;
		6. Determination of stationary distributions of a Markov chain;
		7. Introduction to Poisson Process;

		8. Knowledge of a Birth and Death Process and Queuing Models M/M/1 and M/M/c;
		9. Studying Renewal and Branching Processes and exploration of their properties.
M12	Survival Analysis	1. Students are able to understand about the application of statistics in handling survival data.
		2. Students are able to understand the concept of censoring and the inferential techniques for some of the life distributions under censoring.
		3. Students are able to understand about the estimation of survival function under censored data settings.
		4. Students are able to understand various models to deal with survival data.