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# Attainment of Course Outcomes and Program Outcomes in Outcome Based Education (OBE)

**Department Name ……M.Sc. Statistics with Data Analytics**……

**PO :**

| PO STATEMENTS |
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| **PO 1 ACADEMIC PURSUIT**<br>• **The program typically focuses on teaching students how to use statistical techniques and tools to analyze and interpret large datasets.**<br>• **How to apply Statistical techniques in real-world settings.**<br>• **Learning programming like R, Python, SAS.** |
| **PO 2 MORALLY UPRIGHT CITIZENSHIP**<br>• **Follows the ethical principles and standards of their profession and uses their knowledge and skills in a responsible and respectful manner.** |
| **PO 3 EFFECTIVE COMMUNICATORS**<br>• **Able to clearly and accurately convey statistical concepts, findings, and insights to a variety of audiences**<br>• **Mastering English Language as a passport to global citizenship.** |
| **PO 4 SOCIALLY RESPONSIBLE**<br>• **Conscious of the potential impact of their work on society and take steps to ensure that their actions align with ethical and moral principles.**<br>• **Cultivating interdependency through inclusive relationship, gender equality and mutual accountability.**<br>**PO 5 ENVIRONMENTALLY COMMITTED**<br>• **Using statistical techniques and data to study environmental issues and assess the impact of human activities on the natural world..** |

**PSO :**

| PSO STATEMENTS |
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| **1.** Expertise in the field of Statistical theory and its applications |
| **2.** Expertise on data analysis using statistical techniques. |
| **3.** Expertise to use Statistical software for data analysis. |

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| **4.** Enables to apply data analysis tools using computer programming. |
| **5.** Expertise to take up responsibilities as efficient Statistician/Data Analysis expert/Research Officers in various fields |

CO/Semester :1

| **Semester 1** | | | |
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| **Statements** | | **Activities** | **Assessment mechanism** |
| **MST1C01 MATHEMATICAL METHODS FOR STATISTICS** | 1) Understand the concepts of Eigen values and Eigen vectors of matrix.<br>2) Understand the vector space, matrices and its properties.<br>3) Solve systems of linear equations using multiple methods.<br>4) Understand the properties of quadratic forms and generalized inverse.<br>5) Understand the concept of Metric space and convergence of sequences.<br>6) Understand Reimann – Stieltjes integral and its properties. | 1) Assignments<br>2) Seminar<br>3) Mathematical games<br>4) Competitions | 1) Class Test<br>2) Viva |

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| **MST1C02 PROBABILITY THEORY** | 1) Understand concepts of measure and probability, sequence of sets, sequence of measurable functions and sequence of integrals.<br>2) Understand distribution function and its properties.<br>3) Expectation of random variables and its properties.<br>4) Understand inequalities involving moments.<br>5) Understand various laws of large numbers and different central limit theorem, their mutual implications and applications. | 1) Seminars<br>2) Assignments | 1) Internal assessmenttests<br>2) Viva<br>3) Class Tests |
| **MST1C03 DISTRIBUTION THEORY** | 1) Understand the concepts of discrete and continuous distributions.<br>2) Understand the normal distribution and various non-normal distributions, their properties and applications for scientific research. | 1) Assignment<br>2) Seminar | 1) Internal assessmenttests<br>2) Viva<br>3) Class Test |

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| | 3) Understand the concept of multivariate distributions and their marginal and conditional distributions<br>4) Understand the idea of sampling and sampling distributions from infinite population | Criticism | |
| **MST1C04 STATISTICAL PROGRAMMING USING R** | 1) Understand various built-in functions in R programming for statistical data analysis.<br>**2)** Understand different functions in R programming for writing computer programmes and develop computer programmes for different problems.<br>**3)** Plot cdf and pdf of standard distributions using R.<br>**4)** Test of significance of means, ANOVA, non-parametric tests, simple correlation and regression procedures and apply for real data sets. | 1) Assignment<br>2) Creating new Program<br>3) Seminars | 1) Class tests<br>2) Internal Examination<br>3) Engagement in lab session, use of concepts, quality of programs |

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| **MST1P01 STATISTICAL COMPUTING 1 (LAB USING R PROGRAMMING)** | 1) Acquire practical knowledge of different theoretical methods.<br>2) Improve the basic concepts of statistical theories using practical data.<br>3) Develop their ability to handle real world problems with large scale data.<br>(Practical based on data with respect to problems discussed in module 1 and module 2 of 1st semester paper- Programming Using R.) | 1) Unit-wise Practical examinations.<br>2) Assignmen t/seminars | 1) Assessing seminar presentations.<br>2) Conducting viva- voce.<br>3) Assignment evaluation.<br>4) Assessment of theexaminations.<br>5) Engagement in lab session, use of concepts, quality of programs |

| Semester 2 | | | |
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| **Statements** | | Activities | Assessment mechanism |
| **MST2C05 DATA BASE MANAGEMENT SYSTEM WITH SQL/PL-SQL** | 1) Understand important terms related to DBMS.<br>2) Analyze various normal forms.<br>3) Able toapply structured query language for Data Analytics.<br>4) Demonstrate the use of PL/SQL for Data Analytics. | 1) Seminars.<br>2) Assignments on various topics under the syllabus<br>3) Conduct unit-wiseexaminations. | 1)Assessing seminar presentations.<br>2)Conducting viva-voce.<br>3)Assignment evaluation.<br>4)Assessment of the examinations.<br>5)Engagement in lab session, use of concepts, quality of programs |
| **MST2C06 STATISTICAL INFERENCE** | 1) Apply various parametric techniques with real life examples.<br>2) Understand the concepts of Sufficiency, Completeness and Minimum Variance Unbiased Estimation and various estimation methods and applications in real life problems<br>3) Apply various parametric, non-parametric and sequential testing procedures to deal with | 1)Assignment<br>2) Seminar<br>3)Exercise | 1.Points included, organization of points<br>2.knowledge of topic<br>3.Engagement in lab session, use of concepts, quality of programs |

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| | real life problems.<br>4) Understand various non-parametric tests used for different problems and Sequential Probability Ratio Test and developing SPRT for different situations. | | |

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| **MST2C07 REGRESSION ANALYSIS** | 1) Understand simple linear regression<br>2) Understand multiple regression, residual analysis for fitting a suitable model to a given data and to check the suitability.<br>3) Study necessary transformations and modifications to be made when model assumptions are violated.<br>4) Fit logistic and Poisson, non-linear and polynomial models. | 1) Assignments<br>2) Exercises<br>3) Discussion and presentation<br>4) Practice real life problems related to the topics. | 1) Participation in discussion, ideas proposed, evaluating presentation skill<br>2) Knowledge of subject<br>3) Application of concept, accuracy ofchoosing concepts. |
| **MST2C08 STATISTICS USING PYTHON PROGRAMMING** | 1) Understand the basics of Python programming.<br>2) Analyze various object oriented concepts<br>3) Apply Python tools for statistical analysis.<br>4) Demonstrate the use of graphical representations for data analytics. | 1) Practicing with different syntax<br>2) Assignment<br>3) Seminars | 1) Engagement in lab session, use of concepts, quality of programs<br>2) Viva<br>3) Class Test<br>4) Internal assessment |
| **MST2P02 STATISTICAL COMPUTING II(LAB BASED ON PYTHON PROGRAMMING)** | 1) Know the basics of Python Programming Language.<br>2) Familiarize OOPS concepts using Python.<br>3) Acquaint statistical analysis using Python<br>4) Learn graphical representation of data for analysis using Python. | 1)Practicing with different syntax<br>2) Assignment<br>3) Seminars | 1) Engagement in lab session, use of concepts, quality of programs<br>2) Viva<br>3) Class Test<br>4) Internal Assessment |

CO/Semester :3

| Semester 3 | | | |
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| **Statements** | | Activities | Assessment mechanism |
| **MST3CO9 SAMPLING AND DESIGN OF EXPERIMENTS** | 1) know different census and sample survey methods<br>2) Plan and implement sample surveys, consumer satisfaction surveys, public opinion surveys etc.<br>3) Aware of different designs in experimentation like CRD, RBD, LSD, BIBD, Factorial Designs, etc. 4. Apply ANOVA technique to analyse the data using Python or R. | 1) Seminars.<br>2) A ssignments on various topics under the syllabus.<br>3) C onduct unit-wise examinations. | 1)Assessing seminar presentations.<br>2) Conducting viva-voce.<br>3) Assignment of examination |
| **MST3C10 STOCHASTIC PROCESSES & TIME SERIES ANALYSIS** | 1) Know various stochastic models.<br>2) UnderstandMarkov chain and its properties<br>3) Understand the concept of Poisson process and important queuing models of time series data**.**<br>4) Understand Time series models and able to predict future values to make appropriate | 1) Assignment<br>2) Exercise<br>3) Discussion<br>4) Practical session | 1) Importance of Contents, organizations of data,timely submission, importance of points, communication skills<br>2) Correctness in design, Importance of Contents, organizations of data,<br>3) Relevance of points, communication skills, collaboration with |

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| | planning and decision making.<br>5) Understand autoregressive /moving average models. | | others |
| **MST3C11 BIG DATA ANALYTICS** | 1) Understand the basic concepts of Data Analytics.<br>2) Analyze various storage techniques for data.<br>3) Know various methods for representing data.<br>4) Understand various operations on stored data. | 1) Assignments<br>2) Give Exercises<br>3) Discussion and presentation<br>4) Practice real life problems related to the topics. | 1) Big Data analysis skill<br>2) Knowledge of subject<br>3) Application of concept, accuracy ofchoosing concepts. |
| **MST3E01 ELECTIVE COURSE I** | | | |
| **MST3P03 STATISTICAL COMPUTING III (LAB BASED ON R & PYTHON)** | 1) Get practical knowledge of different theoretical methods using real data.<br>2) Improve the basic concepts of statistical theories using real world data.<br>3) Practical based on data with respect to module 3 and module 4 of 1st semester paper- Programming Using R. | 1) Seminars<br>2) Practicals | 1) Engagement in lab session, use of concepts, quality of program<br>2) Class test<br>3) Internal examination |

| CO/Semester :4<br>**SEMESTER 4** | | | |
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| **Statements** CO/Semester :4 | | Activities | Assessment mechanism |
| **MST4C12 MULTI VARIATE ANALYSIS** | 1) Understand basic concepts on multivariate analysis.<br>2) Apply multivariate techniques such as discriminant function and classification rules, principal components, canonical correlations, factor analysis, MANOVA etc.<br>3) Apply Hotelling's T2 and Mahalanobis D2 etc for testing hypotheses in the case of multivariate data. | 1)Assignment<br>2)Discussions on various topics under the syllabus.<br>3)Conduct unit-wise examinations. | 1) Assessing seminar presentations.<br>2) Conducting viva-voce.<br>3) Assignment evaluation.<br>4) Assessment of the examinations. |
| **MST4E02 ELECTIVE COURSE II** | | | |
| **MST4Pro PROJECT/INTERNSHIP** | 1) Using data mining and machine learning techniques to extract insights from large datasets, such as customer transaction data or social media data.<br>2) Developing predictive models to forecast future trends or outcomes based on historical data.<br>3) Working with structured and unstructured data to create data visualizations that communicate complex information in a clear and concise manner. | 1) Collaborating with other students, faculty members, or industry professionals on a project that involves analyzing and interpreting data from a real-world problem or scenario. | 2) Participating in internships or other experiential learning opportunities that involve working with data analytics tools and techniques in a professional setting. |

# ELECTIVES

## GROUP 1(for 3rd Semester)

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| **MST3E01 SURVIVAL ANALYSIS** | 1) Understand lifetime models and life time characteristics.<br>2) Estimateparameters of life time characteristics.<br>3) Test parametric and non-parametrictests of life time characteristics.<br>4) Understand Parametric regression models of lifetime<br>5) Understand to apply of Bayesian Inference. | 1) Assignments<br>2) Exercises<br>3) Discussion and presentation<br>4) Practice real life problems related to thetopics. | 1)Participation in discussion, ideas proposed, evaluating presentation skill<br>2)Knowledge of subject<br>3)Application of concept, accuracy ofchoosing concepts. |
| **MST3E01 QUEUIN G THEORY** | 1) Understand various Markovian queueing models and their analysis.<br>2) Understand transient behavior of queueing models and analysis of advanced Markovian models with bulk arrival and bulk service.<br>3) Understand various queueing networks and their extensions.<br>4) Understand various non Markovian queueing models and their analysis | Class work<br>Home work<br>Group work<br>Assignment | Class Tests |
| **MST3E01 RELIABILTY MODELLING** | 1) Understand reliability concepts and measures.<br>2) Understand various lifetime Probability distributions and their structural properties.<br>3) Understand univariate and bivariate shock models and reliability | 1) Assignment<br>2) Seminar<br>3) Debate | 1) Class test<br>2) Internal examination |

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| | estimation based on failure times.<br>4) Understand Maintenance and Replacement Policies | | |
| **MST3E01 DATA MINING** | 1) Know various data mining concepts.<br>2) Analyze statistical techniques for data mining.<br>3) Understand various data classification techniques.<br>4) Apply various techniques for cluster analysis. | 1) Seminars.<br>2) Assignments on various topics under the syllabus.<br>3) Conduct unit-wise examinations. | 1) Assessing seminar presentations.<br>2) conducting viva-voce.<br>3) Assignment evaluation.<br>4) Assessment of the examinations. |
| **GROUP II (for 4th Semester)** | | | |
| **MST4E02 BIO STATISTICS** | 1) Understand survival distributions and their applications.<br>2) Estimaesurvival functions using non parametric methods.<br>3) Estimate probabilities of death under competing risks by maximum likelihood and modified minimum chi-square methods.<br>4) Understand basic biological concepts in genetics. | 1)Assign each student to perform seminars.<br>2)Give assignmentson various topics under the syllabus.<br>3)Conduct unit-wise examinations. | 1) Examinations,<br>2) short quizzes,<br>3) graded homework,<br>4) cumulative final exam<br>5) viva- voice |

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| **MST4E02 ANALYSIS OF CLINICAL TRIALS** | 1) Understand Basics of Clinical Trails<br>2) Understand design of clinical trials<br>3) Determine Sample size in clinical trials<br>4) Understand the concept of meta-analysis in clinical trials. | 1) Seminars.<br>2) Examinations. | 1)Assessing presentations.<br>2)Viva-voce.<br>3)Assignment evaluation.<br>4)Assessment of the examinations. |
| **MST4E02 DEMOGRAPHY** | 1) Understand various aspects related to population census of India**.**<br>2) Understand different measures of Fertility.<br>3) Understand different measures of Mortality.<br>4) Understand the method of of population projection. | 1) Divide students into different groups to solve a problem in different methods<br>2) Provide exercise questions to students.<br>3) Conduct unit-wise examinations | 1) Assessment of unit examinations.<br>2) Class tests<br>3) short quizzes<br>4) graded homework<br>5) cumulativefinal exam and viva voice. |
| **MST4E02 MACHINE LEARNING** | 1) Understand machine learning techniques.<br>2) Apply probability techniques for machine learning.<br>3) Apply the concept of neural networks.<br>4) Understand techniques for cluster analysis. | 1) Training and evaluating machine learning models on a dataset<br>2) Participating in a machine learning competition<br>3) Building a real-world machine learning application<br>4) Exploring different types of machine learning algorithms. | 1) Class test<br>2) Note book checking viva |

| OPEN ELECTIVE(for 4th Semester) | | | |
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| **Course Name** | **Statements** | **Activities** | **Assessment mechanism** |
| **MST4OE01 NEURAL NETWORKS & DEEP LEARNING** | 1) Understand concepts of artificial neural networks.<br>2) Apply neural network techniques.<br>3) Apply statistical techniques in neural networks.<br>4) Familiarize with training of neural networks. | 1) Assign each student to perform seminars.<br>2) Give assignments on various topics under the syllabus.<br>3) Conduct unit-wise examinations. | 1) Assessing seminar presentations.<br>2) Conducting viva-voce.<br>3) Assignment evaluation.<br>4) Assessment of the examinations. |
| **MST4OE01 STATISTICS WITH SAS** | 1) Understand basic concepts in data analysis using SAS<br>2) Do programming using PROC MEANS,PROC FREQ,PROC PRINT etc<br>3) Understand various tests and get the knowledge on how to write,interpret and summarizing results.<br>4) Perform ANOVA using SAS. | 1) Assign each student to perform seminars.Give assignmentson various topics under the syllabus.<br>2) Conduct unit-wise examinations. | 1) Assessing seminar presentations.<br>2) Conducting viva-voce.<br>3) Assignment evaluation.<br>4) Assessment of the examinations. |