**Department of Statistics**

**PROGRAMME OUTCOMES:**

1. **PO1: Disciplinary competency:**  The programme produces competent graduates, who can implement gained knowledge in basic and applied field of statistics such as, Sample survey, Population studies, Quality checking. Data Analysis, Forecasting, constructing different indices for economic and social data etc. for healthy growth of Society and nation building.
2. **PO2:Critical Thinking:** Learning of the concepts, principles and processes in basic and applied statistics, a graduate develops ability to identify relevant assumptions and formulate coherent arguments, analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.
3. **PO3:Problem Solving:** Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired.
4. **PO4:Communication skill:**The graduates demonstrate the skills that enable them to listen carefully, read texts and research papers analytically and present complex information in a clear and concise manner to different groups/audiences and confidently express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media.
5. **PO5:Effective Citizenship:** Demonstrate empathetic social concern and equity centrednational development and the ability to act with an informed awareness of issues andparticipate in civic life through volunteering.
6. **PO6: Skill enhancement:** Fundamental theoretical knowledge and its application in designing of laboratory works, copes the learner to contribute innovations to the society.
7. **PO7:Moral and ethical awareness:** Develops ability to embrace moral/ethical values to formulate an ethical issue from multiple perspectives and use ethical practices in all work adhering to intellectual property rights.
8. **PO8: Research-related skills:** The interdisciplinary knowledge acquired by a graduate enable them to design research by putting suitable hypothesis, research methodology and draw conclusion related to the various issues of society, including environmental problems.
9. **PO9: Leadership readiness/qualities:** The inculcation of vast and deep knowledge of the subject, analytical and scientific reasoning, effective communication, problem-solving skill,decision making ability and basic managerial skills through the course develops leadership potentiality in a graduate.
10. **PO10:Information/ digital literacy:** The graduate develops ability to formulate and evaluate verity of statistical data by using appropriate software.

**COURSE OUTCOME:**

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| Course | Course name | Course outcome (CO) | Relevance |
| Core 101 | DESCRIPTIVE STATISTICS | CO1-Learners able to tabulate statistical information given in descriptive form and use graphical for interpretation | National |
| CO2-Develops the knowledge With various methods of collecting data and get familiar with some elementary methods of data. | National |
| CO3- Understand about compute the correlation coefficient for bivariate data and interpret the correlation between two variables | National |
| CO-4Distinguish different price index  numbers both weighted and unweighted index number.  Also construct consumer price index number. | Regional |

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| Course | Course name | Course outcome (CO) | Relevance |
| Core 102 | ALGEBRA | CO1-Understand Algebraic equation, Algebraic solution. Vector space, Field, Scalars and their operations. | National |
| CO2-Develops the knowledge on Symmetric and Skew symmetric, Hermitian, Skew Hermitian matrices, Orthogonal Singular and Nonsingular matrices and their properties and applications. | National |
| CO3- Understand and apply the basics of Matrix algebra to solve the system of equations and translate a linear equation in to a matrix. | National |
| CO-4 Evaluate Rank of a matrix and Characteristics root and its application. | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -203 | PROBABILITY  AND  PROBABILITY DISTRIBUTIONS | CO1- Explain classical, statistical, and conditional theorem of probability | Local |
| CO2-Define p.d.f , p.m.f , c.d.f , discrete and continuous type of random variable. | National |
| CO3- Understand and apply the single and bivariate random variable and generating function. | National |
| CO-4 FormulateSeparate mixture of distributions. | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -204 | CALCULUS | CO1- Understand basics limits, Continuity Differential Calculus and application. | National |
| CO2-Describe the basic concepts on Integral calculus of one variable, along with definite integral, Beta and Gamma functions | National |
| CO3- Define and distinguish between different types of differential equations. | National |
| CO-4 Explain and solve 1st order linear partial differential equations with problems. | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -305 | SAMPLING DISTRIBUTIONS | CO1-Describethe concept on convergence in probability, Chebychev’s inequality, law of large number. | National |
| CO2-Interpretsample, population, parameter and statistic and formulate hypothesis testing for large sample. | Local |
| CO3- Apply Chi – square distribution for small sample test. | National |
| CO-4 Explain sampling distribution like t and Ffor data analysis. | Global/Local |

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| Course | Course name | Course outcome (CO) |  |
| Core -306 | SURVEY SAMPLING  AND INDIAN OFFICIAL STATISTICS | CO1-Understand Sample survey and Census survey. | National |
| CO2-Describe stratified random sampling,  Systematic sampling. | National |
| CO3- Acquire knowledge on Ratio and Regression method of estimation and Cluster sampling | National |
| CO-4 ExplainOfficial statistical system in India. Explain role and functionsof different statistical offices with their publications. | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -307 | MATHEMATICAL ANALYSIS | CO1- Calculate real numbers and various tests. | National |
| CO2-Describe Uniform continuity and bounded ness of a function and various theorems | National |
| CO3- Interpret idea on Interpolation and various interpolation formulas. | National |
| CO-4 Formulate Trapezoidal rule and other rules and solutions of differential equations of 1st order | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -408 | STATISTICAL  INFERENCE | CO1-Develops clear concept on computing estimate and estimator | National |
| CO2-Formulate to estimate by different method of estimation | National |
| CO3- Learners Have an idea on Fundamental concepts of Testing of Hypothesis. | Regional |
| CO-4 Able to Develop best test procedures to test the hypothesis. | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -409 | LINEAR MODEL | CO1-Understand the elementary theory of linear model to solve problem | National |
| CO2-Elaborateelementary matrix theory to real life problem and its uses. | National |
| CO3- Apply basic theory of ANCOVA and ANOVA in data analysis. | Global/National |
| CO-4 Describe assumptions of model. | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -410 | STATISTICAL QUALITY CONTROL | CO1- Identify the quality of process and product control of items to satisfy the customers. | Local |
| CO2-Develops new idea for improving quality, predict future performance, find possible solutions by using control charts for different products. | National |
| CO3- Analyze OC, AQL,AOQ, ASN And ATI functions. Graphically quantifying consumers and producers risk for different products. | National |
| CO-4 Compare standardize an organizations problem by six –sigma methodology and creates new ideas for quality management of products. | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -511 | STOCHASTIC PROCESS AND QUEUING THEORY | CO1- Develop clear concept to generate the function under mild conditions for determining the distribution of the random variable. | National |
| CO2-Interpret traffic flows, communication networks, genetic issues, model performance. | National |
| CO3- Analyze number of network failure using Poisson process. | Local |
| CO-4 Describe the concept of reducing waiting times, improve service quality, increase customer loyalty. | Local |

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| Course | Course name | Course outcome (CO) |  |
| Core -512 | STATISTICAL  COMPUTING USING  C AND R-PROGRAMMING | CO1-Understand different components and structure of C programming. | National |
| CO2-Formulate decision through branching of different operators and using scanf and printf to read and write strings from terminal in C programming | National |
| CO3- Understand different functions in number of categories for easy understanding to use “C” program. | National |
| CO-4 Develop advance knowledge with running R programming and to develop their skills by applying R program in different fields | National |

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| Course | Course name | Course outcome (CO) |  |
| Core-613 | DESIGN OF EXPERIMENTS | CO1-Calculate ANOVA for one – way and two – way classified data. | Regional |
| CO2-Understand comparative study on different designs’, RBD, LSD. | National |
| CO3- Develops idea on factorial analysis such as 22,23, 2n and 32 experiment | National |
| CO-4 Acquire knowledge to derive total and partial confounding for 2n,32 and33 experiment | National |

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| Course | Course name | Course outcome (CO) |  |
| Core -614 | Multivariate analysis and non-parametric methods | CO1-Analyze multivariate data and properties. | National |
| CO2-ExplainSampling distribution, formulation of multiple and partial correlation. | National |
| CO3- Interpret data using non parametric test procedures | National |
| CO4 Design methods measuring the value by various tests | National |

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| Course | Course name | Course outcome (CO) |  |
| DSE – 501 | OPERATIONS RESEARCH | CO1-Able to identify and formulate real-world problems in decision-making that can be addressed using Operations Research techniques. | National |
| CO2-Develop skills in solving optimization problems, including linear optimization, to find the best solution given constraints. | National |
| CO3- Understand the techniques for analyzing and optimizing networks, including critical path analysis, PERT, and CPM. | National |
| CO-4 Apply key concepts of Inventory management in various organizations | Local |

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| Course | Course name | Course outcome (CO) |  |
| DSE – 502 | TIME SERIES ANALYSIS | CO1-DescribeTime series analysis. | Regional |
| CO2-Classify time series data into its main components, including trend, seasonality. | Regional |
| CO3- Understand Harmonic analysis, AR ( 1 ) and AR ( 2 ) model for analysis. | National |
| CO-4 Develop skills in time series forecasting using appropriate models. | National |

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| Course | Course name | Course outcome (CO) |  |
| DSE – 603 | DEMOGRAPHY AND VITAL STATISTICS | CO1-Recognize the importance of demographic studies in understanding population dynamics. | National |
| CO2-Evaluate mortality measures, including death rates, infant mortality rates and analyze the determinants of mortality. | Local |
| CO3- Construct and interpret life tables to analyze mortality patterns. | Regional |
| CO-4.Calculate and interpret fertility measures, including birth rates and total fertility rates and Abridged Life table. | National |

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| Course | Course name | Course outcome (CO) |  |
| DSE – 604 | PROJECT WORK | CO 1 -Demonstrate the ability to conduct independent research. | National |
| CO2-. Define the research problem or project scope. | National |
| CO3- Develop a sound research methodology | National |
| CO-4 Analyze data using relevant statistical or analytical methods. | National |

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| Course | Course name | Course outcome (CO) |  |
| GENERIC ELECTIVE  GE-101 | Descriptive statistics -1 and linear algebra | CO1-Understand tabulate statistical information given in descriptive form and use graphical techniques for interpretation. | Local |
| CO2-. Develops the knowledge on Central tendency and Dispersion. | Regional |
| CO3- Explain the concepts of Permutation, combination, Binomial theorem, Logarithmic and exponential series. | National |
| CO-4 Describe Symmetric and Skew symmetric matrices, Hermitian, Skew Hermitian matrices, Orthogonal matrices and rank of matrix. | National |

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| Course | Course name | Course outcome (CO) |  |
| GENERIC ELECTIVE  GE-202 | Descriptive statistics - 2 and linear algebra | CO1-Understand tabulate statistical information given in descriptive form and use graphical techniques for interpretation. | Local |
| CO2-. Develops the knowledge on Central tendency and Dispersion. | Regional |
| CO3- Explain the concepts of Permutation, combination, Binomial theorem, Logarithmic and exponential series. | National |
| CO-4 Describe Symmetric and Skew symmetric matrices, Hermitian, Skew Hermitian matrices, Orthogonal matrices and rank of matrix. | National |

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| Course | Course name | | Course outcome (CO) | |  |
| GENERIC ELECTIVE  GE-303 | BASICS OF STATISTICAL INFERENCE | | CO1- Describe sample, population, parameter and statistics, Hypothesis testing for large sample. | | Local |
| CO2-Apply Chi – square, F-test, t-test for data analysis. | | National |
| CO3- Analyze data using non parametric test procedures. | | National |
| CO-4 ANOVA for one – way and two – way classified data.And study on different designs CRD,RBD,with their mathematical model. | | Regional |
| Course | Course name | Course outcome (CO) | |  | |
| GENERIC ELECTIVE  GE-404 | BASICS OF STATISTICAL INFERENCE | CO1- Describe sample, population, parameter and statistics, Hypothesis testing for large sample. | | Local | |
| CO2- Apply Chi – square, F-test, t-test for data analysis. | | National | |
| CO3- Analyze data using non parametric test procedures. | | National | |
| CO-4 ANOVA for one – way and two – way classified data. And study on different designs CRD, RBD, with their mathematical model. | | Regional | |

**PO-CO Mapping**

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| Course outcomes | Programme outcomes | | | | | | | |
| PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 PO-9 PO-10 |
| CC-1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 1 1 |
| CC-2 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 100 |
| CC-3 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 010 |
| CC-4 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 011 |
| CC-5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 110 |
| CC-6 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 101 |
| CC -7 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 111 |
| CC – 8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 110 |
| CC – 9 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 000 |
| CC – 10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 110 |
| CC- 11 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 1 1 |
| CC – 12 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 101 |
| CC- 13 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 000 |
| CC14 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 010 |
| DSE -1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 111 |
| DSE -2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 1 1 |
| DSE -3 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 111 |
| DSE -4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 110 |
| G.E - 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 010 |
| G.E - 2 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 001 |
| G.E - 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 110 |
| G.E - 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 101 |
| TOTAL | 17 | 19 | 14 | 11 | 19 | 15 | 20 | 141511 |