DEPARTMENT OF STATISTICS

B.Sc Statistics and Data Science

VISION

The department of Statistics aspires to establish and develop a nucleus of academic eminence and calibre in mathematical and applied Statistics through dynamic teaching, learning and collaborative research work thereby bringing out the best statisticians.

MISSION

- Mission 1: Advancing Statistical Knowledge: Conduct cutting-edge research to develop new statistical methodologies and improve existing techniques, contributing to the field's theoretical and practical advancements.
- Mission 2: Providing High-Quality Education: Offer comprehensive undergraduate and graduate programs to train students in statistical theory, methods, and applications, preparing them for careers in academics, industry and government sectors.
- Mission 3: Promoting Interdisciplinary Collaboration: Foster partnerships with other academic departments, research institutions, and industry to apply statistical methods to a wide range of disciplines, enhancing the impact and relevance of statistical science.
- Mission 4: Engaging in Community Outreach: Serve the broader community by providing statistical consulting services, organizing workshops and seminars, and promoting statistical literacy among the public.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Professional Competence and Higher Education

Graduates will acquire strong foundational knowledge in statistics, mathematics, and data science, enabling them to excel in professional careers, research, or higher studies in nationally and internationally reputed institutions.

PEO 2: Technical Expertise and Analytical Application

Graduates will attain proficiency in programming languages and analytical tools such as R, Python, and SQL, applying statistical and computational techniques to solve real-world problems in business, healthcare, industry, and research.

PEO 3: Ethical Values, Communication, and Lifelong Learning

Graduates will demonstrate effective communication, teamwork, and ethical responsibility, while continuously upgrading their knowledge to adapt to evolving technologies and global challenges in the field of Statistics and Data Science.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Statistical and Computational Expertise

Demonstrate proficiency in statistical theories, data structures, and computational tools such as R, Python, SQL, and Excel to analyze, visualize, and interpret complex datasets for meaningful insights.

PSO 2: Analytical Modelling and Data-Driven Decision Making

Apply statistical modeling, machine learning algorithms, and predictive analytics to design data-driven solutions and support rational decision-making in academic, industrial, and research contexts.

PSO 3: Professional Growth, Ethics, and Lifelong Learning

Develop problem-solving ability, communication skills, and ethical awareness to adapt to emerging technologies and pursue lifelong learning, research, or professional careers in data analytics, business intelligence, and related domains.

PROGRAMME OUTCOMES (POs):

PO 1: Conceptual Recall

Define fundamental concepts of statistics, probability, and data science to build a strong theoretical foundation for advanced learning and application.

PO 2: Data Comprehension

Interpret datasets, visualizations, and statistical outputs to derive meaningful insights and understand relationships among variables.

PO 3: Practical Application

Apply appropriate statistical and computational techniques using software such as R, Python, or SQL to solve real-world analytical problems.

PO 4: Analytical Reasoning

Analyze complex data structures, identify patterns, and diagnose problems using statistical models, machine learning algorithms, and exploratory data analysis.

PO 5: Critical Evaluation

Evaluate the suitability, accuracy, and ethical implications of statistical models, data-driven predictions, and research conclusions.

PO 6: Innovative Solution Design

Design and develop innovative analytical frameworks, predictive models, and data-driven systems for informed decision-making across disciplines.

PO 7: Ethical and Sustainable Practice

Assess the societal, environmental, and ethical impacts of statistical and data science applications, promoting responsible and sustainable data usage.

PO 8: Communication and Team Competence

Develop effective communication, collaborative, and leadership skills to function productively in multidisciplinary and global data science teams.

Credit Definition

Type	Duration (in hours)	Credit
Lecture (L)	1	1
Tutorial (T)	1	1
Practical (P)	2	1

Total Credit Distribution for the Entire Programme

Semester	Credits									Credits/ Semester
	MC	NON MAJOR		MDC	AEC	SEC	VAC	INT	Project	
		NM	NV							
I	9	4	1+1	-	2	3	2	-	-	22
II	9	-	1+1	4	2	3	2	-	-	22
III	9	4	1+1	4	2	-	-	-	-	21
IV	9	4	1+1	4	2	-	-	-	-	21
V	13	-	1+1	-	-	3	2	-	-	20
VI	13	4	1+1	-	-	-	-	3	-	22
VII	13	4		-	-	-	-	-	4	21
VIII	13 / 17	-	-	-	-	-	-	-	8 / 4	21
Credits / Course	88/ 92	32		12	8	9	6	3	12 / 8	-
Total Credit										170

Category Definition

Definition of Category/Type	Abbreviation
Major Compulsory	MC
Non-Major Specific Subject Course	NM
Non-major Vocational Education and Training	NV
Multidisciplinary Courses	MDC
Ability Enhancement Courses	AEC
Skill Enhancement Courses	SEC
Value Added Courses	VAC
Internship	INT

FIRST YEAR

SEMESTER-I

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Introduction to Statistics	STATU011B04	MC1	5	4	0	2
2	Probability	STATU011T05	MC2	4	3	1	0
3	Real Analysis		NM1	4	3	1	0
4	Vocational – EAA I (Yoga/ Sports/ NCC/ NSS)		NV1	1	0	0	2
5	Vocational – Soft Skill Development I		NV2	1	1	0	0
6	Communicative English I		AEC1	2	2	0	0
7	Environmental Science I		VAC1	2	2	0	0
8	Computer Application		SEC1	3	3	0	0
Total Credit = 22							

SEMESTER-II

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Linear Algebra for Data Science		MC3	4	3	1	0
2	Probability Distributions		MC4	5	4	0	2
3	Vocational – EAA I (Yoga/ Sports/ NCC/ NSS)		NV3	1	0	0	2
4	Vocational – Soft Skill Development II		NV4	1	1	0	0
5	Selected by the candidate (Elective)		MDC1	3	3	0	0
6	Communicative English II		AEC2	2	2	0	0
7	Environmental Science II		VAC2	2	2	0	0
8	Basic Management Skill		SEC2	3	3	0	0
Total Credit = 21							

SECOND YEAR

SEMESTER-III

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Sampling Distributions		MC5	4	3	1	0
2	Numerical Computations Using C/C++		MC6	5	3	0	4
4	XXXXX		NM2	3	3	0	0
5	XXXXX			1	0	0	2
6	Vocational – Mentored Seminar I		NV5	1	0	0	2
7	Vocational – Soft Skill Development III		NV6	1	1	0	0
8	Selected by the candidate (Elective)		MDC2	4	4	0	0
9	Logical Ability I / Foreign Language I		AEC3	2	2	0	0
Total Credit = 21							

SEMESTER-IV

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Statistical Inference I		MC7	5	4	0	2
2	Statistical Computing Using R		MC8	4	0	0	8
3	XXXXX		NM3	3	3	0	0
4	XXXXX			1	0	0	2
5	Vocational – Mentored Seminar II		NV7	1	0	0	2
6	Vocational – Soft Skill Development IV		NV8	1	1	0	0
7	Selected by the candidate (Elective)		MDC3	3	3	0	0
8	Logical Ability II / Foreign Language II		AEC4	2	2	0	0
Total Credit = 21							

THIRD YEAR

SEMESTER-V

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Statistical Inference II		MC9	4	3	0	2
2	Elementary Data Science and Data Structures		MC10	5	3	0	4
3	Introduction to Python Programming		MC11	4	0	0	8
4	Vocational – Mentored Seminar III		NV9	1	0	0	2
5	Vocational – Soft Skill Development V		NV10	1	1	0	0
6	Ethics Study and IPR		VAC3	2	2	0	0
7	Data Analysis		SEC3	3	3	0	0
Total Credit = 20							

SEMESTER-VI

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Linear Models and Design of Experiments		MC12	5	4	0	2
2	Time Series Analysis		MC13	4	3	0	2
3	Database Management System		MC14	4	3	0	2
4	XXXXX		NM4	3	3	0	0
	XXXXX			1	0	0	2
5	Vocational – Mentored Seminar IV		NV11	1	0	0	2
6	Vocational – Soft Skill Development VI		M14	1	1	0	0
7	Internship		INT1	3	0	0	6
Total Credit = 22							

FOURTH YEAR

SEMESTER-VII

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Multivariate Analysis		MC15	5	4	0	2
2	Predictive Analytics		MC16	4	3	0	2
3	Machine Learning and Applications		MC17	4	3	0	2
4	Dissertation / Minor Project		Project	4	0	0	8
5	XXXXX		NM5	3	3	0	0
	XXXXX			1	0	0	2
Total Credit = 21							

SEMESTER-VIII

Sl No	Course Name	Code	Type	Credit	Teaching Scheme		
					L	T	P
1	Big Data Analytics		MC18	4	3	0	2
2	Data Management and Data Warehousing		MC19	4	3	0	2
3	Artificial Intelligence and Deep Learning		MC20	5	4	0	2
4	Dissertation / (Optimization Techniques + Final Project /Seminar)		Project/ Courses	8/ (4+4)	0/ (3+0)	0	16/ (2+8)
Total Credit = 21							

SEMESTER-I

INTRODUCTION TO STATISTICS

Component: THEORY

COURSE OUTCOMES:

***CO1*: Identify** different types of data and their illustrations through textual, tabular or graphical representations.

***CO2*: Implementing** the knowledge of frequency distributions and their graphical representations in real life scenarios.

***CO3*: Infer** the various characteristics of a distribution based on measures of central tendency, dispersion, skewness and kurtosis.

***CO4*: Verify** the existence of any kind of association and its nature, if any, for bivariate data through correlation and regression analysis.

***CO5*: Compile** and **predict** results for problems associated with rank correlation, correlation ratio, correlation index and intra-class correlation.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	1	3	2	2
CO2	3	3	3	2	2	1	1	2	3	2	3
CO3	3	3	3	3	3	1	1	1	3	3	3
CO4	3	3	3	3	3	3	1	2	3	3	3
CO5	3	3	3	3	2	2	1	2	3	3	2

1: LOW **2:** MODERATE **3:** SUBSTANTIAL

***Component:* PRACTICAL**

COURSE OUTCOMES:

CO1: **Categorize** and illustrate different types of data through graphical methods.

CO2: **Use** the concept of frequency distributions and their graphical representations, stem and leaf plot for solving relevant problems.

CO3: **Examine** the various important characteristics of a distribution by applying the knowledge of measures of central tendency, dispersion, skewness and kurtosis.

CO4: **Detect** the nature and extent of association among variables under study by making use of correlation and regression.

CO5: **Generate** results for problems related to rank correlation, correlation ratio, correlation index and intra-class correlation.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	2	1	2	2	2	2
CO2	3	3	3	1	2	1	1	2	2	2	2
CO3	3	3	3	3	3	1	1	1	3	3	3
CO4	3	3	3	3	3	3	1	2	3	3	3
CO5	3	3	3	1	2	2	1	2	3	3	2

1: LOW **2:** MODERATE **3:** SUBSTANTIAL

PROBABILITY

COURSE OUTCOMES:

CO1: **Explain** the basic concepts of probability along with its foundational definitions and fundamental theorems.

CO2: **Solve** numerical problems using the knowledge of conditional probability and its related theorems.

CO3: **Differentiate** between one dimensional discrete and continuous random variables based on their probability distributions and moments.

CO4: **Judge** the applicability of different probability inequalities in bounding the likelihood of certain events.

CO5: **Construct** various generating functions to model and analyze properties of random variables in probabilistic systems.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	1	3	2	2
CO2	3	3	3	2	2	1	1	2	3	2	3
CO3	3	3	3	3	3	1	1	1	3	3	3
CO4	3	3	3	3	3	3	1	2	3	3	3
CO5	3	3	3	3	2	2	1	2	3	3	2

1: LOW **2:** MODERATE **3:** SUBSTANTIAL

SEMESTER-II

LINEAR ALGEBRA FOR DATA SCIENCE

COURSE OUTCOMES:

CO1: Explain the fundamental concepts of linear algebra — including vectors, matrices, addition, multiplication, linear transformations, and systems of linear equations — and their geometric interpretations.

CO2: Acquire matrix operations, determinants, ranks and vector space concepts to solve system of linear equations and analyze data relationships.

CO3: Illustrate matrix decompositions such as LU, QR, and SVD to transform multi-dimensional data and apply in real world problems.

CO4: Interpret the role of linear algebra in machine learning models — including regression, classification, and clustering — and analyze how linear transformations impact data representations.

CO5: Formulate eigenvalues, eigenvectors and related results to perform dimensionality reduction in data science applications.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	1	1	1	3	2	1
CO2	3	3	2	3	2	1	1	1	3	2	1
CO3	3	3	2	3	2	1	1	1	3	2	1
CO4	3	3	3	3	2	2	1	1	3	3	1
CO5	3	3	2	3	2	1	1	1	3	2	1

1. LOW 2. MODERATE 3. SUBSTANTIAL

PROBABILITY DISTRIBUTIONS

Component: THEORY

COURSE OUTCOMES:

***CO1*: Describe** the characteristics and properties of standard univariate discrete probability distributions such as Bernoulli, Binomial, Poisson, Geometric, and Negative Binomial, and their real-life examples.

***CO2*: Explore** various continuous probability distributions including Uniform, Exponential, Normal, Gamma, Beta, and others, and **demonstrate** their inter-relationships and limiting cases.

***CO3*: Illustrate** joint, marginal, and conditional distributions for bivariate random variables

***CO4*: Summarize** concepts of correlation, regression, and bivariate PGF, MGF.

***CO5*: Explain** the concepts and applications of truncated distributions (discrete and continuous) and **cultivate** the properties and applications of the bivariate normal distribution**.**

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	1	2	1	1	1	1	3	2	1
CO2	3	3	1	2	1	1	1	1	3	3	1
CO3	3	3	2	3	2	1	1	1	3	3	1
CO4	2	3	2	3	2	2	1	1	2	3	2
CO5	3	2	2	3	2	2	1	2	2	3	2

1: LOW **2:** MODERATE **3:** SUBSTANTIAL

***Component:* PRACTICAL**

COURSE OUTCOMES:

***CO1*: Compute** methods to fit standard discrete probability distributions (Binomial, Poisson, and Negative Binomial) using given or computed parameters.

***CO2*: Employ** the concepts of discrete probability distributions (Binomial, Poisson, and

Negative Binomial) to solve application based problems.

***CO3*: Figure out** problems related to area property of Normal Distribution

***CO4*: Estimate** the fitting of suitable continuous probability distributions and *evaluate* their goodness of fit.

***CO5*: Develop** outcomes related to application based problems on joint probability distributions and Bivariate normal distribution.

MAPPING OF COs WITH POs AND PSOs

COURSE OUTCOMES	PROGRAMME OUTCOMES								PROGRAMME SPECIFIC OUTCOMES		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	1	1	3	2	1
CO2	2	3	3	3	2	2	1	1	3	3	2
CO3	3	2	2	2	1	1	1	1	3	2	1
CO4	3	3	2	3	2	2	1	1	3	3	2
CO5	3	3	3	3	2	2	1	1	3	3	2

1: LOW **2:** MODERATE **3:** SUBSTANTIAL