DISCIPLINE SPECIFIC CORE COURSE
DSC FT 19: STATISTICAL ANALYSIS IN RESEARCH

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITE OF THE COURSE

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical		
Statistical Analysis in Research DSC FT 19	4	3	0	1	Studied XII	Nil

Learning Objectives

- Introduce students to basic statistical concepts and methods.
- Develop skills to organize, analyze and interpret data.
- Provide the foundation for applying statistical methods in real-world scenarios.
- Equip students with tools for making inferences from data using probability and hypothesis testing.

Learning Outcomes

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- Understand and apply basic statistical concepts.
- Organize and summarize data using descriptive statistics.
- Understand probability theory and apply it to various problems.
- Conduct hypothesis testing and interpret the results.

SYLLABUS OF DSC FT 19

THEORY
(Credits 3; Hours 45)

UNIT I: Basics of Statistics **16 Hours**

In this unit, the students will be able to classify data into appropriate types and levels of measurement. They will understand the distinction between descriptive and inferential statistics. The students will

also learn how to collect, organize and interpret data. They will understand the concept of central tendency and dispersion for different data sets.

- Definition, Scope, types and limitations of statistics
- Data vs Information, variable, frequency, frequency distribution, sample, population, univariate, bivariate and multivariate data tables, types of data (qualitative & quantitative), sources of data (primary and secondary), visualization of data.
- Level of measurement: Nominal, Ordinal, Interval & Ratio with examples
- Importance of Reliability and validity
- Meaning and Measures of Central Tendency- Arithmetic mean, geometric mean and harmonic mean, median, mode, their properties and relationship, partition values (Quartile, Decile, Percentile), Percentile vs Percentile Rank for ungrouped and grouped data.
- Meaning and Measures of Dispersion: Absolute Vs Relative Dispersion for ungrouped and grouped data.
- Overview of Skewness & Kurtosis.

UNIT II: Probability and Probability Distributions **8 Hours**

- Probability: Basic concepts, addition and multiplication rules of probability, conditional probability, Bayes theorem and its applications in Food Sciences
- Probability Distribution: Definition of Random variable: Discrete (Binomial and Poisson probability distribution) and Continuous (Normal distribution) random variables, properties of Normal distribution, Z-score, area under the normal curve
- Mathematical Expectation and Variance: definition with examples.

UNIT III: Correlation and Linear Regression **7 Hours**

- Correlation Analysis: Definition, Types of correlation, measure of correlation (Scatter diagram, Karl Pearson's coefficient of correlation and Spearman's rank correlation coefficient), coefficient of determination, properties of coefficient of correlation.
- Regression Analysis: Meaning of regression, Regression Lines (regression equations), regression coefficients along with their properties, Simple Linear model.

UNIT IV: Sampling & Hypothesis Testing **14 Hours**

Sample, population, techniques of sampling, sample size, sampling distribution, standard error, null and alternate hypothesis, one-tail and two tail test, type I and type II errors, level of significance & level of confidence, concept of confidence interval estimation.

Parametric analysis:

- Large sample tests for single mean and difference of means
- Student t-distribution: test for single mean, unpaired and paired t- test,
- F-test and one-way analysis of variance (ANOVA)
- Karl Pearson's (Product moment) Coefficient of correlation

Non-parametric analysis:

- Chi-square distribution: tests for goodness of fit, test for independence of attributes
- Test the significance of Spearman's rank correlation coefficient.

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PRACTICAL
(Credit 1; Hours 30)

Computer-based practicals using any statistical software like MS-Excel, SPSS, etc. to understand the following concepts:

1. Graphical data representation
2. Measures of central tendency, partition and dispersion
3 Normal distribution (Continuous distribution)
4. Correlation and linear regression analysis
5. Student t- test (one sample and 2 sample)
6. Chi-square test
7. ANOVA (one way)

Essential Readings

- Minium, E. W., King, B. M., & Bear, G. (2017). Statistical Reasoning for Psychology and Education. New York: Wileyand Sons.
- Rastogi Veer Bala, Fundamentals of Biostatistics, latest edition.
- Gupta, S.P. (2022) Statistical Methods, 46th Edn. S.Chand and Sons.
- Agresti, A., Christine Franklin, C. and Klingenberg, B. (2017). Statistics: The Art and Science of Learning from data, Pearson, Boston.
- Biostatistical Analysis, 5th edition (2009), Jerrold H. Zar, Pearson. ISBN-13: 978-0131008465

Suggested Readings

- Derek, R. (2018). Statistics Without Tears, An Introduction for Non-Mathematicians ISBN:978-0-141-98749-1.

- Schmuller, J.(2016). Statistical Analysis with Excel for Dummies, 5th Edition, New York, USA.
- Gupta, S. C. & Kapoor, V. K. (2020). Fundamentals of Mathematical Statistics, 12th Edn., S. Chand and Sons. ISBN: 9781119844549
- Ross, Sheldon M. (2010): Introductory Statistics, 3rd Edition, Academic Press.

Examination scheme and mode shall be as prescribed by the Examination branch, University of Delhi, from time to time