DSE (IV.3.3) Statistical Tools for Research Analysis
Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (IV.3.3)	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Statistical Tools for Research Analysis	**4**	**2**	**0**	**2**	**Undergraduate**	**NIL**

2. Learning Objectives

This course focuses on the application of advanced statistical tools for making inferences from the sample data to the larger population. It connects conceptual understanding with hands-on data analysis using digital tools and statistical software such as **S**PSS**,** STATA, Excel & NVIVO. Students will learn how to select appropriate statistical tests and make inferences based on research questions, data types, and sampling designs.

3. Learning Outcomes

- Understand the concepts, reasoning and interpretation of inferential statistics;
- Examine the need and usability of non-parametric statistics;
- Choose appropriate statistical tools for analysing quantitative data;
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4. Syllabus **[30 hours]**

Unit I Foundations of Inferential Statistics - The central limit theorem; Testing null hypothesis; Significance of difference between the means; level of significance; Degree of freedom; One sample Z test; Significance of difference between means of two small and independent samples; Significance of difference between means of two matched or correlated groups (non- independent samples); Statistical significance of coefficient of correlation.
[8 hours]

Unit II Non-Parametric Statistics in Educational Research - Concept and rationale for using non-parametric tests; Statistical tests for non-parametric data: Mann–Whitney U, Wilcoxon Signed-Rank; Chi-square tests for independence and goodness of fit; Comparison between parametric and non-parametric testing. **[6 hours]**

Unit III Statistical Software for Quantitative Analysis - Descriptive and inferential analysis of quantitative data using SPSS/STATA. **[8 hours]**

Unit IV Statistical Software for Qualitative analysis - Open and axial coding and thematic analysis of qualitative data using NVIVO/MaxQDA. **[8 hours]**

5. Practicals **[60 hours]**

- Collect, organise and visualize raw educational data manually/using spreadsheet/SPSS/STATA. Classify the distinguished features and interpret the results based on visualized data.
- Prepare an analytical table for statistical inferences and interpretive reflection on learning diversity among learners using any existing research studies.
- Conduct non-parametric analysis for ordinal and categorical data.
- Assess the reliability and construct validity of an educational measurement tool.
- Select two independent group datasets, use Mann Whitney U Test and interpret the result
- Prepare a correlation and regression analysis report for variables parents' math background and students'math achievement.
- Do sentiment analysis of metacognitive skills of students in math learning.
- Do axial coding for an opinion poll on students' preference for practical exam vs theory exam.
- Overlap npc on a skewed data graph and do correction to pull it towards normality.
- Use appropriate software to conduct chi square analysis for categorical dataset using teachers' professional competency scale and their association with professional networks.
- Use a small data set to compare two groups using an independent t-test.
- Use rank order correlation for ordering students based on inputs on attitudinal scale.
- Use 10-item attitude scale responses and compute Cronbach's Alpha in SPSS.
- Use a small dataset of study hours (X) and achievement (Y) and run a linear regression model and interpret slope and R^2.
- Collect short written feedback on a week long math lessons and do sentiment analysis using manual coding and thematic coding using NVIVO. Compare the findings.

6. Essential Readings

- Pallant, J. (2022). *SPSS Survival Manual.* McGraw-Hill.
- Creswell, J. W. & Poth, C. (2023). *Qualitative Inquiry and Research Design.* Sage.
- Gravetter, F. J. & Wallnau, L. B. (2021). *Essentials of Statistics for the Behavioral Sciences.* Cengage.
- Braun, V. & Clarke, V. (2022). *Thematic Analysis: A Practical Guide.* Sage.

7. Suggestive Readings

- Beekhuyzen, J. & Bazeley, P. (2024). *Qualitative Data Analysis with NVivo,* (4th ed.). Sage Publication.

- Peers, I. (1996). *Statistical Analysis for Education and Psychology Researchers: Tools for Researchers in Education and Psychology*. Routledge.