

DSE (IV.1.3) Statistical Tools for Research Analysis Discipline Specific Elective

1. Credit Distribution of the Course

Course title & Code DSE (IV.1.3)	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 SPSS, 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]

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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.

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