

Research Methods/Tools/Writing Course: 02 Credits

III.4 Research and Statistical Tools in Mathematics Education

1. Credit Distribution of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
III.4						
Research and Statistical Tools in Mathematics Education	2	0	0	2	Undergraduate	NIL

2. Learning Objectives

This course will be conducted in the practical mode providing students opportunities to work with educational data for research and statistical analysis. Students will gain experience in selecting and modelling statistical models/techniques relevant to different kinds of educational/ STEM education data sets. The course will help them to develop competence in selecting, designing, and using research instruments and generate data suitable for diverse Indian classrooms across government, private, rural, and urban settings. Students will learn to apply descriptive and inferential statistics to real educational datasets with specific examples in math/STEM related experiences using statistical tools: JASP (Open-source), PSPP, AMOS (quantitative analysis) and ATLAS.ti, Taguette (Open-source) for qualitative analysis.

3. Learning Outcomes

- Design quantitative & qualitative research instruments (tests, surveys, rubrics) and evaluate them using statistical reliability and validity measures;
- Organise, clean, and transform datasets and prepare data for analysis;
- Conduct descriptive statistical analysis using appropriate statistical tools;
- Choose appropriate statistical tools to perform inferential statistical analysis;
- Integrate digital statistical tools to generate evidence-based insights for Mathematics/STEM curriculum and pedagogy.

4. Syllabus (Practicals)**[60 hours]**

- Create a classroom observation schedule for analysing questioning patterns in a math classroom. (aligned with NCF 2023).
- Design and pilot a Google Forms survey on students' misconceptions in science or mathematics in an Indian school setting. Conduct thematic analysis and create a brief report.
- Analyse real datasets from a public repository available on government platforms to study learning patterns in STEM subjects.
- Use free or open-source tools to collect data on students' error patterns in geometrical concepts.
- Conduct a Focus Group Discussion with teachers on challenges in accessible math curriculum. Make codes and analyse the responses.
- Use STATA or parallel software to conduct descriptive statistics on a small dataset from an Indian school context (ASSET/PISA/NAS).
- Compare learning outcomes across three teaching interventions using Post-Hoc Tests.
- Use a real dataset on two variables, creativity and problem solving, and run a linear regression model and interpret slope and R^2 .

5. Essential Readings

- Creswell, J. W. & Poth, C. (2023). *Qualitative Inquiry and Research Design*. Sage.
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th Ed.) Routledge.
- Acock, A.C. (2018). *A Gentle Introduction to Stata* (6th Ed.). College Station, Texas : A Stata Press Publication.
- Braun, V. & Clarke, V. (2022). *Thematic Analysis: A Practical Guide*. Sage.

6. Suggestive Readings

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