University of Arkansas – Fort Smith
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General Syllabus

MATH 38373 Mathematics Pedagogy for Data Analysis

Credit Hours: 3 Lecture Hours: 3 Laboratory Hours: 0

Prerequisite: STAT 21003 Probability and Statistics I or STAT 35043 Applied Mathematical Statistics I

Effective Catalog: 2018~2019

I. Course Information

A. Catalogue Description

Designed for pre-service or in-service secondary mathematics teachers. The course will cover selected mathematics topics, technological resources, and methods of teaching relevant to the secondary mathematics curriculum with an emphasis on engaging students in concepts of probability and statistics ranging from middle level to high school. Candidates will also engage in mathematics education research and study literacy-related strategies as it relates to the mathematical content.

B. Additional Description -

None

II. Student Learning Outcomes

A. Subject Matter

Upon completion of the course the candidate will be able to:

1. Apply the ideas of data analysis to solve problems in a variety of types of middle level and secondary problems.
2. Apply, explain, and analyze the various ways of solving statistical problems.
3. Solve non-routine mathematics problems related to probability and statistics.
4. Design engaging mathematical tasks for the student's conceptual development of statistical concepts.
5. Conduct and present research related to mathematics education.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills

Quantitative Reasoning: Students will analyze strategies used to compute with rational numbers. Students will use numbers, read and analyze data, create models, draw inferences, and support conclusions based on sound mathematical reasoning.

Communication Skills (written and oral)

Students will communicate proficiently. Students will participate in small group discussions and individual presentations of problem-solving strategies as well as written reflections of various techniques for calculations.

Ethical Decision Making

Students will model ethical decision-making processes while working in groups and during assessments. Students will practice the expectations concerning plagiarism by completing their own work.

Global and Cultural Perspective

Students will reflect upon cultural differences and their implications for interacting with people from cultures other than their own.

III. Major Course Topics

The following topics will be covered as they relate to the NCTM content strands of Probability and Statistics as they are incorporated from the middle school to upper high school curriculum and the developmental needs of students in these age groups:

A. Secondary Pedagogy
   1. Standards for Mathematical Practice
   2. The learning of mathematics
   3. The teaching of mathematics
   4. Planning a mathematics unit
   5. Planning a mathematics lesson
   6. Enacting a mathematics lesson
   7. Reflecting on the mathematics lesson
   8. Creating a flipped-class lesson

B. Arkansas Standards/NCTM Standards

C. Current trends/topics in mathematics education

D. Professional resources and organizations

E. Technology
   1. Graphing calculators
   2. Excel
   3. Online resources such as Edulastic and DESMOS

F. Probability content
   1. Permutations
   2. Combinations
   3. Dependent and independent events
   4. Compound events

5. Represent probability situations in many ways such as Venn Diagrams, tables, formulas, tree diagrams
6. Simulation
7. Use manipulatives such as dice, coins, spinners
8. Use technology

G. Statistics content
   1. Categorical Data
      a. Graphs such as pie charts, bar graphs, mosaic plots, segments bar graphs
      b. Misleading graphs
      c. Contingency tables
      d. Collecting categorical data
      e. Chi-Square
   2. Quantitative Data
      a. Graphs such as dot plots, stem and leaf plots, histograms, box plots
      b. Measurements of center (mean, median, mode)
      c. Measurements of spread (range, IQR, standard deviation, MAD)
      d. Comparing two or more groups
   3. Bivariate data
      a. Scatterplots
      b. Correlation and Causation
      c. Linear regression