**Department of Mathematics**                                    **Course No. MA 624**
**Title of Course:  Data and Probability**                          **New: Fall 2013**

## I.    Catalog Description and Credit Hours of Course:

The course is designed to develop understanding of probabilistic reasoning and the collection, exploration, and analysis of data.  Emphasis will be given to how children think and learn about these concepts and how they fit into the elementary school curriculum (3)

## II.    Prerequisite(s):

None.

## III.    Purposes and Objectives of the Course:

This course will focus on the content and complexities of teaching and assessing data analysis, statistics, and probability in a K-5 setting but will include topics in 6-8 grades because elementary teachers must understand how the mathematical ideas in the elementary grades build to those in the middle grades and should understand the connections between the topics in the various grade levels. Candidates will develop an expertise related to data analysis, statistics, and probability that will support fellow teachers and enhance student learning. Candidates will also examine the learning trajectories as children develop data analysis, statistics, and probability concepts and skills. Course content will include the essentials of probability and statistics: designing data investigations; describing data using measures like mean, median, interquartile range, and mean absolute deviation; using measures to compare data sets; using data displays to ask and answer questions about data; and drawing conclusions and making inferences.

## IV.    Student Learning Outcomes:

A. Student will summarize, describe, and compare distributions of numerical data in terms of shape, center, and spread.
B. Student will calculate theoretical and experimental probabilities of simple and compound events and explain how they differ.
C. Student will design and execute a data investigation.

## V.    Expectations of Students:

A. Develop ways to use data to investigate other mathematical concepts (e.g. algebra).
B. Recognize key mathematical ideas regarding data and probability, including common misconceptions, with which their students and colleagues are grappling.
C. Develop an appreciation for statistical variability and its sources, and the role of randomness in statistical inference.
D. Explore relationships between two variables by studying patterns in bivariate data.
E. Use the Common Core State Standards for Mathematics and the Learning Progressions documents to guide the creation of lessons and the assessment of students in data and probability.
F. Ask questions that deepen students' and colleagues' mathematical understanding of data and probability.
G. Develop methods of supporting their students' and colleagues' mathematical understanding.
H. Develop methods to interpret, analyze, and communicate about data regarding students' understanding.

I.  Develop in themselves the mathematical practices described in the Standards for Mathematical Practice from the Common Core State Standards for Mathematics in the context of data analysis and probability.

**VI.  Course Outline:**

| Topics | Class Hours |
|---|---|
| A.  The Nature and Uses of Data | 3 |
|    1.  The Collection of Data | |
| B.  Design | 3 |
| C.  Questions | 3 |
| D.  Selection | 3 |
| E.  Variability | 6 |
|    1.  Types of Data | |
|       a.  Discrete (Continuous) | |
|       b.  Continuous (Numerical) | |
|    2.  Representations of Data | |
|       a.  Graphs | |
|       b.  Tables | |
|       c.  Numbers | |
|    3.  Exploring Data | |
|       a.  Center | |
|       b.  Spread | |
|       c.  Questions | |
|       d.  Selection | |
|       e.  Variability | |
| F.  Concepts of Probability | 3 |
| G.  Randomness | 1 |
| H.  Measuring Chance | 2 |
| I.  Theoretical vs. Experimental | 2 |
| J.  Sample Spaces | 1 |
| K.  Counting Principles | 3 |
| L.  Fairness | 3 |
| M.  The Joining of Data and Probability | 3 |
| N.  Modeling – Using data to explore algebraic concepts | 3 |
| O.  Drawing conclusions from data – Using data to research teaching and learning | 3 |
| P.  Communicating inferences from data – Using data to improve teaching and learning | 3 |
|    Total Hours | 45 |

**VII.  Textbook:**

**Required textbook:**
   *Developing Mathematical Ideas: Working with Data*, by Schifter, Bastable, and Russell, Dale Seymour, 2002. (Case Studies book for students, Facilitator's package for Instructors)

**Common Core Learning Progressions**

### Resources ( not required)

*Navigating through Data and Analysis and Probability in Prekindergarten- Grade 2*, by Sheffield, Cavanagh, Dacey, Findell, Greenes, Small, NCTM 2002.

*Navigating through Data and Analysis and Probability in Grades 3-5*, by Chapin, Koziol, MacPherson, and Rezba, NCTM 2003.

*Navigating through Data and Analysis and Probability in Grades 6-8*, by Bright, Brewer, McClain, and Mooney, NCTM 2003.

*Elementary and Middle School Mathematics: Teaching Developmentally*, by Van De Walle, Pearson 2011.

*Helping Children Learn Mathematics*, by Reys, Lindquist, Lambdin, and Smith, Wiley, 2010

*Statistics and Probability: Activities Integrating Math and Science*, by AIMS Education Foundation, 2008

## VIII. Basis of Student Evaluation:

A. Exams to assess mathematical content knowledge       50%

B. Written discussions of research articles related to student learning of data and probabilistic concepts.       10%

C. Assignments of collecting, representing, and analyzing data.       10%

D. Assignments of looking at student (or other teacher) discussions of probability to identify misconceptions.       10%
*To complete the assignment the student must develop a plan for correcting the misconception that includes probing questions and input needed.*

E. Project that requires students to use school achievement data to draw conclusions and make inferences about student learning.       20%

## IX. Grading Scale
90% - 100%  = A
80% - 89%  =  B
70% - 79%  =  C
0% - 69%  =  F

The weight of the evaluation criteria may vary according to each instructor and will be communicated at the beginning of the course.

## X. Academic Policy Statement:
Students will be expected to abide by the University Policy for Academic Honesty regarding plagiarism and academic honesty.  Refer to:
http://www6.semo.edu/judaffairs/code.html

## XI. Student with Disabilities Statement:
If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course.  Reasonable efforts will be made to accommodate special needs.