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MATH 317/ELMA 517 Probability and Statistics for Elementary/Middle Level Teachers-DEAdd-2015-08-31

Form Information

Page Naming Example: CRIM 101 Intro to Criminology-DEAdd-2015-08-10

Please direct any questions to curriculum-approval@iup.edu

*Indicates a required field

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Proposing Department/Unit* Mathematics **Contact Phone*** 74759
Course Level* graduate-level
undergraduate-level

Distance Education Section

- Complete this section only if adding Distance Education to a New or Existing Course

Course Prefix/Number

MATH 317/ELMA 517

Course Title Probability and Statistics for Elementary/Middle Level Teachers

Type of Proposal

See CBA, Art. 42.D.1 for Definition

online

Brief Course Outline

Give an outline of sufficient detail to communicate the course content to faculty across campus. It is not necessary to include specific readings, calendar or assignments

As outlined by the federal definition of a "credit hour", the following should be a consideration regarding student work - For every one hour of classroom or

direct faculty instruction, there should be a minimum of two hours of out of class student work.

- A. Quantitative Literacy through Descriptive Statistics
1. Statistical studies and connections to the real world
 2. Displaying data
 - a. bar graphs, pie charts, and pictographs
 - b. stemplots and histograms
 - c. box plots
 - d. scatter plots
 3. Describing data

- a. measures of central tendency
- b. measures of spread
- 4. Two-variable statistics
 - a. correlation
 - b. linear regression
- 5. Descriptive statistics activities for elementary and middle school students
- 6. Standards, research, and other resources related to the teaching and learning of statistics
- 7. Technology appropriate for analyzing data, including graphing calculators, spreadsheets, software, and applets
 - 1. Quantitative Literacy through Probability
 - 1. Theoretical and experimental probability and simulations
 - 2. Probability and connections to the real world
 - 3. Geometric probability
 - 4. Expected value
 - 5. Probability activities for elementary and middle school students
 - 6. Standards, research, and other resources related to the teaching and learning of probability
 - 7. Technology appropriate for teaching and learning probability, including graphing calculators, computer software, and applets
 - C. Quantitative Literacy through Inferential Statistics
 - 1. Statistical significance, p-values and connections to the real world
 - 2. t-tests
 - 3. Chi-square test
 - D. Student Presentations
 - 1. Use appropriate curriculum materials to plan a project related to probability and statistics
 - E. Research on Teaching Probability and Statistics (**FOR GRADUATE STUDENTS**)
 - 1. Misconceptions and Errors
 - 2. Guidelines for Assessment and Instruction in Statistics Education
 - 3. Common Core Standards for Probability and Statistics

Rationale for Proposal (Required Questions from CBA)

How is/are the instructor(s) qualified in the Distance Education delivery method as well as the discipline?

Dr. Metz earned a Doctor of Education in Mathematics Education degree from the University of Pittsburgh in 2007. She also earned a B.S. in Mathematics Education in 1976 and an M.Ed. in Secondary Mathematics in 1998. Both degrees were earned at IUP.

Dr. Metz taught mathematics at the secondary level for 27 years and has taught mathematics at the university level for 10 years. She has conducted professional development for secondary teachers in the area of teaching and learning mathematics for over 20 years.

Dr. Metz has designed and taught distance education courses in mathematics for five years including MATH 217 Probability and Statistics, MAED 650 Curriculum and Instruction in Mathematics Education, MAED 613 Probability and Statistics for Secondary Teachers, and MAED 654 Teaching of Problem Solving in Mathematics Education. She has also utilized WebCT, Moodle, and D2L with her non-distance education courses including MATH 151 Elements of Math I, MATH 152 Elements of Math II, MATH 413 Methods of Teaching Mathematics at the Middle Level, MATH 420/ELMA 520 Patterns and Functions for Elementary and Middle School Teachers, and MATH 317/ELMA 517 Probability and Statistics for Elementary and Middle School Teachers.

Finally, Dr. Metz attended the trainings in both Moodle and D2L offered by IT Services

For each outcome in the course, describe how the outcome will be achieved using

Outcome 1: demonstrate an understanding of data analysis and its applications to the real world by collecting, organizing, analyzing, graphing, and interpreting data

Students will view an instructor designed presentation. They will then complete several statistical explorations and solve several performance based tasks using online tools such as a graphing calculator, a spreadsheet, the Gapminder Tool, Census at Schools Surveys, Data Sets for Classroom Use, and TUVA labs.

Distance Education technologies.

Outcome 2: investigate real world phenomena, draw conclusions, and make decisions using elementary concepts of probability as tools

Students will view an instructor designed presentation. They will then complete several probability explorations and solve several performance based tasks using online tools such as a graphing calculator containing a probability app, a spreadsheet, Probability Explorer, National Library of Virtual Manipulatives, and SHODOR Interactivate.

Outcome 3: explore and demonstrate appropriate uses of technology for investigating concepts in probability and statistics

This Outcome will be accomplished through Outcomes 1 and 2.

Outcome 4: examine and investigate probability and statistics concepts, standards, resources and activities appropriate for diverse groups at the elementary/middle level

Students will explore educational websites dealing with data analysis and probability concepts including: nctm.org, illuminations.org, amstat.org, causeweb.org. They will also participate in components of a MOOC: Teaching Statistics through Data Investigations through the North Carolina State University that focus on the aspects of this outcome

Outcome 5: examine and present research related to common misconceptions and errors, the Guidelines for Assessment and Instruction in Statistics Education (GAISE), and the Common Core Standards for Probability and Statistics

Students will complete two research projects. In the first project, they will examine research related to common misconceptions and errors in probability and statistics. As a group, they will engage the undergraduate students in an exploration of these misconceptions and errors through web conferencing technologies and discussion forum. The students will also compare/contrast the GAISE and Common Core Standards for Probability and Statistics. They will then engage the undergraduate students in a discussion via web conferencing and discussion forums.

How will the instructor-student and student-student interaction take place?

Instructor-Student Interactions: The instructor will participate in online discussion forums and will provide individual and group feedback on assignments in both the discussion forum and the dropbox of the LMS. The course syllabus will include instructor contact information and online and on-campus office hours. The instructor will be available to meet with students, either individually and or in small groups, during the posted office hours or at other times suitable to both the instructor and the student(s). Students may reach the instructor via e-mail, through the LMS, and by phone during the instructor's office hours.

(if applicable)

Student-Student Interactions: Students are expected to actively participate in discussion forums and small-group discussions and projects, and to provide peer feedback through the LMS discussion forums, web conferencing technologies, Blackboard Collaborate, e-mail, chat, and LMS instant messaging features.

How will student achievement be evaluated?

Assignments will be downloaded to the dropbox of the LMS for evaluation and feedback by the instructor. Assignments account for 10% of the student's grade for graduate students and 20% for undergraduates.

Midterm and final exams will provide a summative assessment of topics covered. They will be given on the LMS which will use a pool of questions so that all students do not have the same exam. The midterm exam will cover concepts related to Data Analysis. The final exam will cover topics related to probability. Each exam accounts for 20% of the student's grade.

A Data Analysis Project will account for 15% of the grade for graduate students and 20% for undergraduates. Each student or group of students will choose a statistical question of interest to study (approved by the instructor) and conduct a statistical study using available, approved Internet resources. The project will occur in stages and at each stage students will submit the project component to the instructor via the LMS. The instructor will provide feedback to each student or group in regards to their progress towards completing the assignment.

A Probability Project will account for 15% of the grade. Students will work in groups to design probability games that address different probability concepts at the elementary/middle level. The games will utilize online technology. Students will play each other's games, determine whether or not the game is a fair game, and determine the expected value of the game.

Two Research Projects (FOR GRADUATE STUDENTS) will account for 20% of the grade. Students will complete two research projects. In the first project, they will examine research related to common misconceptions and errors in probability and statistics. As a group, they will engage the undergraduate students in an exploration of these misconceptions and errors. The students will also compare/contrast the GAISE and Common Core Standards for Probability and Statistics. They will then engage the undergraduate students in a discussion that discusses how the GAISE levels align with the Common Core Standards, including engaging the undergraduates in activities at each level.

How will academic honesty for tests and assignments be addressed?

Students will be made aware of the IUP's Academic Integrity Policy, located at <http://www.iup.edu/page.aspx?id=127235>. In addition to clearly expressing the above expectations and explicitly referring to these expectations in the syllabus, course activities will be designed to minimize the potential for violations of academic integrity. Many of the assignments are individualized either in terms of the resource used or in terms of the performance based task. The project is also individualized in that each student or group chooses his/her own question of interest to study. No two students will be permitted to study the same question. Finally, the exams will be developed using a pool of questions so that no two students have the same exam.