Course Proposal: Modify Course

This proposal will change the following elements of the course. **Prerequisites** 

- 1. Course prefix and number: MTE 552
- 2. Effective Term/Year: FALL 2013
- 3. CIP CODE/10 digit program code: 13131100 No Change
- 4. Short Course Title: Patterns and Reasoning

Modified Short Course Title:

5. What is the primary reason you are modifying this course?

# This modified course description more accurately represents the course content and the function of the course in the proposed consolidated graduate major.

6. Enter course description exactly as it now appears in the general/graduate bulletin.

Applications of critical reasoning skills to topics that include number and operations, relations and functions, patterns and recursion, transformations and modeling, and connections to elementary and middle school mathematics. Students will be required to have a graphics calculator.

Enter modified course description exactly as it will appear in the general/graduate bulletin? **NA** 

7. Current Prerequisites:

# At least 6 hours of undergraduate mathematics

Modified Course Prerequisites:

At least 6 hours of undergraduate mathematics or consent of instructor.

# 8. College: College of Science and Mathematics

9. Department Teaching Course: Mathematics and Statistics

10a. Instruction Type: Lecture No Change
10b. Credit Hours: No Change
Current - Maximum: 3 Minimum: 3 Maximum Hours counted toward degree: 3
Modified- Maximum: Minimum: Maximum Hours counted toward degree:

11a. Second Instruction Type: ns

11b. Second Credit Hours:Current - Maximum: Minimum: Maximum Hours counted toward degree:Modified- Maximum: Minimum: Maximum Hours counted toward degree:

12. Maximum contact hours each week fall semester: **No Change** Lecture: **3** Lab: Other:

13. May this course be taken more than one time each semester: No

# 14. Grade Type: Regular: A-F No Change

15. Describe the place of the modified course within your current curriculum. Will it be elective or required? Part of a major or a minor? (Enter NA if no change is being made.)

We are proposing a consolidation of existing graduate majors, School Mathematics Teaching: Middle Level and School Mathematics Teaching: Secondary Level, into a single major in School Mathematics Teaching with a 24 credit hour core and emphases in middle or secondary levels. This course is currently required for the middle level major and there is no change in the placement of the course as it will be required in the new consolidated major with emphasis on middle level.

16. How does the modified course differ from similar courses being offered at Stephen F. Austin? (Enter NA if no change is being made.) **NA** 

17. Syllabus: Course Learning Goals

List course objectives; describe what students who complete the course will know or be able to do. (Enter NA if no change is being made.) **NA** 

# 18. Syllabus: Course Outline

List the topics that the modified course will cover and indicate the approximate proposed amount of time to be devoted to each, either by percent of course time or number of weeks. Please indicate which topics will be required in all sections of the course and which may vary. (Enter NA if no change is being made.) **NA** 

19. Syllabus: Modified Textbook/Assigned Reading Materials for course. See attached syllabus.

20. Any Other Information Dept. Chair	Date:	
College Curriculum Chair	Date:	
College Dean	Date:	

Grad Dean/Univ Curr Chair \_\_\_\_\_ Date: \_\_\_\_\_

STEPHEN F. AUSTIN STATE UNIVERSITY

### **Department of Mathematics and Statistics**

# MTE 552 – Patterns and Reasoning Course Syllabus

**<u>Course Description</u>**: Applications of critical reasoning skills to topics that include number and operations, relations and functions, patterns and recursion, transformations and modeling, and connections to elementary and middle school mathematics. Students will be required to have a graphics calculator.

# **<u>Credit hours:</u>** 3

<u>Course Prerequisites and Corequisites:</u> At least 6 hours of undergraduate mathematics or consent of instructor.

## **Course Outline:**

- Numerical and Proportional Reasoning
  - Review the common Number Systems
  - Examine Decimals and Real Numbers
  - Establish Connections between Fractions and Decimals in the Context of Terminating and Nonterminating Decimals
  - Describe ideas from number theory as they apply to whole numbers, integers, and fractions, and use these ideas in problem situations.
  - Model and solve problems, including proportion problems, using concrete, geometric, tabular, graphic, and algebraic methods.

# • Patterns and Relations

- Use inductive reasoning to identify and generalize patterns using concrete models, geometric figures, tables, graphs, and algebraic expressions.
- Formulate implicit and explicit rules to describe and construct sequences using concrete models, geometric figures, tables, graphs, and algebraic expressions.
- Translate problem-solving situations into expressions and equations.
- Make, test, validate, and use conjectures about patterns and relationships in data presented in tables, sequences, or graphs.
- Work with patterns with random variations.
- Analyze the properties of sequences and series.
- Use methods of recursion and iteration to model and solve problems.

#### • Relations and Functions

- Illustrate concepts of relations and functions (i.e., linear and nonlinear) using concrete models, geometric figures, tables, graphs, and algebraic expressions.
- Use linear functions and relations to model problems.
- Use linear and nonlinear functions and relation, including polynomial, absolute value, trigonometric, rational, radical, exponential, logarithmic, and piecewise functions, to model and solve problems using a variety of methods, including technology.
- Analyze attributes of functions and relations (e.g., domain, range, one-to-one functions, inverse functions, composite functions, odd and even functions, continuous functions) and their graphs.



30%

25%

Approximate time spent

25%

23%

- Describe linear, quadratic, and other polynomial functions and analyze their algebraic and graphical properties to model and solve problems using a variety of methods, including technology.
- Describe exponential, logarithmic, and logistic functions algebraically and graphically and analyze their algebraic and graphical properties to model and solve problems using a variety of methods, including technology.
- Patterns and Reasoning to the classroom

20%

- Communicate the vertical alignment of number concepts across the grade levels.
- Analyze error patterns that often occur when students use algorithms to perform operations.
- Recognize that a mathematical problem can be solved in a variety of ways, evaluate the appropriateness of various strategies, and select an appropriate strategy for a given problem.
- Develop and use iteration and recursion to model and solve problems.
- Apply appropriate strategies, techniques, and procedures (e.g., pattern recognition, visual representations, and formulaic approaches) for helping students understand mathematics.
- Structure problem solving activities so students can recognize patterns and relationships.

# Student Learning Outcomes (SLO): At the end of MTE 552, the successful student will be able to:

- 1. Think critically and reason about mathematical ideas. [PLO: 1, 2, 3, 4]
- 2. View mathematics as a structured number system with definite relationships between quantity and symbolic representations. [PLO: 1, 2, 3, 4]
- 3. Communicate effectively about mathematics, with an ability to convey detailed information about patterns, relations, and functions with clarity and accuracy. [PLO: 1, 2, 3, 5]
- 4. Develop an appreciation for the real-world applications of mathematics, particularly in the areas of patterns, relations, and functions. [PLO: 1, 2, 3, 6]
- 5. Demonstrate understanding of the connectedness among geometric, graphic, numeric, and symbolic representations of functions and relations. [PLO: 1, 2, 3, 4, 5, 6]
- 6. Demonstrate how number concepts, operations, algorithms, patterns, relations, algebraic reasoning, and analysis are developmental and connected between and across the grade levels. [PLO: 1, 2, 3, 4, 5, 6]

**<u>Program Learning Outcomes (PLO)</u>**: Students graduating from SFASU with an M.S. degree and a major in school mathematics teaching will demonstrate:

- 1. Conceptual understanding and procedural fluency necessary for teaching the core areas of school mathematics (number/operation (N&O), patterns/algebra (P&A), geometry/measurement (G&M), and probability/statistics (P&S)). [Concepts & Skills]
- 2. Competences in using various mathematical tools (including technology) to formulate, represent, and solve problems. (N&O tools, P&A tools, G&M tools, and P&S tools applied to basic and multi-step computational and application problems) [*Problem Solving*]
- 3. The ability to use mathematical reasoning to develop conjectures, design sound arguments, and analyze student thinking. (pattern recognition/conjecture development, examples/non-examples, deductive/inductive reasoning, argument analysis) [*Critical Thinking*]
- 4. An understanding of the development and connectedness of mathematical ideas historically, between content areas, and across grade levels. [*Connections*]
- 5. Effective communication of mathematical ideas in oral, visual, and written forms. [Communication]
- 6. Leadership skills in facilitating collaboration, mentoring teachers, making appropriate instructional decisions, and delivering professional development. [*Leadership*]

*Date of document: 11/01/2012*