Course Proposal: Modify Course

This proposal will change the following elements of the course. Short Title, Course Description, Prerequisites

- 1. Course prefix and number: MTE 558
- 2. Effective Term/Year: FALL 2013
- 3. CIP CODE/10 digit program code: 13131100 No Change
- 4. Short Course Title: Numerical Techniques of Mathematics

Modified Short Course Title: Introduction to Concepts of Calculus

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.

Algorithmic and numerical approaches to problems in algebra, geometry, number theory, counting techniques, modeling and limiting processes. Students will use a variety of computer software and will be required to have a graphics calculator.

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

A survey of calculus concepts including limits, derivatives, and integrals with emphasis on connections to patterns, rates of change, and area. The development of proof by induction via the examination of patterns and limiting processes. Students will use a variety of computer software and will be required to have a graphics calculator. Special attention will be given to the implementation of these concepts into the middle and secondary curricula.

7. Current Prerequisites:

MTE 556

Modified Course Prerequisites:

MTE 565

- 8. College: College of Science and Mathematics
- 9. Department Teaching Course: Mathematics and Statistics

10a. Instruction Type: Lecture No Change

10b. Credit Hours: No ChangeCurrent - Maximum: 3 Minimum: 3 Maximum Hours counted toward degree: 3Modified- 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 both the middle level and secondary level majors and there is no change in the placement of the course. It is one of the 24 credit hour core courses required in the new consolidated major.

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:	



Department of Mathematics and Statistics

MTE 558 – Introduction to Concepts of Calculus **Course Syllabus**

Course Description: A survey of calculus concepts including limits, derivatives, and integrals with emphasis on connections to patterns, rates of change, and area. The development of proof by induction via the examination of patterns and limiting processes. Students will use a variety of computer software and will be required to have a graphics calculator. Special attention will be given to the implementation of these concepts into the middle and secondary curricula.

Credit hours: 3

Course Prerequisites: MTE 565

Course outline:

- **Relations, Functions, and Concepts of Infinity**
 - Represent and solve problems using numerical techniques applied to arithmetic and geometric sequences and series.
 - Review patterns in growth and decay and iterative and recursive processes. 0
 - Review summation and product notation: applications to programming using loops including 0 computer simulation and random number generator.
 - Analyze and apply calculus concepts of limit of a function, continuity, differentiability of functions, 0 definite integrals, and the Fundamental Theorem of Calculus.
 - Demonstrate numerical and graphical techniques for solving equations.
 - Develop proof by induction.

Other Concepts of Calculus

- Use calculus concepts to answer questions about rates of change, areas, volumes, and properties of 0 functions and their graphs.
- Illustrate concepts of calculus using slopes, rates of change, areas and volumes, and average value 0 of a function.
- Show how differential calculus is used to answer questions about rates of change and optimization. 0
- Use integral calculus to compute various measurements associated with curves and regions in the 0 plane, and measurements associated with curves, surfaces, and regions in three-dimensional space.
- Investigate and solve problems using techniques of differential and integral calculus along with a 0 variety of other methods, including technology.
- Explain and demonstrate applications of calculus in a variety of disciplines other than mathematics. 0 30%

Calculus connections to the classroom

- Relate the concept of limit as a conceptual foundation of calculus to middle and high school 0 mathematics.
- Relate the rate of change as a conceptual foundation of calculus to middle and high school 0 mathematics.
- Relate the area under a curve as a conceptual foundation of calculus to middle and high school 0 mathematics.
- Apply content knowledge to develop a mathematical model of a real-world situation and analyze and evaluate how well the model represents the situation.
- Provide students with opportunities to demonstrate their understanding of mathematics in a variety of ways using a variety of tools.
- Use visual media such as graphs, tables, diagrams, and animations to communicate mathematical information.
- Use and translate among multiple representations (e.g., concrete, symbolic, verbal, graphic, pictorial) 0 of mathematical content.

Approximate time spent

35%

35%

Student Learning Outcomes (SLO): At the end of MTE 558, the successful student will be able to:

- 1. Demonstrate an understanding of the fundamental concepts of differential and integral calculus. [PLO: 1, 2, 3]
- 2. Communicate orally and in written form an understanding of the connections among geometric, graphic, numeric, and algebraic solutions to problems. [PLO: 1, 2, 3, 4, 5, 6]
- 3. Use calculus concepts to answer questions about rates of change, areas, volumes, and properties of functions and their graphs and relate these concepts to the middle school classroom. [PLO: 1, 2, 4, 5, 6]
- 4. Use spreadsheets and graphing calculators to perform simulations, solve problems, and support understanding of calculus concepts. [PLO: 1, 2, 4, 5]
- 5. Demonstrate understanding of how to model, construct, and solve conceptual calculus problems within and outside of mathematics as applied to the middle and high school mathematics classroom. [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*]

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