Texas A&M University
Core Curriculum
Initial Request for a Course Addition to the Fall 2014 Core Curriculum

Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics as applied to Engineering and Physics. Upon successful completion of this course, students will be able to:

1. Use the concepts of definite integrals to solve problems involving area, volume, work, and other physical applications.

2. Use substitution, integration by parts, trigonometric substitution, and partial fractions to evaluate definite and indefinite integrals.

3. Apply the concepts of limits, convergence, and divergence to evaluate different types of improper integrals.

4. Determine convergence or divergence of sequences and series.

5. Use Taylor and Maclaurin series to represent functions.

6. Use Taylor or Maclaurin series to integrate functions not integrable by conventional methods.

7. Understand and apply vector operations such as dot and cross product in three dimensions.

8. Use Computer Algebra Systems such as Matlab to solve non-routine problems.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):
The following critical thinking skills will be assessed on quizzes, homework, and exams:

- Students will synthesize data from graphs and visual skills to formulate and evaluate definite integrals to calculate areas, volumes, work, and surface areas of revolution.

- Students will analyze definite and indefinite integrals to determine and apply appropriate methods of evaluation of these integrals.

- Students will inquiry to determine the convergence or divergence of improper integrals and evaluate convergent improper integrals where appropriate.

- Students will apply creative thinking and logical reasoning to determine the convergence or divergence of sequences and series and evaluate convergent sequences and series where appropriate.

- Students will use Taylor and Maclaurin series to represent functions which cannot be integrated conventionally.

- Students will apply appropriate error estimates to determine the accuracy of integration using Taylor and Maclaurin series.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed in class, on quizzes, homework, and exams:

- Students will visually examine graphs of areas and volumes and be able to write definite integrals which represent said areas and volumes.

- Students will clearly develop problem-solving strategies and analysis used to answer questions concerning topics discussed in class.

- Students will use appropriate theorems to present clear written arguments in support of the convergence or divergence of improper integrals, sequences, and series.

- Students will be required to communicate orally with other group members when working on Computer Algebra system projects or other group activities.

- Students will communicate orally in group discussion in required weekly recitation sessions.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on quizzes, homework, and exams:

- Students will interpret a given integral as the area of an appropriate 2-dimensional region or volume of an appropriate solid.
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- Students will use appropriate calculations to analyze the convergence or divergence of series.
- Students will use graphical and numerical data to assess appropriate error formulas used in measuring the accuracy of the partial sum of a series.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.