Course Outline

Course Number: MTH-251
Title: Calculus I
Date Approved: 1/29/2021
Credits: 5
Length of Course: 55

For each credit, the student will be expected to spend, on average, 3 hours per week in combination of in-class and out-of-class activity.

Grading Method: A-F or Pass/No Pass
Prerequisites: MTH-112Z with a C or better, or placement in MTH-251
Co-requisites: None
Recommended: WRD-098 or placement in WR-121Z
Required: None
Related Instruction Area: Computation
Uses Library Resources: Yes

Department: Mathematics
Outline Developed by: Berri Hsiao
Course Approved as: Lower Division Collegiate

Course Description:
For science, engineering, and mathematics students, this is the first course in the four-term Calculus sequence. Focuses on the analysis of functions using limits and differential calculus. Emphasis on applying calculus concepts and techniques to model and solve appropriate real-world applications.

Student Learning Outcomes:
Upon successful completion of this course, students should be able to:

1. determine limits numerically, graphically, and algebraically; (MA1) (MA2)
2. demonstrate understanding of the limit definition of the derivative and its interpretation as an instantaneous rate of change; (MA1) (MA2)
3. demonstrate understanding of the derivative as a function and use the local linearity of functions to obtain approximations from the derivative; (MA1) (MA2)
4. apply techniques of differentiation by choosing the appropriate derivative rule for the appropriate type of function; (MA1)
5. interpret the meaning of the first and second derivatives in various scenarios, and use technology to investigate and verify; (MA2)
6. use the first and second derivative in problem solving that requires sustained reasoning and technology to reach successful conclusions. (MA2)

Major Topic Outline:
1. Limits
   a. Graphically
   b. Numerically
   c. Algebraically
2. Differentiation
   a. Instantaneous rate of change
   b. Difference quotient
   c. Differentiability vs. Continuity
   d. Derivative as a function
3. Symbolic differentiation
   a. Product rule
   b. Quotient rule
   c. Chain rule
   d. Implicit differentiation
4. Using the derivative
   a. Critical Values
   b. Local and Global Extrema
   c. Inflection points
   d. Concavity
5. Applications of Differentiation
   a. Optimization
   b. Related Rates
Outcomes addressed by the course:

'C' - this course completely addresses the outcome. Students who successfully complete this course are likely to have attained this learning outcome.

'S' - this course substantially addresses the outcome. More than one course is required for the outcome to be completely addressed. Students who successfully complete all of the required courses are likely to have attained this learning outcome.

'P' - this course partially addresses the outcome. Students will have been exposed to the outcome as part of the class, but the class is not a primary means for attaining the outcome and assessment for general education purposes may not be necessary.

As a result of completing the AAOT/ASOT general education requirements students will be able to:

MA: Mathematics Outcomes

C 1. Use appropriate mathematics to solve problems.

C 2. Recognize which mathematical concepts are applicable to a scenario, apply appropriate mathematics and technology in its analysis, and then accurately interpret, validate, and communicate the results.