Course Outline

Course Number: MTH-251
Title: Calculus I
Date Approved: 3/6/2015
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-112 with a C or better or placement in MTH-251
Co-requisites: None
Recommended: WRD-098 or placement in WR-121
Required: None
Related Instruction Area: Computation
Uses Library Resources: Yes

Department: Mathematics
Outline Developed by: Mark Yannotta
Course Approved as: Lower Division Collegiate

Course Description:
Topics and applications of differentiation. This course is the first in a four-term sequence designed for students in science, engineering, or mathematics. It will focus on differential calculus.

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

1. estimate limits numerically and graphically, (MA1)
2. determine limits numerically, graphically, and algebraically; (MA1) (MA2)
3. demonstrate understanding of the limit definition of the derivative and its interpretation as an instantaneous rate of change, (MA1) (MA2)
4. find derivatives numerically, algebraically, and graphically; (MA1)
5. interpret the meaning of the first and second derivatives in various applications, (MA2)
6. demonstrate understanding of the derivative as a function in its own right and use the local linearity of functions to obtain approximations from the derivative, (MA1) (MA2)
7. demonstrate proficiency in differentiation, specifically choosing the appropriate derivative rule for the appropriate type of function; (MA2)
8. communicate understanding as to why the various derivative rules are true, (MA2)
9. investigate families of functions using graphing technology to observe their properties and the first and second derivatives to verify these observations, (MA1) (MA2)
10. use derivatives in problem solving that requires sustained reasoning to reach successful conclusions. (MA1) (MA2)

Major Topic Outline:
1. Limits.
   a. The purpose is to provide an understanding of the limit of a function and the various methods for determining a limit.
2. Differentiation.
   b. The purpose is to provide a practical understanding of the limit definition of the derivative and its interpretation as an instantaneous rate of change.
   a. Techniques of differentiation.
   b. The chain rule, and implicit differentiation.
4. Using the derivative.
   a. The first and second derivatives are used to analyze the behavior of families of functions and to solve optimization problems.
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.