EASTERN ARIZONA COLLEGE
Calculus I
Course Design
2015-2016

Course Information

Division Mathematics
Course Number MAT 220 (SUN# MAT 2220)
Title Calculus I
Credits 5
Developed by Adam Stinchcombe
Lecture/Lab Ratio 5 Lecture/0 Lab
Transfer Status ASU NAU UA
MAT 270, Mathematics (MA) Elective Credit --and-
Note: Will fulfill MAT 265 requirement for MATH 122B
265 requirement for Engineering Majors. - MAT 136 also

Activity Course No
CIP Code 27.0101
Assessment Mode Pre/Post Test (15 Questions/100 Points)
Semester Taught Fall and Spring
GE Category Mathematics
Separate Lab No
Awareness Course No
Intensive Writing Course No

Prerequisites
MAT 181 with a grade of "C" or higher or MAT 187 with a grade of "C" or higher or placement test score as established by District policy and ENG 091 with a grade of "C" or higher or reading placement test score as established by District policy

Educational Value
Students majoring in Mathematics, Science, the Arts, and Engineering

Description
Real numbers, limits and continuity for functions of a single real variable. Differentiability and applications of the derivative. Introduction to integral calculus and applications of the integral.
Supplies
Scientific calculator; TI-83 or TI-84 recommended

Competencies and Performance Standards
1. Demonstrate an understanding of and appreciation for the notion of the limit.
   Learning objectives
   What you will learn as you master the competency:
   a. Write out the definition of a limit of a function of a single real variable as the independent variable approaches a finite value.
   b. Discuss in a coherent fashion the notion of limit.
   Performance Standards
   You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
   Your performance will be successful when:
   o You can define and discuss the limiting process

2. Calculate from first principles elementary limits.
   Learning objectives
   What you will learn as you master the competency:
   a. Compute limits from the definition for simple cases
   Performance Standards
   You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
   Your performance will be successful when:
   o You can calculate limits in elementary cases using the definition

3. Demonstrate an understanding of the idea of continuity of a function of a single real variable.
   Learning objectives
   What you will learn as you master the competency:
   a. Write out a correct definition of continuity of a function of a single real variable at a point in its domain.
   b. List three ways in which a function can fail to be continuous at a point.
   c. Extend the definition of continuity of a function of a single real variable from a point to an open subset of the real line.
   Performance Standards
   You will demonstrate your competence:
   o On assigned activities
4. Define the derivative of a function of a single real variable.

Learning objectives

What you will learn as you master the competency:

a. Write out the definition of the derivative of a function of a single real variable at a given point in its domain

Performance Standards

You will demonstrate your competence:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Your performance will be successful when:

- You can demonstrate an understanding of continuity

5. Compute the derivatives of elementary functions from the definition.

Learning objectives

What you will learn as you master the competency:

a. Use the definition to compute the derivatives of elementary functions

Performance Standards

You will demonstrate your competence:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Your performance will be successful when:

- You can compute derivatives of elementary functions from the definition

6. Master the rules of the differential calculus of a function of a single real variable.

Learning objectives

What you will learn as you master the competency:

a. Compute derivatives of reasonably complicated functions of a single real variable

Performance Standards

You will demonstrate your competence:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Your performance will be successful when:

- You can successfully apply the rules of differential calculus
7. **Apply the differential calculus to the solution of nontrivial problems in Mathematics, the Arts, and Science.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Solve problems in Science, Mathematics, the Arts, and Engineering using differential calculus

**Performance Standards**

*You will demonstrate your competence:*

- On assigned activities
- On written exams
- On a two hour cumulative final exam

*Your performance will be successful when:*

- You can solve nontrivial problems

8. **Demonstrate an understanding of and appreciation for the indefinite integral as an antiderivative.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Use the known derivatives of elementary functions to obtain corresponding integrals

**Performance Standards**

*You will demonstrate your competence:*

- On assigned activities
- On written exams
- On a two hour cumulative final exam

*Your performance will be successful when:*

- You can invert the differentiation process to obtain elementary indefinite integrals

9. **Demonstrate an understanding of and appreciation for the definite integral as a process of summation.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Evaluate Riemann integrals as the common limit of the upper and lower Riemann sums

**Performance Standards**

*You will demonstrate your competence:*

- On assigned activities
- On written exams
- On a two hour cumulative final exam

*Your performance will be successful when:*

- You can compute upper and lower Riemann sums and evaluate them in a limiting process
10. Demonstrate an ability to use the fundamental properties of the integral to evaluate elementary integrals.

Learning objectives
What you will learn as you master the competency:
   a. Evaluate integrals

Performance Standards
You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
Your performance will be successful when:
   o You can successfully evaluate integrals

11. Demonstrate an ability to solve nontrivial problems in Mathematics, Science, the Arts, and Engineering.

Learning objectives
What you will learn as you master the competency:
   a. Solve nontrivial problems in Mathematics, Science, the Arts, and Engineering using the integral calculus

Performance Standards
You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
Your performance will be successful when:
   o You can successfully solve nontrivial problems using integral calculus.

Types of Instruction
Classroom Presentation

Grading Information

Grading Rationale
Each instructor has the flexibility to develop evaluative procedures within the following parameters.
1. Written exams must represent at least 60% of the final course grade
2. Final exam must represent at least 20% of the final course grade.
3. The Post Test is to be embedded in the final exam and must represent at least 10% of the final course grade.
4. Other activities may represent at most 20% of the final course grade.
Grading Scale

A  90%-100%
B  80%-89%
C  70%-79%
D  60%-69%
F  Below 60%