EASTERN ARIZONA COLLEGE

Calculus III

Course Design

2019-2020

Course Information

Division	Mathematics
Course Number	MAT 240 (SUN# MAT 2241)
Title	Calculus III
Credits	4
Developed by	Pedro Dabalsa
Lecture/Lab Ratio	3 Lecture/2 Lab

Transfer Status

ASU	NAU	UA
MAT 272, MAT 267, Mathematics (MA) *Note: Will fulfill MAT 267 requirement for Engineering Majors.*	MAT 238	MATH 223

Activity Course	No
CIP Code	27.0101
Assessment Mode	Final Exam (20 Questions/100 Points)
Semester Taught	Spring
GE Category	Mathematics
Separate Lab	No
Awareness Course	No
Intensive Writing Course	No
Diversity and Inclusion Course	No

Prerequisites

MAT 230 with a grade of "C" or higher

Educational Value

Students majoring in Mathematics, the Sciences, the Arts and Engineering

Description

Continuation of MAT 230. Vectors, geometry, differentiation, and integration in Euclidean n-space. Line and surface integrals. Theorems of Green, Gauss, and Stokes.

Supplies

Scientific calculator; TI-83 or TI-84 recommended

Competencies and Performance Standards

1. Define and operate with vectors in Euclidean 2- and 3-space.

Learning objectives

What you will learn as you master the competency:

a. Operate with vectors.

b. Use midpoint and distance formulas for two and three space.

c. Apply dot and cross products to various applications.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner can model problems using vectors in 2- and 3-space

2. Define lines and curves in space.

Learning objectives

What you will learn as you master the competency:

a. Use the various forms of a line in 3-space.

b. Graph curves in 3-space.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner can write the equation of lines in 2- and 3-space

3. Apply vector-valued functions.

Learning objectives

What you will learn as you master the competency:

a. Find derivatives of vector-valued functions in 2- and 3- dimensions.

b. Integrate vector-valued functions.

c. Find velocity and acceleration from a displacement function.

d. Find displacement and velocity from an acceleration vector-valued function.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- o learner can derivate and integrate a given vector valued function in 2- and 3- space

4. Calculate the length of curves, curvature and normal vectors.

Learning objectives

What you will learn as you master the competency:

a. Use parametric integration to find the length of a curve in 2- and 3- space.

b. Calculate the curvature and normal vectors of a curve.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can compute the length of a curve given in parametric form in some interval
- o learner can calculate the curvature of a given curve and its normal vectors

5. Write equations of planes, quadratic surfaces, and level curves.

Learning objectives

What you will learn as you master the competency:

a. Determine the quadric surface of a given quadratic equation in general form.

b. Generalize the concept of cylinder.

c. Determine the equation of some of the level curves of a given surface.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can identify the graph of the quadric from the equation in general form
- o learner will find equations of level curves to a surface

6. Evaluate limits and continuity of vector-value functions.

Learning objectives

What you will learn as you master the competency:

a. Apply limit laws to vector-valued functions.

b. Determine if a function is continuous at a point for a given vector-valued function.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams

- o on a comprehensive final exam

Your performance will be successful when:

- o learner can evaluate a limit of a function in 2- and 3- space

7. Calculate partial derivatives.

Learning objectives

What you will learn as you master the competency:

a. Find the derivative, given a function in several independent variables, by any of those variables.

b. Find mixed-partial derivatives of a given multivariable function.

c. Find the derivative of a function of multiple variables by using the chain rule.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can find multiple derivatives of a given multivariable function

8. Determine directional derivatives and the gradient.

Learning objectives

What you will learn as you master the competency:

a. Compute the directional derivative of a vector-valued function.

b. Compute the gradient of a given vector-valued function.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can find the derivative and gradient of a given multivariable function

9. Write equations of tangent planes and linear approximations.

Learning objectives

What you will learn as you master the competency:

a. Find the equation of a tangent plane to a surface at a given point.

b. Apply linear approximations and differential to functions of multiple variables.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can write the equation of a tangent plane to a given surface
- o learner can write the complete differential of a given function

10. Determine absolute and relative extrema to surfaces.

Learning objectives

What you will learn as you master the competency:

a. Determine absolute extrema to a given surface.

b. Determine relative extrema to a given surface.

c. Apply the method of Lagrange Multipliers to functions in two and three variables.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can find absolute and relative extrema of a given surface

11. Evaluate multiple integrals.

Learning objectives

What you will learn as you master the competency:

a. Evaluate double and triple integrals over various regions of integration.

b. Apply the concept of double and triple integration to functions in polar, cylindrical, and spherical coordinates.

c. Apply multiple integration to mass calculations.

d. Change the variable of integration in multiple integrals.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can evaluate multiple integrals in Cartesian, Cylindrical, Polar, and Spherical Coordinates

12. Draw vector fields and line integrals.

Learning objectives

What you will learn as you master the competency:

a. Evaluate a line integral over a given vector field.

b. Determine whether a vector field is conservative or not.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner can evaluate line integrals over a vector field

13. Apply Green's Theorem, curl, and divergence.

Learning objectives

What you will learn as you master the competency:

a. Compute the curl of a given vector field.

b. Compute the divergence of a given vector field.

c. Evaluate the two forms of Green's Theorem to check for consistency.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner can compute the curl and divergence of a vector field and evaluate Green's Theorem

14. Use surface integrals in applications.

Learning objectives

What you will learn as you master the competency:

a. Evaluate surface integrals over different surfaces.

b. Use surface integrals to solve different application problems, like total charge of a sphere given its surface charge density.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner can evaluate a surface integral over different surfaces

15. Apply Stoke's Theorem and Divergence Theorem.

Learning objectives

What you will learn as you master the competency:

a. Solve physical application problems using Stoke's Theorem.

b. Apply the divergence theorem to electric and magnetic fields.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can apply Stoke's Theorem to electric and magnetic fields

16. Use MatLab to draw curves in two and three space.

Learning objectives

What you will learn as you master the competency:

a. Use MatLab to draw curves in 2- and 3- space.

b. Plot 3-D surfaces using MatLab.

Performance Standards

You will demonstrate your competence:

- o on assigned activities
- o on written exams
- o on a comprehensive final exam

Your performance will be successful when:

- o learner can draw 2- and 3- space curves and surfaces using MatLab

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. 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%