COLLIN COUNTY COMMUNITY COLLEGE
COURSE SYLLABUS

COURSE NUMBER: Math 2419

COURSE TITLE Accelerated Calculus II

CREDIT HRS: 4 **LECTURE HRS:** 3 **LAB HRS:** 3 **CLN/HRS:** 0

PREREQUISITE: Math 2414 or Math 2417

COREQUISITE: None

TEXTBOOK:

Calculus; Early Transcendental Functions, 4rd ed., Larson, Hostetler, & Edwards, ©2007, Houghton Mifflin

SUPPLIES: Graphing Calculator required

COURSE DESCRIPTION:

A study of infinite series, parametric equations and polar functions, vectors in two and three dimensions, vector-valued functions, functions of several variables, cylindrical and spherical coordinates, partial derivatives, multiple integrals and their applications and the calculus of vector fields. Lab included.

COURSE MEASURABLE LEARNING OUTCOMES:

Upon completion of this course the students should be able to do the following:

1. Find the limit of a sequence study the series convergence tests. Estimate the sum of series, including Taylor, Maclaurin, power, and Binomial series with applications.
2. Find equations of lines and planes using multivariable calculus.
3. Draw space graphs using rectangular, cylindrical, and spherical coordinates. Find limits of functions both graphically and analytically, including former proves, and study the continuity and differentiability of three dimensional graphs.
4. Find partial derivatives and gradients with application to optimizations and Lagrange Multipliers.
5. Study the calculus of vector valued functions.
6. Find multiple and triple integrals including applications in different coordinate systems to find volumes and surface areas of revolutions.
7. Use the indicated change of variables to find the Jacobian and then evaluate the double integral

COURSE REQUIREMENTS:

Completion of required exams, labs, projects, and assignments.

COURSE FORMAT:

Lecture, lab and guided practice.

METHOD OF EVALUATION:

A minimum of four written exams, a lab component grade, and a comprehensive final exam. Homework and/or quizzes may be used in place of one exam or in addition to exams. The weight of each of these components of evaluation will be specified in the individual instructor's addendum to this syllabus. All out-of-class course credit, including take-home exams, home assignments, service-learning, etc. may not exceed 25% of the total course grade; thus, at least 75% of a student's grade must consist of exams given in the class or testing center, and no student may retake any of these exams.

ATTENDANCE POLICY:

Attendance is expected of all students. If a student is unable to attend, it is his/her responsibility to contact the instructor to obtain assignments. Please see the schedule of classes for the last day to withdraw.

RELIGIOUS HOLY DAYS:

In accordance with section 51.911 of the Texas Education Code, the college will allow a student who is absent from class for the observance of a religious holy day to take an examination or complete an assignment scheduled for that day within a reasonable time. A copy of the state rules and procedures regarding holy days and the form for notification of absence from each class under this provision are available from the Admissions and Records Office.

COURSE REPEAT POLICY:

All students may repeat this course only once after receiving a grade, including W. For example students who have taken this course twice have to choose a different course to take after two trials.

ADA STATEMENT:

It is the policy of Collin County Community College to provide reasonable and appropriate accommodations for individuals with documented disabilities. This College will adhere to all applicable Federal and State laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student's responsibility to contact the ACCESS Office (G-200) or 972.881.5898, (TDD 972.881.5950) in a timely manner if he/she desires to arrange for accommodations.

ACADEMIC ETHICS:

The college may initiate disciplinary proceedings against a student accused of scholastic dishonesty. Scholastic dishonesty includes, but is not limited to, statements, acts, or omissions related to applications for enrollment or the award of a degree, and/or the submission of material as one's own work that is not one's own. Scholastic dishonesty may involve one or more of the following acts: cheating, plagiarism, collusion, and/or falsifying academic records.

Cheating is the willful giving or receiving of information in an unauthorized manner during an examination, illicitly obtaining examination questions in advance, using someone else's work for assignments as if it were one's own, copying computer disks or files, and any other dishonest means of attempting to fulfill the requirements of a course.

Plagiarism is the use of an author's words or ideas as if they were one' s own without giving credit to the source, including, but not limited to, failure to acknowledge a direct quotation. Contact the Dean of Students at 972.881.5771 for the student disciplinary process and procedures or consult the CCCCD Student Handbook.

COURSE CONTENT:
Note: Proofs and derivations will be assigned at the discretion of the instructor.

MODULE 1: INFINITE SEQUENCES AND SERIES

The student will be able to do:

Sequences
- List the terms of a sequence.
- Determine whether a sequence converges or diverges.
- Write a formula for the n^{th} term of a sequence.
- Use properties of monotonic sequences and bounded sequences.

Series and Convergence
- Understand the definition of a convergent infinite series.
- Use properties of infinite geometric series.
- Use the n^{th}-Term Test for Divergence of an infinite series.

The Integral Test and p-Series
- Use the Integral Test to determine whether an infinite series converges or diverges.
- Use properties of *p*-series and harmonic series.

Comparisons of Series
- Use the Direct Comparison Test to determine whether a series converges or diverges.
- Use the Limit Comparison Test to determine whether a series converges or diverges.

Alternating Series
- Use the Alternating Series Test to determine whether an infinite series converges.
- Use the Alternate Series Remainder to approximate the sum of an alternating series.
- Classify a convergent series as absolutely or conditionally convergent.
- Rearrange an infinite series to obtain a different sum.

The Ratio and Root Tests
- Use the Ratio Test to determine whether a series converges or diverges.
- Use the Root Test to determine whether a series converges or diverges.
- Review the tests for convergence and divergence of an infinite series.

Taylor Polynomials and Approximations
- Find polynomial approximations of elementary functions and compare them with the elementary function.
- Find Taylor and Maclaurin polynomial approximations of elementary functions.
- Use the remainder of a Taylor polynomial.

Power Series
- Understand the definition of a power series.

Find the radius and interval of convergence of a power series.
Determine the endpoint convergence of a power series.
Differentiate and integrate a power series.

Representation of Functions by Power Series

Find a geometric power series that represents a function.
Construct a power series using series operations.

Taylor and Maclaurin Series

Find a Taylor or Maclaurin series for a function.
Find a binomial series.
Use a basic list of Taylor series to find other Taylor series.

MODULE 2: CONICS, PARAMETRIC EQUATIONS, AND POLAR COORDINATES

The student will be able to do:

Plane Curves and Parametric Equations

Sketch the graph of a curve given by a set of parametric equations.
Eliminate the parameter in a set of parametric equations.
Find a set of parametric equations to represent a curve.
Understand two classic calculus problems, the tautochrone and brachistochrone problems.

Parametric Equations and Calculus

Find the slope of a tangent line to a curve given by a set of parametric equations.
Find the arc length of a curve given by a set of parametric equations.
Find the area of a surface of revolution (parametric form).

Polar Coordinates and Polar Graphs

Understand the polar coordinate system.
Rewrite rectangular equations in polar form and vice versa.
Sketch the graph of an equation in polar form.
Find the slop of a tangent line to a polar graph.
Identify several types of special polar graphs.

Area and Arc Length in Polar Coordinates

Find the area of a region bounded by a polar graph.
Find the points of intersection of two polar graphs.
Find the arc length of a polar graph.
Find the area of a surface revolution (polar form).

MODULE 3: VECTORS AND THE GEOMETRY OF SPACE

The student will be able to do:

Vectors in the Plane

Write the component form of a vector.
Perform vector operations and interrupt the results geometrically.
Write a vector as a linear combination of standard unit vectors.
Use vectors to solve problems involving force or velocity.

Space Coordinates and Vectors in Space

Understand the three-dimensional rectangular coordinate system.
Analyze vectors in space.

Use three-dimensional vectors to solve real-life problems.

The Dot Product of Two Vectors

Use properties of the dot product of two vectors.
Find the angle between two vectors using the dot product.
Find the direction cosines of a vector in space.
Find the projection of a vector onto another vector.
Use vectors to find the work done by a constant force.

The Cross Product of Two Vectors in Space

Find the cross product of two vectors in space.
Use the triple scalar product of three vectors in space.

Lines and Planes in Space

Write a set of parametric equations for a line in space.
Write a linear equation to represent a plane in space.
Sketch the plane given by a linear equation.
Find the distances between points, planes, and lines in space.

Surfaces in Space

Recognize and write equations for cylindrical surfaces.
Recognize and write equations for quadratic surfaces.
Recognize and write equations for surfaces of revolution.

Cylindrical and Spherical Coordinates

Use cylindrical coordinates to represent surfaces in space.
Use spherical coordinates to represent surfaces in space.

MODULE 4: VECTOR-VALUED FUNCTIONS

The student will be able to do:

Vector-Valued Functions

Analyze and sketch a space curve given by a vector-valued function.
Extend the concepts of limits and continuity to vector-valued functions.

Differentiation and Integration of Vector-Valued Functions

Differentiate a vector-valued function.
Integrate a vector-valued function.

Velocity and Acceleration

Describe the velocity and acceleration associated with a vector-valued function.
Use a vector-valued function to analyze projectile motion.

Tangent Vectors and Normal Vectors

Find a unit tangent vector at a point on a space curve.
Find the tangential and normal components of acceleration.

Arc Length and Curvature

Find the arc length of a space curve.
Use the arc length parameter to describe a plane curve or space curve.
Find the curvature of a curve at a point on the curve.
Use a vector-valued function to find frictional force.

MODULE 5: FUNCTIONS OF SEVERAL VARIABLES

The student will be able to do:

Introduction to Functions of Several Variables
- Understand the notation for a function of several variables.
- Sketch the graph of a function of two variables.
- Sketch level curves for a function of two variables.
- Sketch level surfaces for a function of three variables.
- Use computer graphics to sketch the graph of a function of two variables.

Limits and Continuity
- Understand the definition of as neighborhood in the plane.
- Understand the definition of the limit of a function of two variables.
- Extend the concept of continuity to a function of two variables.
- Extend the concept of continuity to a function of three variables.

Partial Derivatives
- Find and use partial derivatives of a function of two variables.
- Find and use partial derivatives of a function of three or more variables.
- Find higher-order partial derivatives of a function of two or three variables.

Differentials
- Understand the concepts of increments and differentials.
- Extend the concept of differentiability to a function of two variables.
- Use a differential as an approximation.

Chain Rules for Functions of Several Variables
- Use the Chain Rules for functions of several variables.
- Find partial derivatives implicitly.

Directional Derivatives and Gradients
- Find and use directional derivatives of a function of two variables.
- Find the gradient if a function of two variables.
- Use the gradient of a function of two variables in applications.
- Find directional derivatives and gradients of functions of three variables.

Tangent Planes and Normal Lines
- Find equations of tangent planes and normal lines to surfaces.
- Find the angle of inclination of a plane in space.
- Compare the gradients of functions

Extrema of Functions of Two Variables
- Find absolute and relative extrema of a function of two variables.
- Use the Second Partials Test to find relative extrema of a function of two variables.

Applications of Extrema of Functions of Two Variables
- Solve optimization problems involving functions of several variables.
- Use the method of least squares.

Lagrange Multipliers
- Understand the method of Lagrange Multipliers.
- Use Lagrange Multipliers to solve constrained optimization problems.
- Use the method of Lagrange Multipliers with two constraints.

MODULE 6: MULTIPLE INTEGRATION

The student will be able to do:

Iterated Integrals and Area in the Plane

- Evaluate an iterated integral.
- Use an iterated integral to find the area of a plane region.

Double Integrals and Volume

- Use a double integral to represent the volume of a solid region.
- Use properties of double integrals.
- Evaluate a double integral as an iterated integral.

Change of Variables: Polar Coordinates

- Write and evaluate double integrals in polar coordinates.

Center of Mass and Moments of Inertia

- Find the mass of a planar lamina using a double integral.
- Find the center of mass of a planar lamina using double integrals.
- Find moments of inertia using double integrals.

Surface Area

- Use a double integral to find the area of a surface.

Triple Integrals and Applications

- Use a triple integral to find the volume of a solid region.
- Find the center of mass and moments of inertia of a solid region.

Triple Integrals in Cylindrical and Spherical Coordinates

- Write and evaluate a triple integral in cylindrical coordinates.
- Write and evaluate a triple integral in spherical coordinates.

Change of Variables: Jacobians

- Understand the concept of a Jacobian.
- Use a Jacobian to change variables in a double integral.