South Central College

MATH 132 Calculus II

Course Outcome Summary

Course Information

Description	In this continuation of Calculus I, you will begin by investigating more applications of along with useful techniques for evaluating them. This leads in a natural way to a brie differential equations, and the evaluation of improper integrals and indeterminate forr of the transcendental functions is explored in some detail. Then the study of sequenc taken up, including power series and Taylor series. Important geometrical concepts s coordinates, parametric equations and vectors in the plane and in space are also cov ***Credits: (3 Lecture/1 Lab)***
Total Credits	4
Total Hours	80

Types of Instruction

Instruction Type	Credits/Hours
Lecture	3
Lab	1

Institutional Core Competencies

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. **Apply definite integrals to volume problems**

   Learning Objectives
   a. Compute the volume of a solid by slicing into circular cross-sections
   b. Compute the volume of a solid by slicing into washers
   c. Compute the volume of a solid with cylindrical shells

2. **Apply definite integrals to arc length problems**

   Learning Objectives
   a. Compute the arc length of a smooth curve by integration
   b. Rewrite the formula for arc length in differential form

3. **Apply definite integrals to problems involving work**

   Learning Objectives

a. Calculate the work done by a constant force
b. Calculate the work done by a variable force along a line
c. Calculate the work done in pumping liquids from containers

4. Apply definite integrals to problems involving fluid forces

Learning Objectives
a. Explain the pressure-depth equation
b. Calculate the fluid force on a constant-depth surface
c. Calculate the fluid force against a vertical flat plate

5. Calculate moments and centers of mass

Learning Objectives
a. Calculate center of mass along a line
b. Calculate center of mass along a thin rod with varying density
a. Calculate moments, mass and center of mass of a thin plate

6. Describe the natural logarithm as an integral

Learning Objectives
a. Define natural logarithm precisely
b. Differentiate the natural logarithm function
c. Extend integration to the reciprocal function
d. Extend these operations to logarithms of other bases Differentiate functions logarithmically

7. Complete the calculus of trigonometric functions

Learning Objectives
a. Use logarithms to determine the integrals of tangent and cotangent functions
b. Use substitutions to determine the integrals of secant and cosecant functions

8. Define the exponential function as the inverse of the logarithm function

Learning Objectives
a. Determine the derivative of inverses of differentiable functions
b. Define the natural exponential function
c. Compute the derivative and integral of the natural exponential function
d. Extend (b) and (c), above, to include exponential functions of other bases
e. Express the number e as a limit
f. Generalize the Power Rule

9. Apply the calculus to the inverse trigonometric functions

Learning Objectives
a. Compute the derivative of the six inverse trigonometric functions
b. Evaluate integrals of certain algebraic functions with inverse trigonometric functions

10. Apply the calculus to the hyperbolic functions

Learning Objectives
a. Compute derivatives of the six hyperbolic functions
b. Compute integrals of the six hyperbolic functions
c. Develop useful identities involving the hyperbolic functions
d. Define the inverse hyperbolic functions

11. Develop techniques of integration

Learning Objectives
a. Apply algebraic transformations to simplify integrals
b. Compute integrals by means of integration by parts
c. Extend (b), above, to tabular integration
d. Decompose rational expressions by means of partial fractions
e. Apply trigonometric substitutions to simplify integrals

12. Evaluate limits of certain indeterminate forms

Learning Objectives
a. Deduce L'Hôpital's Rules
b. Evaluate limits of the form 0/0
c. Evaluate limits involving infinity
d. Evaluate limits of other indeterminate forms

13. Evaluate improper integrals

Learning Objectives
a. Evaluate integrals with infinite limits
b. Evaluate integrals with infinite discontinuities
c. Develop rules for convergence or divergence of certain improper integrals
d. Use the limit comparison test for convergence or divergence

14. Determine convergence or divergence of sequences

Learning Objectives
a. Define sequence
b. Define convergence, divergence and limit for sequences
c. Deduce limit properties for sequences
d. Explain the sandwich theorem for sequences
e. Apply L'Hôpital's Rule to sequences
f. Define subsequence
g. Define monotonic and bounded sequences

15. Explain the concept of infinite series

Learning Objectives
a. Define infinite series
b. Explain the connection between series and sequences in terms of partial sums
c. Define interval of convergence
d. Develop rules for working with geometric series
e. Determine the limit of the nth term of a convergent series

16. Determine convergence or divergence of infinite series of non-negative terms

Learning Objectives
a. Apply the integral test
b. Apply the limit comparison test
c. Apply the ratio test
d. Apply the nth root test

17. Determine convergence or divergence of infinite series with alternating terms

Learning Objectives
a. Define alternating series
b. Apply the alternating series test
c. Define absolute convergence
d. Define conditional convergence
e. Apply the absolute convergence test
f. Demonstrate the rearrangement of terms within an absolutely convergent series

18. Define power series

Learning Objectives
a. Apply the convergence theorem for power series
b. Calculate the interval of convergence
c. Demonstrate when term-by-term differentiation of a power series is possible
d. Demonstrate when term-by-term integration of a power series is possible
e. Demonstrate when multiplication of two power series is possible

19. Represent functions by special power series

Learning Objectives
a. Construct a Maclaurin series

b. Construct a Taylor series
c. Extend linearization to the notion of Taylor polynomials
d. Demonstrate Taylor's Theorem
e. Estimate the remainder in Taylor's Theorem
f. Apply power series to simple differential equations
g. Apply power series to the evaluation of indeterminate forms
h. Apply power series to the inverse tangent function
i. Derive a series for p

20. Develop the properties of vectors in a plane

Learning Objectives
a. Decompose vectors into linear combinations of the standard unit vectors
b. Find vectors which are tangent or normal to a curve

21. Carry out operations on vectors in a plane

Learning Objectives
a. Find the angle between two vectors
b. Define dot product
c. Define orthogonal vectors
d. Write a vector as a sum of orthogonal vectors
e. Compute vector projections
f. Define work done by a constant force in terms of vectors

22. Graph functions in the polar plane

Learning Objectives
a. Determine symmetries of polar graphs
b. Find points of intersection of multiple polar graphs
c. Relate polar and Cartesian coordinates

23. Develop the calculus of polar curves

Learning Objectives
a. Compute the slope of a polar curve
b. Compute the area bounded by the origin and a polar curve
c. Compute the area between two polar curves
d. Compute the length of a polar curve

24. Model geometric concepts with vectors in space

Learning Objectives
a. Extend the previous definitions and operations to three-dimensional vectors
b. Compute the magnitude of a space vector
c. Compute the distance between two points in space
d. Derive the standard equation of a sphere
e. Compute the midpoint of a line segment in space
f. Determine expressions for planes
g. Compute the angle between two planes

25. Apply operations to vectors in space

Learning Objectives
a. Compute the dot product of two vectors in space
b. Compute orthogonal vectors and projections
c. Compute the cross product of two vectors in space
d. Compute torque

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