Syllabus

MATH1600
ANALYTIC GEOMETRY AND CALCULUS I

2015

Committee Members:

Phillip Broberg, Central Community College
Frank Weidenfeller, Metropolitan Community College
Michael Jonckheere, Mid-Plains Community College
Beth Welke, Northeast Community College
Dana Nimic, Southeast Community College
Scott Schaub, Western Nebraska Community College

Facilitator

Date Reviewed: _____

Jody Tomanek

NCCA Council of Chief Academic Officers Chair

Date Approved: 3-20-15

I. CATALOG DESCRIPTION:

MATH 1600
Analytic Geometry and Calculus I

Prerequisite: Algebra & Trig or PreCalculus or appropriate placement score.

This course is a study of analytical geometry and single variable calculus. Topics include limits, continuity, derivatives, applications of derivatives, integrals, and applications of integrals.

5.0 semester credit hours/ 7.5 quarter credit hours/75 contact hours

II. COURSE OBJECTIVES

The course will:

1. Present analytical, numerical and graphical techniques to establish limits.
2. Introduce analytical, numerical and graphical techniques to verify continuity
3. Use the definition of derivative
4. Provide the rules of differentiation to calculate derivatives
5. Relate the concepts of differentiation to analyze increasing and decreasing functions and determine concavity.
6. Use the concepts of differentiation to calculate rates of change.
7. Present model functions and use techniques of differentiation to optimize the function.
8. Use the definition of integrals and approximation.
9. Provide the rules of integration to calculate integrals.
10. Relate the concepts of integration to calculate area between curves.
11. Use the concepts of integration to calculate volumes of solids.

III. STUDENT LEARNING OUTCOMES:

Limits and Continuity

Outcomes: The student will:

- Evaluate rates of change
- Find tangents to curves
- Calculate limits of a function using the limit laws
- Evaluate one-sided limits and limits at infinity
- Evaluate infinite limits and find vertical asymptotes
- Verify continuity of functions

Derivatives

Outcomes: The student will:

- Find tangents and derivatives at a point
- Express the derivative as a function
- Utilize differentiation rules for polynomials, products, and quotients
- Interpret the derivative as a rate of change
- Find the derivatives of transcendental functions
- Utilize the chain rule
- Determine higher order derivatives
- Use implicit differentiation
- Utilize the mean value theorem

Applications of Derivatives

Outcomes: The student will:

- Determine extreme values of functions
- Solve related rates problems
- Utilize linearization and differentials
- Use the first and second derivatives to identify extrema and sketch curves
- Solve applied optimization problems
- Utilize Newton's Method

Integrals

Outcomes: The student will:

- Estimate with finite sums
- Use sigma notation and limits of finite sums
- Evaluate definite integrals
- Utilize the fundamental theorem of calculus
- Evaluate indefinite integrals
- Use the substitution method to evaluate integrals
- Find the area under a curve and between curves

Applications of Definite Integrals

Outcomes: The student will:

- Determine volumes by slicing and rotation about an axis
- Evaluate volumes by cylindrical shells

IV. CONTENT/TOPICAL OUTLINE:

A. Limits and Continuity
   1. Rates of change
   2. Limits of functions
   3. Continuity

B. Derivatives
   1. Derivative at a point
   2. Derivative as a function
   3. Differentiation Rules
   4. Derivative as Rate of Change
   5. Derivatives of Transcendentals Functions
   6. Chain Rule
   7. Implicit Differentiation
   8. Higher Order Derivatives
   9. Related Rates
   10. Linearization and Differentials

C. Applications of Derivatives
    1. Extreme values of functions
    2. Mean value theorem
    3. First and Second Derivative Test
    4. Concavity
    5. Applied Optimization
    6. Newton's Method
    7. Antiderivatives

D. Integrals
    1. Finite sums
    2. Definite integral
    3. Fundamental Theorem of Calculus
    4. Indefinite Integrals
    5. Substitution Method

E. Applications of Definite Integrals
    1. Area between curves
    2. Volumes using cross-sections
    3. Volumes using cylindrical shells

V. INSTRUCTIONAL MATERIALS:

APPROVED TEXTBOOKS and/or MATERIALS:

1. Calculus Early Transcendentals; 13th Edition., Thomas, Pearson/Addison Wesley,
2. Calculus: Early Transcendental Functions; 4th Edition, Smith, McGraw-Hill,
3. Calculus; 9th or later Edition, Larson, Houghton Mifflin
4. University Calculus, 2nd or later Edition, Hass, Person/Addison Wesley
5. Calculus, 7th or later Edition, Stewart-Thomson, Brooks/Cole
6. Single and Multivariable Calculus, 5th or later Edition, Hughes-Hallett,
7. Calculus Early Transcendentals, 2nd ed., Briggs/Cochran, Pearson

Equipment: Graphing calculator recommended

VI. METHODS OF PRESENTATION

A. Methods of presentation are determined by the instructor. They traditionally include some combination of the following:

1. Lecture
2. Class Discussion
3. Presentation and discussion of solutions to problems and exercises

VII. METHODS OF EVALUATION

A. Methods of evaluation are determined by the instructor. Evaluation traditionally include some combination of the following:

1. Unit Tests
2. Comprehensive final exam
3. Quizzes
4. Assignments

B. Students will receive a course outline/syllabus indicating the instructor's specific attendance policy, course timeline, course requirements, and grading criteria.

VIII. INSTITUTIONAL DEFINED SECTION

(*To be used at the discretion of each community college as deemed necessary)*