Syllabus
MATH 1600
Analytic Geometry and Calculus I
2021

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The Institution agrees to the contents in this syllabus including course prefix, number, course description and other contents of this syllabus.

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I. CATALOG DESCRIPTION

MATH 1600
Analytic Geometry and Calculus I

Prerequisite: College Algebra & Trigonometry 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/COMPETENCIES

The course will:

1. Present analytical, numerical and graphical techniques to establish limits.
2. Introduce analytical, numerical and graphical techniques to verify continuity.
3. Present the definition to find derivatives.
4. Provide the rules of differentiation to calculate derivatives.
5. Relate the concepts of differentiation to analyze increasing and decreasing functions, locate extrema 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: Students will be able to:

- Evaluate rates of change
- Find the equation of a tangent to a curve
- 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: Students will be able to:

- Find derivatives and equations of tangents 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: Students will be able to:

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

Integrals

Outcomes: Students will be able to:

- 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: Students will be able to:

- 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. 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. Related Rates
    7. Newton's Method
    8. Antiderivatives

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

E. Applications of Definite Integrals
    1. Volumes using cross-sections
    2. Volumes using cylindrical shells

V. INSTRUCTIONAL MATERIALS

SUGGESTED TEXTBOOKS and/or MATERIALS

1. Calculus Early Transcendentals; Thomas, Pearson
2. Calculus; Larson & Edwards, Cengage
3. University Calculus; Hass, Pearson
4. Calculus; Stewart-Thomson, Brooks/Cole
5. Calculus Early Transcendentals; Briggs/Cochran, Pearson
6. Calculus Volume 1; Herman & Strang, Openstax Rice University

Equipment: Graphing calculator recommended

VI. METHODS OF PRESENTATION/INSTRUCTION

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)*