COURSE OUTLINE OF RECORD

Number: MATH A180 **TITLE:** Calculus 1

ORIGINATOR: Tab Livingston **EFF TERM:** Fall 2014

FORMERLY KNOWN AS: **DATE OF OUTLINE/REVIEW:** 03-02-2016

CROSS LISTED COURSE: **TOP NO:** 1701.00

CID: MATH 210

SEMESTER UNITS: 4.0

HRS LEC: 90.0 **HRS LAB:** 0.0 **HRS OTHER:** 0.0

CONTACT HRS TOTAL: 90.0

STUDY/NON-CONTACT HRS RECOMMENDED: 126.0

CATALOG DESCRIPTION:

This is the first course in the calculus sequence. It satisfies the sequence for majors in mathematics, science, or engineering. Topics include limits, derivatives of algebraic and transcendental functions, applications of derivatives, indefinite integrals, definite integrals, the Fundamental Theorem of Calculus and applications of integration. May be taken for grades or on a pass-no pass basis. Transfer Credit: CSU; UC.

JUSTIFICATION FOR COURSE:

Comparable to UC and CSU courses

PREREQUISITES:

- MATH A170: Precalculus with a minimum grade of C or better
  or
- qualifying OCC mathematics placement score. See mathematics assessment requirement.

COREQUISITES:

ADVISORIES:

ASSIGNED DISCIPLINES:

Mathematics

MATERIAL FEE: Yes [ ] No [X] Amount: $0.00

CREDIT STATUS: Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]

GRADING POLICY: Pass/No Pass [X] Standard Letter [X] Not Graded [ ]

OPEN ENTRY/OPEN EXIT: Yes [ ] No [X]

TRANSFER STATUS: CSU Transferable[ ] UC/CSU Transferable[X] Not Transferable[ ]

BASIC SKILLS STATUS: Yes [ ] No [X] **LEVELS BELOW TRANSFER:** Not Applicable

CALIFORNIA CLASSIFICATION CODES: Y - Not Applicable

NON CREDIT COURSE CATEGORY: Y - Not applicable, Credit Course

OCCUPATIONAL (SAM) CODE: E

REPEATABLE ACCORDING TO STATE GUIDELINES: No [X] Yes [ ] NUMBER REPEATS:

REQUIRED FOR DEGREE OR CERTIFICATE: No [ ] Yes [X]

Associate in Science in Physics for Transfer(Associate in Science for Transfer)
BUSINESS APPLICATION DEVELOPMENT(Associate in Science)
BUSINESS APPLICATION DEVELOPMENT(Certificate of Achievement)
Business Administration(Certificate of Achievement)
COMPUTER INFORMATION SYSTEMS(Associate in Science)
COMPUTER INFORMATION SYSTEMS(Certificate of Achievement)

GE AND TRANSFER REQUIREMENTS MET:

IGETC Area 2: Mathematical Concepts and Quantitative Reasoning

2A: Mathematic

CSU GE Area B: Scientific Inquiry and Quantitative Reasoning

B4 - Mathematics/Quantitative Thinking

OCC AA Gen Ed

AREA A2: LANGUAGE AND RATIONALITY - Communication and Analytical Thinking

OCC AS Gen Ed

AREA A2 – ENGLISH COMMUNICATION - Communication and Analytical Thinking

COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:

1. Calculate limits when they exist, and explain why when they do not.
2. Determine where a function is continuous and/or differentiable, and explain why.
3. Compute derivatives of polynomial, rational, algebraic, exponential, logarithmic, and trigonometric functions.
4. Use techniques of differentiation, including the product, quotient, and chain rules, and implicit differentiation.

COURSE OBJECTIVES:

1. State and apply the definitions of limits, derivatives, definite integrals and indefinite integrals.
2. Determine if a function is continuous at a real number.
3. Find the derivative of a function as a limit.
4. Find the equation of a tangent line to a function.
5. Compute the limit of a function with and without using L'Hospital's Rule.
6. Calculate derivatives of algebraic and transcendental functions using the definition, the sum rule, the product rule, the quotient rule and the chain rule.
7. Use implicit differentiation.
8. Solve certain types of derivative applications such as related rates problems, linear approximations to functions and optimization problems.
9. Graph functions by applying information obtained from the first and second derivative.
10. Calculate definite integrals using the definition, formulas, Riemann Sums and simple substitutions.
11. Evaluate definite integrals using the Fundamental Theorem of Calculus and using the Substitution Method.
12. Calculate indefinite integrals using the definition, formulas and simple substitutions.
13. Use definite integrals in terms of either x or y to computer areas and volumes.
14. Use definite integrals to compute work and the average value of a function.

COURSE CONTENT:

LECTURE CONTENT:

A. Functions and Models
   1. Functions, domains and ranges
   2. Catalog of functions: polynomial, rational, algebraic and transcendental
   3. Inverse functions and their properties
   4. Review of properties of exponential and logarithmic functions
   5. Development of the inverse trigonometric functions and their properties

B. Limits and Rates of Change
   1. Two-sided limits and one-sided limits with graphical interpretations
   2. Computing limits using sum, difference, product, quotient and other rules

3. Computing limits indirectly using the "Squeeze" theorem and other methods
4. Formal ε, δ definitions of limits
5. Given a linear function and its limit, compute δ for given values of ε
6. Given a linear function and its limit, compute δ in terms of an arbitrary ε
7. Definition of continuity, a survey of continuous functions, and the Intermediate Value Theorem
8. The definition of limits as $x \to \pm \infty$ and its graphical interpretation as horizontal asymptotes
9. Slopes of tangent lines and velocities as applications of limits

C. Derivatives
1. The definition of the derivative of a function
2. Computing derivatives using only the limit definition
3. Derivative formulas for monomial, trigonometric, exponential, logarithmic and hyperbolic functions
4. Discussion of the power rule, sum rule, product rule and quotient rule with examples
5. Discussion of the chain rule with examples
6. Computing derivatives using implicit differentiation
7. Computing higher order derivatives explicitly and implicitly
8. Related rates applications
9. Differentials and their use as estimations in applications
10. Newton's Method

D. Applications of the Derivative
1. Identifying critical numbers, local extrema and absolute extrema
2. Rolle's Theorem, the Mean Value Theorem, and applications of these theorems
3. Identifying intervals where $f(x)$ is increasing or decreasing
4. The First Derivative Test for identifying local extrema
5. Concavity and points of inflection
6. The Second Derivative Test for identifying local extrema
7. L'Hospital's Rule and indeterminate forms
8. Curve sketching identifying local and absolute extrema, intervals where the graph is increasing or decreasing, concavity, inflection points and asymptotes
9. Optimization applications from the sciences and economics
10. Antiderivatives as an example of a basic differential equation

E. Integrals
1. Summation notation and properties of finite sums
2. Areas computed as Riemann sums
3. Definition of the definite integral as a limit of a Riemann sum
4. Properties of definite integrals
5. The Fundamental Theorem of Calculus
6. Computation of definite integrals using the Fundamental Theorem of Calculus
7. Using u-substitution in definite and indefinite integrals

F. Applications of Integration
1. Computing area between curves by constructing definite integrals and integrating with respect to x or y
2. Computing volumes of solids of revolution by constructing definite integrals using the methods of cross-sections or disks and integrating with respect to x or y
3. Computing volumes of solids of revolution by constructing definite integrals using the methods of washers or shells and integrating with respect to x or y
4. Computing work by constructing definite integrals and integrating with respect to x or y
5. Computing the average value of a function over a closed interval by constructing definite integrals and integrating with respect to x or y

LABORATORY CONTENT:

METHODS OF INSTRUCTION:

A. Lecture:
B. Independent Study:

INSTRUCTIONAL TECHNIQUES:

The primary mode of instruction is the lecture/demonstration method. Some sections may utilize graphing calculators.

COURSE ASSIGNMENTS:

Reading Assignments

From assigned text. 1 hour

Out-of-class Assignments

Homework assignments as given by instructor. 6 hours

Writing Assignments

Problem solving exercises commonly appear on exams or quizzes. These require written responses of the students. Critical thinking is an integral part of a calculus course. 1 hour

METHODS OF STUDENT EVALUATION:

Midterm Exam
Final Exam
Short Quizzes
Written Assignments
Projects (ind/group)
Problem Solving Exercises

Demonstration of Critical Thinking:

Grades are determined by performance on quizzes and exams. Some instructors may also include grades on homework, cooperative assignments, or participation in cooperative learning sessions. A comprehensive final exam is part of this course.

Required Writing, Problem Solving, Skills Demonstration:

Problem solving exercises commonly appear on exams or quizzes. These require written responses of the students. Critical thinking is an integral part of a calculus course.

TEXTS, READINGS, AND RESOURCES:

TextBooks:

1. Stewart, James. *Calculus, Early Transcendentals* , 7th ed. Belmont, Ca: Brooks/Cole Publishing Co., 2010

Other:

1. Other appropriate textbook as chosen by faculty.

LIBRARY:

Adequate library resources include: Print Materials
Non-Print Materials
Online Materials
Services

Comments:

Attachments:

Attached Files