TAFTCOLLEGE

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Mathematics (MATH) 2100 Analytic Geometry and Calculus I (5 Units) CSU:UC
[formerly Mathematics 3A]

Prerequisite: Successful completion of Mathematics 1540 with a 'C' or better or equivalent.

Prerequisite knowledge/skills: Before entering the course, the student should be able to:

1. Graph functions and relations in rectangular coordinates and polar coordinates;
2. Synthesize results from the graphs and/or equations of functions and relations;
3. Apply transformations to the graphs of functions and relations;
4. Recognize the relationship between functions and their inverses graphically and algebraically;
5. Solve and apply equations including rational, linear, polynomial, exponential, absolute value, radical, and logarithmic, and solve linear, nonlinear, and absolute value inequalities;
6. Solve systems of equations and inequalities;
7. Apply functions to model real world applications;
8. Identify special triangles and their related angle and side measures;
9. Evaluate the trigonometric function of an angle given in degree and radian measure;
10. Manipulate and simplify a trigonometric expression;
11. Solve trigonometric equations, triangles, and applications;
12. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs; and
13. Prove trigonometric identities

Total Hours: 80 hours lecture. 160 Outside of class hours. (240 Total Student Learning Hours) 5 Units

Catalog Description: This course is a beginning course in calculus and analytic geometry including functions, limits and continuity, derivatives, integrals, applications of derivatives and integrals, transcendental functions, and Fundamental Theorem of Calculus. This course is primarily for Science, Technology, Engineering and Math majors, and is taught with a computer component (Maple). C-ID: MATH 211.

Type of Class/Course: Degree Credit

Text: Briggs, William, L. Cochran and B. Gillett. *Calculus*. *Single Variable. 3rd Ed.* Pearson Addison-Wesley, 2019.

Additional Instructional Materials: none.

Course Objectives:

By the end of the course, a successful student will be able to:

1. understand the use of functional notation,
2. plot and interpret graphs of functions,
3. differentiate algebraic, trigonometric, exponential, logarithmic and hyperbolic functions,
4. apply derivatives, and
5. find the integrals of basic functions (this topic is continued in Math 3B) and
6. complete items 1-5 above by both hand computations and computer assisted (Maple) Compute the limit of a function at a real number;
7. Determine if a function is continuous at a real number;
8. Find the derivative of a function as a limit;
9. Find the equation of a tangent line to a function;
10. Compute derivatives using differentiation formulas;
11. Use differentiation to solve applications such as related rate problems and optimization problems;
12. Use implicit differentiation;
13. Graph functions using methods of calculus;
14. Evaluate a definite integral as a limit;
15. Evaluate integrals using the Fundamental Theorem of Calculus; and
16. Use the definite integral to find areas and volumes

Course Scope and Content:

Unit I Functions & Graphs
- A. Identify graphs of polynomial functions
- B. Identify horizontal and vertical translations
- C. Identify the effect of the magnitude and sign of leading coefficients on the graph of a polynomial
- D. Construct and graph piecewise and composite functions
- E. Identify local minimums and maximums

Unit II Limits & Continuous Functions
- A. Find limits graphically and numerically
- B. Evaluate limits analytically
- C. Identify continuity of functions on open and closed intervals
- D. Determine when functions have infinite limits and interpret the meaning of an infinite limit

Unit III Derivative
- A. Demonstrate an understanding of the derivative as it pertains to the tangent line problem
- B. Identify and appropriately apply basic rules of differentiation as they pertain to rates of change
- C. Identify and appropriately apply the power, constant, product, and quotient rule for first and higher-order derivatives
- D. Differentiation formulas: constants, power rule, product rule, quotient rule and chain rule
- E. Demonstrate a working knowledge of related rates of change
- F. Determine the differentiability of functions
- G. Determine a derivative as a limit

Unit IV Application of Derivatives
- A. Use derivatives to identify and appropriately interpret local extrema
- B. Identify intervals where functions are increasing/decreasing based on derivatives
- C. Identify regions of concavity
- D. Identify asymptotic behavior based on limits
- E. Use derivatives for optimization problems

F. Apply Newton's Method where appropriate
G. Utilize differentials as they pertain to calculating maximum error propagation
H. Use derivatives as a tool to graph functions
I. Intermediate and Mean Value Theorem

Unit V Definite Integral
A. Calculate antiderivatives and apply to Indefinite Integration
B. Calculate area under a curve by Reimann sums and The Fundamental Theorem of Calculus
C. Demonstrate power rule for integration
D. Demonstrate integration by substitution and numerical integration
E. Demonstrate the use of integrals to calculate volume

Unit VI Topics in Differential Calculus
A. Demonstrate applications of logarithmic differentiation and integration
B. Demonstrate applications of differentiation and integration of inverse functions
C. Demonstrate applications of differentiation and integration of exponential functions
D. Apply differential equations in growth and decay models
E. Demonstrate applications of differentiation and integration of Inverse Trigonometric Hyperbolic functions

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 10 hours per week outside of the regular class time doing the following:

1. Studying
2. Answering questions
3. Skill practice
4. Completing required reading
5. Problem solving activity or exercise with and without computer assistance

Methods of Instruction:

1. Lecture-demonstrations and sample problems solved by the instructor
2. Computer modeling and exploration

Methods of Evaluation:

1. Computational or non-computational problem-solving demonstrations, including:
   a. Exams
   b. homework problems
   c. quizzes

Supplemental Data:

TOP Code:	170100 Mathematics

SAM Priority Code:	E: Non-Occupational
Funding Agency:	Y: Not Applicable
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Not Applicable
Prior to College Level:	Y: Not Applicable
Cooperative Work Experience:	N: Course is not a part of a cooperative education program
Eligible for Credit by Exam:	Yes
Eligible for Pass/No Pass:	Yes