Las Positas College
3000 Campus Hill Drive
Livermore, CA 94551-7650
(925) 424-1000
(925) 443-0742 (Fax)

Course Outline for MATH 34

CALCULUS FOR BUSINESS AND SOCIAL SCIENCES

Effective: Fall 2019

I. CATALOG DESCRIPTION:
MATH 34 — CALCULUS FOR BUSINESS AND SOCIAL SCIENCES — 5.00 units

Functions and their graphs; limits of functions; differential and integral calculus of algebraic, exponential and logarithmic functions. Applications in business, economics, and social sciences and use of graphing calculators. Partial derivatives and the method of LaGrange multipliers.

5.00 Units Lecture

Prerequisite
MATH 55 - Intermediate Algebra for BSTEM
with a minimum grade of C
or

MATH 55B - Intermediate Algebra for STEM B
with a minimum grade of C
or

NMAT 255 - Intermediate Algebra for BSTEM
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:
- Mathematics

	MIN
Lecture Hours:	90.00
Expected Outside of Class Hours:	180.00
Total Hours:	270.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. MATH55
1. Recognize and determine the distinctions between relations and functions, numerically, graphically, symbolically, and verbally;
2. Given a function, determine the domain and range and express them in interval notation;
3. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
4. Apply basic operations on functions, including composition of functions and finding inverse functions;
5. Solve systems of linear equations in three variables;
6. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
7. Solve absolute value equations and inequalities and, where appropriate, sketch the graph of the solution and use set or interval notation to express the solution;
8. Factor polynomials, including using the sum and difference of cubes;
9. Use the properties of radicals, complex numbers, exponents and logarithms;

B. MATH55B
1. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
2. Apply basic operations on functions, including composition of functions and finding inverse functions;
3. Solve systems of linear equations in three variables;
4. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.

5. Use the properties of radicals, complex numbers, exponents and logarithms;

C. NMAT255
1. Recognize and determine the distinctions between relations and functions, numerically, graphically, symbolically, and verbally;
2. Given a function, determine the domain and range and express them in interval notation;
3. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
4. Apply basic operations on functions, including composition of functions and finding inverse functions;
5. Solve systems of linear equations in three variables;
6. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
7. Solve absolute value equations and inequalities and, where appropriate, sketch the graph of the solution and use set or interval notation to express the solution;
8. Factor polynomials, including using the sum and difference of cubes;
9. Use the properties of radicals, complex numbers, exponents and logarithms;

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Solve problems using limits;
B. Use a graphing calculator to graph functions;
C. Determine the domain and range of a function;
D. Find the first and second derivatives of algebraic, logarithmic and exponential functions;
E. Apply the concepts of continuity, limits and the derivative to graphs;
F. Find the derivatives of functions involving constants, sums, differences, products, quotients, and the chain rule;
G. Use the chain rule to find first derivatives of composite functions;
H. Find and interpret equations of tangents to functions;
I. Apply the concept of the derivative to solve applied optimization and related rate problems in such areas as marginal analysis, consumer behavior and the spread of disease;
J. Find and interpret the anti-derivatives and definite integrals of algebraic and exponential functions;
K. Find definite and indefinite integrals by using the general integral formulas, integration by substitution, and other integration techniques
L. Apply the Fundamental Theorem of Calculus to solve problems involving area and accumulations of sums;
M. Solve basic differential equations and interpret the result;
N. Find partial derivatives of functions of several variables;
O. Use the method of LaGrange multipliers to solve optimization problems involving functions of two variables;
P. Apply the tools of calculus to solve applications in business, economics and the social sciences.
Q. Use calculus to analyze revenue, cost, and profit

V. CONTENT:

A. Functions
1. Functional notation
2. Algebraic, exponential, logarithmic functions
   a. Solving equations
   b. Applications
   c. Exponential growth and decay
   d. Logistic growth
3. Graphs of functions
   a. Using a table of values, basic functional graphs, and translation
   b. Using a graphing calculator, generate a table of values and draw a graph, selecting appropriate intervals for the x and y values and scale.
4. Interpretation of functions numerically and graphically

B. Limits, continuity and derivatives
1. Definitions
2. Numerical and graphical interpretation of the limit
   a. Generate a table of values to determine the limit
   b. Given a graph, determine the limit
   c. Graph the function using a calculator and determine the limit
3. Graphical interpretation of continuity
   a. Given a graph, determine continuity at a point
4. Finding limits using limit rules
5. Determining continuity of a function from the definition
6. Finding derivatives using the definition of the derivative
7. Rules of differentiation including the chain rule
8. Derivatives of natural logs and exponential functions
9. Higher derivatives
10. Implicit differentiation

C. Applications of derivatives
1. Equation of a tangent line; interpretation of the tangent line
2. Rate of change
3. Maximum-minimum problems
4. Curve sketching
   a. Sketch curves by hand, using the first and second derivative tests
   b. analyze and interpret graphs by locating relative extrema, discussing intervals where the function is increasing or decreasing, discussing concavity and determining points of inflection
   c. Sketch curves using a graphing calculator and discuss relative extrema, intervals where the function is increasing or decreasing, concavity and points of inflection
   d. Given a graph of an applied function, use calculus-based analysis to interpret the behavior of the function
5. Related rates
6. Marginal analysis

D. Integration
1. Techniques of Integration
   a. Antidifferentiation
   b. Method of substitution
2. Area under a curve and the definite integral
   a. Approximating the definite integral as a sum
3. Fundamental Theorem of Calculus
4. Applications of integration in business and economics
5. Numerical integration with a graphing calculator

6. Differential equations
    a. Initial value problems
    b. Interpretation of result

E. Multivariable functions
    1. Functions of several variables and their application
    2. Derivatives of multivariable functions
    3. Maximum-minimum problems and the method of LaGrange multipliers

VI. METHODS OF INSTRUCTION:

A. Classroom discussion
B. Collaborative learning where applicable
C. **Lab** - assignments
D. **Lecture** -
E. Computer and graphing calculator demonstrations

VII. TYPICAL ASSIGNMENTS:

A. Perform specific differentiation techniques
B. Apply differentiation and integration to business and social science problems
C. Analyze a function using limits
D. Discuss the results of application problems
E. Find and interpret marginal cost, marginal revenue and marginal profit
F. Sketch the graphs of cost, revenue and profit functions and determine break-even points

VIII. EVALUATION:

Methods/Frequency

A. Exams/Tests
    Minimum of 4 exams plus a finial examination
B. Quizzes
    Quizzes and other assignments at the discretion of the instructor
C. Group Projects
    At the discretion of the instructor.
D. Home Work
    Daily homework from each section covered in class
E. Lab Activities
    Minimum of 8 graphing calculator/lab assignments

IX. TYPICAL TEXTS:

1. Bittinger, Marvin , and David Ellenbogen. *Calculus and Its Applications.* 11th ed., Pearson, 2016.
2. Tan, Soo . *Applied Calculus for the Managerial, Life, and Social Sciences.* 10th ed., Thomson – Brooks/Cole, 2017.
3. Goldstein, Larry , David Lay, David Schneider, and Nakhle Asmar. *Calculus and Its Applications.* 14th ed., Pearson, 2018.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. A graphing calculator is required.