# COLLIN COLLEGE EXPANDED GENERIC COURSE SYLLABUS

## COURSE INFORMATION

**Course Number:** MATH 1325
**Course Title:** Calculus for Business and Social Sciences
**Credit Hours:** 3
**Lecture Hours:** 3
**Lab Hours:** 1

### Prerequisite
MATH 1314, or MATH 1324; or equivalent.

### Course Description
This course is the basic study of limits and continuity, differentiation, optimization and graphing, and integration of elementary functions, with emphasis on applications in business, economics, and social sciences. This course is not a substitute for MATH 2413 – Calculus I. Lab required.

### Textbook/Supplies
*Calculus with Applications*, 12th Edition, Lial/Greenwell/Ritchey, Pearson Education Inc. 2022

Supplies: Graphing calculator required.

## STUDENT LEARNING OUTCOMES (SLO)

Upon completion of this course the students should be able to do the following:

1. Apply calculus to solve business, economics, and social sciences problems. (Communication Skills/Critical Thinking)
2. Apply appropriate differentiation techniques to obtain derivatives of various functions, including logarithmic and exponential functions. (Empirical/Quantitative Skills)
3. Solve application problems involving implicit differentiation and related rates. (Communication Skills, Critical Thinking)
4. Solve optimization problems with emphasis on business and social sciences applications. (Communication Skills, Critical Thinking)
5. Determine appropriate technique(s) of integration. (Empirical/Quantitative Skills, Critical Thinking)
6. Integrate functions using the method of integration by parts or substitution, as appropriate. (Empirical/Quantitative Skills, Critical Thinking)
7. Solve business, economics, and social sciences applications problems using integration techniques. (Communication Skills, Critical Thinking)

## REQUIRED CORE OBJECTIVES FOR MATHEMATICS

As per the Texas Higher Education Coordinating Board, mathematics students must develop and demonstrate the following three required core objectives:

- Critical Thinking Skills - creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.
- Communication Skills - effective development, interpretation and expression of ideas through written, oral and visual communication.
- Empirical and Quantitative Skills - manipulation and analysis of numerical data or observable facts resulting in informed conclusions.

## METHOD OF EVALUATION

### Course requirements

Attending class**,** completing homework assignments**,** completing labs, and completing required exams.

### Course format

Lecture, lab, and guided practice.

A minimum of four proctored exams, a lab component grade, and a proctored comprehensive final exam will be given. The final exam must count at least as much as any regular exam. Homework and/or quizzes may be used in place of one exam or in addition to exams. The weight of each of these components of evaluation will be specified in the individual instructor's Concourse syllabus. All out-of-class course credit, including home assignments, service-learning, etc. may not exceed 25% of the total course grade; thus, at least 75% of a student's grade must consist of proctored exams, and no student may retake any of these exams.

### Lab Statement

Labs are opportunities for students to apply the concepts taught in class. They fulfill the course's learning outcomes while assessing the core objectives skills of critical thinking, communication, and empirical/quantitative analysis. The lab assignments must be completed outside of class and labs will be graded and recorded as part of the grading process. Lab credits should count for 10% - 25% of the overall course grade.

## COURSE POLICIES

*College-wide policies are pre-loaded into the Concourse Syllabi and are not duplicated in the Expanded Generic Syllabi for each course.*

COURSE CONTENT

Proofs and derivations will be assigned at the discretion of the instructor. The student will be responsible for knowing all definitions and statements of theorems for each section outlined in the following modules.

Module 1: Limits, Continuity, and the Derivative

The student will be able to:

1. Calculate limits by constructing a table of values. (Course Description)
2. Calculate limits by direct substitution and rules of limits. (Course Description)
3. Calculate limits by factoring and rationalization of the numerator or denominator.
4. Calculate one-sided limits. (Course Description)
5. Obtain limits by examining a given graph. (Course Description)
6. Calculate limits as x approaches + ∞ or - ∞ . (Course Description)
7. Use the definition of continuity to demonstrate a given function is continuous at an indicated point. (Course Description)
8. Calculate points of discontinuity of a given function. (Course Description)
9. Determine if a function has an infinite limit at a point of discontinuity. (Course Description)
10. Evaluate and interpret average rate of change over an interval. (SLO 1)
11. Calculate and interpret instantaneous rate of change at a value. (SLO 1)
12. Estimate the slope of the tangent line to a curve. (SLO 1)
13. Calculate the slope and equation of a secant line given two points. (SLO 1)
14. Calculate the slope and equation of a tangent line to a curve. (SLO 1)
15. Use the limit definition of the derivative to compute the derivative of a polynomial, rational, or square root function. (SLO 2)
16. Determine the existence of the derivative by examining a given graph. (SLO 2)
17. Sketch the graph of the derivative of a function given its graph. (SLO 2)

**Module 2: More Derivatives**

The student will be able to:

1. Compute the derivative of a function using the constant, power, sum, and difference rules. (SLO 2)
2. Apply marginal analysis to cost, revenue, and profit functions. (SLO 1)
3. Compute the derivative of a function using the product rule or quotient rule. (SLO 2)
4. Compute the marginal average revenue, marginal average cost, and marginal average profit. (SLO 1)
5. Compute the derivative using the chain rule. (SLO 2)
6. Compute the derivative of exponential functions. (SLO 2)
7. Compute the derivative of logarithmic functions. (SLO 2)

Module 3: Graphs and Curve Sketching

The student will be able to:

1. Calculate the critical numbers of a function. (SLO 4)
2. Use a sign chart to identify the intervals where a function is increasing or decreasing. (SLO 4)
3. Use the first derivative test to identify relative extrema. (SLO 4)
4. Sketch the graph of a function using the information obtained from the first derivative. (Course Description)
5. Compute the nth derivative of a function. (SLO 4)
6. Use a sign chart to identify the point(s) of inflection of a graph. (SLO 4)
7. Use a sign chart to identify the intervals where a function is concave up or concave down. (SLO 4)
8. Use the second derivative test to identify relative extrema. (SLO 4)
9. Use a sign chart to sketch curves by analyzing the first and second derivatives. (Course Description)
10. Analyze the definition of a function to locate horizontal, oblique, and vertical asymptotes, and hole(s) of the graph. (Course Description)

**Module 4: Additional Derivative Topics**

The student will be able to:

1. Use the Extreme Value Theorem to identify absolute extrema. (SLO 4)
2. Solve optimization problems. (SLO 4)
3. Solve Lot Size problems. (SLO 1)
4. Solve Order Quantity problems. (SLO 1)
5. Solve Elasticity of Demand problems. (SLO 1)
6. Compute derivatives by using implicit differentiation. (SLO 3)
7. Compute slopes of tangents by using implicit differentiation. (SLO 3)
8. Compute equations of tangent lines to implicitly defined curves. (SLO 3)
9. Solve related rate problems. (SLO 3)
10. Obtain differentials of dependent variables. (Course Description)
11. Compute approximations using differentials. (Course Description)
12. Use L'Hospital's Rule to calculate limits of functions. (Course Description)

**Module 5: Integration**

The student will be able to:

1. Given a function, compute its antiderivative or integral using the basic integration formulas. (SLO 5)
2. Compute the indefinite integral of an exponential function. (SLO 5)
3. Given initial conditions, calculate the constant of integration. (SLO 5)
4. Given the marginal revenue function or marginal cost function, compute the demand or total cost function. (SLO 7)
5. Compute the indefinite integral using substitution. (SLO 6)
6. Use the sum of areas of rectangles to approximate area under a curve. (Course Description)
7. Evaluate definite integrals using the Fundamental Theorem of Calculus. (SLO 5)

8. Compute the integral using integration by parts. (SLO 6)
9. Compute the average value of a function between x = a and x = b. (SLO 7)
10. Solve first order differential equations involving Growth and Decay by separation of variables. (SLO 7) (Optional)