SCHENECTADY COUNTY COMMUNITY COLLEGE
Course Outline

ACADEMIC DIVISION/SCHOOL: Mathematics, Science, Technology and Health

PREPARED BY: Laurie Lacey, Margaret Spring, and Ray Ross

COURSE CODE: MAT 180 **COURSE TITLE:** Calculus I

LECTURE HOURS/WEEK: 4 LAB HOURS/WEEK: 0 CREDIT HOURS 4

PREREQUISITE/S: MAT 167 or equivalent
PREREQUISITE or CONCURRENT COURSE: none
COREQUISITES: none

FINAL EXAM REQUIRED: yes

COURSE DESCRIPTION:
This course, in the calculus of a single variable, includes limits, continuity, derivatives of algebraic and transcendental functions, implicit differentiation, related rates, The Mean Value Theorem, antiderivatives, definite integrals, and The Fundamental Theorem of Calculus. The course introduces applications of differentiation such as curve sketching and optimization problems as well as applications of integration such as area and average value.

SCCC Core Principle Course **yes**
SUNY General Education Course **yes**

STUDENT LEARNING OUTCOMES:
Students who have successfully completed this course will:

- determine limits of functions and explain the relationship between the limit of a function at a point and the continuity of a function at the point;
- explain the relationship between ve1iical asymptotes and infinite limits and between horizontal asymptotes and limits at infinity;
- calculate and interpret derivatives of algebraic and transcendental functions;
- explain the relationship between the derivatives of a function and attributes of the function such as increasing, decreasing, and relative extrema;
- determine antiderivatives using the method of substitution, and ·
- apply the Fundamental Theorem of Calculus to evaluate definite integrals and use definite integrals to find area of a region bounded by two curves.

REPRESENTATIVE TEXT/S:
Larson and Edwards, *Calculus: Early Transcendental Functions,* Cengage, current edition, (Print)

SUPPLEMENTARY MATERIALS: (Optional)

Computer software and/or graphing calculators will be used.

NOTE: Grading and assessment criteria may appropriately differ. Grades focus on what individual students have learned while assessments focus on entire cohorts of students. Each instructor will determine his/her grading criteria for the course and state on the course syllabus.

EVALUATION METHODS
Evaluation methods are to include at least two semester exams and a final examination and at least one graded homework or project. Other methods of evaluation may include, but are not limited to, additional graded homework or written projects, computer projects, calculator projects and quizzes.

REQUIRED ASSESSMENT METHODS:

Assessment results from these methods will be used for course-level assessment and, where applicable, for SCCC core principles and SUNY General Education Knowledge and Skills areas. This information will be incorporated in program reviews.

Student Learning Outcome	Method(s)
• Determine limits of functions and explain the relationship between the limit of a function at a point and the continuity of a function at the point.	Examination questions.
• Explain the relationship between vertical asymptotes and infinite limits and the relationship between horizontal asymptotes and limits at infinity.	Examination questions.
• Calculate and interpret derivatives of algebraic and transcendental functions.	Examination questions.
• Explain the relationship between the derivatives of a function and attributes of the function such as increasing, decreasing, and relative extrema.	Examination questions.
• Determine antiderivatives using the method of substitution.	Examination questions.
• Apply the Fundamental Theorem of Calculus to evaluate definite integrals and use definite integrals to find area of a region bounded by two curves.	Examination questions.

COURSE CONTENT OUTLINE:

The course Content Outline is attached.

COURSE CONTENT OUTLINE:

Course: MAT 180 - Calculus I

Week(s)	**Topics**
1-3	Limits: properties of limits; algebraic techniques for evaluation of limits; the precise definition of a limit; continuity
4-7	Differentiation: definition of the derivative; proofs of the differentiation formulas; addition/subtraction rules; constant multiple rule; power rule; product rule; quotient rule; chain rule; trigonometric derivatives; derivatives of exponential and logarithmic functions; instantaneous rate of change; Liebniz notation; implicit differentiation; higher order derivatives; related rates;
8-10	Applications of Differentiation: the Extreme Value Theorem; absolute maxima and minima; the Mean Value Theorem; graphical analysis; increasing/decreasing; concavity; critical numbers; relative extrema; inflection points; limits at infinity; infinite limits; optimization
11 -14	Integration: antiderivatives; approximating sums; definite integral; area; the Fundamental Theorem of Calculus; integrals with variable upper limits; u-substitution; trapezoidal and Simpson's Rules; average value; hyperbolic functions
15	Differential Equations: introduction to differential equations
Final Week	Final Examination