RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

MATH 151 Calculus I

I. Basic Course Information

A. Course Number and Title: MATH 151 Calculus I

B. New or Modified Course: Modified

C. Date of Proposal: Semester: Fall Year:2025

D. Effective Term: Fall 2026

E. Sponsoring Department: Math and Computer Science

F. Semester Credit Hours**:** 4

G. Weekly Contact Hours**:** 5 Lecture**:** 3
Laboratory**:** 2
Out of class student work per week: 7

H. ☒ Prerequisite (s): A grade of C or better in MATH 113 Precalculus II or MATH 114H Precalculus Honors.
☐ Corequisite (s):

I. Additional Fees**:** None

II. Catalog Description

Prerequisite: A grade of C or better in MATH 113 Precalculus II or MATH 114H Precalculus Honors.

Introductory calculus with a technology-based computer laboratory component. Topics include limits, differentiation, applications of derivatives, integration, the Fundamental Theorem of Calculus, and logarithmic, exponential, and other transcendental functions.

III. Statement of Course Need

A. This is the first course in a standard three-semester Calculus sequence that is required in many STEM programs.
B. The two-hour lab is standard for all of our Calculus I, II, and III sections. It enables the students to use technology to help them become proficient in the course material.
C. This course generally transfers as a Mathematics Program requirement dependent on the transfer institution.

IV. Place of Course in College Curriculum

A. Free Elective
B. This course serves as a General Education course in Mathematics.
C. This course meets a program requirement for Chemistry, Physics, Mathematics, Mechanical Engineering Technology, Biological Sciences, Engineering, Computer and Data Science, and Information Systems & Technology, as well as being an optional mathematics course in many degree programs.
D. This course transfers as a first semester Calculus Course. To see course transferability: a) for New Jersey schools, go to the NJ Transfer website, www.njtransfer.org; b) for all other colleges and universities, go to the individual websites.

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V. Outline of Course Content

A. Limits
    1. The Idea of Limits
    2. Definitions of Limits
    3. Techniques for Computing Limits
    4. Infinite Limits
    5. Limits at Infinity
    6. Continuity
    7. Precise Definitions of Limits

B. Derivatives
    1. Introducing the Derivative
    2. The Derivative as a Function
    3. Rules of Differentiation
    4. The Product and Quotient Rules
    5. Derivatives of Trigonometric Functions
    6. Derivatives as Rates of Change
    7. The Chain Rule
    8. Implicit Differentiation
    9. Derivatives of Logarithmic and Exponential Functions

10. Derivatives of Inverse Trigonometric Functions
11. Related Rates

C. Applications of the Derivative
    1. Maxima and Minima
    2. Mean Value Theorem
    3. What Derivatives Tell Us
    4. Graphing Functions
    5. Optimization Problems
    6. Linear Approximation and Differentials
    7. L'Hôpital's Rule
    8. Newton's Method
    9. Antiderivatives

D. Integration
    1. Approximating Areas Under Curves
    2. Definite Integrals
    3. Fundamental Theorem of Calculus
    4. Working with Integrals
    5. Substitution Rule

E. Applications of Integration
    1. Velocity and Net Change
    2. Regions Between Curves

VI. A. <u>Course Learning Outcomes</u>:

At the completion of the course, students will be able to:

1. evaluate various limits. (GE 2)
2. utilize the concept of instantaneous rate of change to solve problems in physics, biology, economics, and other real-world phenomena. (GE 2)
3. differentiate polynomial, rational, exponential, logarithmic, and trigonometric functions algebraically. (GE 2)
4. demonstrate the relationship between the algebraic and geometric properties of the derivative. (GE 2)
5. use the Fundamental Theorem of Calculus and the concept of antiderivative to algebraically evaluate integrals. (GE 2)
6. utilize the derivative procedure to solve various application problems. (GE 2)

B. Assessment Instruments

1. tests
2. final examination
3. projects
4. laboratory products
5. quizzes

VII. Grade Determinants

A. cumulative final examination
B. tests
C. projects
D. individual teacher determinants

Given the goals and outcomes described above, LIST the primary formats, modes, and methods for teaching and learning that may be used in the course:

A. lecture
B. small groups
C. labs with technology component
D. homework
E. quizzes
F. projects
G. tests
H. cumulative Final Examination

VIII. Texts and Materials

A. Suggested Textbook: *Calculus Early Transcendentals,* latest edition, by Briggs, Cochran, Gillett, and Schulz, Pearson Addison Wesley, or similar textbook.

> Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.

B. A graphing calculator may be required; TI-84 is recommended

IX. Resources

This course is held in a computer lab for two hours a week. The computers need to be installed with the calculus software currently licensed to the math department. Contact the math department chair to determine which software to install.

X. Check One: ☐Honors Course ☒ N/A