RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

MATH 251 CALCULUS III

I. Basic Course Information

A. Course Number and Title: MATH 251 Calculus III

B. New or Modified Course: Modified Course

C. Date of Proposal: Fall 2025

D. Effective Term: Fall 2026

E. Sponsoring Department: Mathematics 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: MATH 152 Calculus II or MATH 152H Calculus II Honors with grade of C or better
☐ Corequisite:

I. Additional Fees: None

II. Catalog Description

A. Prerequisite: MATH 152 Calculus II or MATH 152H Calculus II Honors with grade of C or better. Third semester of calculus with a technology-based computer laboratory. Topics include vectors, vector-valued functions, curves in space, functions of two or more variables, partial differentiation, multiple integrals, line integrals, Green's Theorem, Divergence Theorem, and Stokes' Theorem. The Honors Option is available for this course.

III. Statement of Course Need

A. This is the third 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 requirement in Mathematics.

C. This course meets a program requirement in Engineering, Physics, and Mathematics.

D. This course transfers as a third semester calculus course. Course transferability; for New Jersey schools go to the NJ Transfer website, www.njtransfer.org. For all other colleges and universities go to their individual websites.

V. Outline of Course Content

A. Vectors and the Geometry of Space
   1. Vectors in the Plane
   2. Vectors in Three Dimensions
   3. Dot Products
   4. Cross Products
   5. Lines and Planes in Space
   6. Cylinders and Quadric Surfaces

B. Vector-Valued Functions
   1. Vector-Valued Functions
   2. Calculus of Vector-Valued Functions
   3. Motion in Space
   4. Length of Curves
   5. Curvature and Normal Vectors

C. Functions of Several Variables
   1. Graphs and Level Curves
   2. Limits and Continuity
   3. Partial Derivatives
   4. The Chain Rule
   5. Directional Derivatives and the Gradient 2020.02.19
   6. Tangent Planes and Linear Approximation
   7. Maximum/Minimum Problems
   8. Lagrange Multipliers

D. Multiple Integration
   1. Double Integrals over Rectangular Regions
   2. Double Integrals over General Regions
   3. Double Integrals in Polar Coordinates
   4. Triple Integrals
   5. Triple Integrals in Cylindrical and Spherical Coordinates
   6. Integrals for Mass Calculations
   7. Change of Variables in Multiple Integrals

E. Vector Calculus
   1. Vector Fields
   2. Line Integrals
   3. Conservative Vector Fields
   4. Green's Theorem
   5. Divergence and Curl
   6. Surface Integrals
   7. Stokes' Theorem
   8. Divergence Theorem

VI. A. Course Learning Outcomes

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

1. Compute with vectors in three-dimensional space (GE-NJ 2)

2. Differentiate functions of several variables, including graphing functions of two variables. (GE-NJ 2)

3. Evaluate multiple integrals (GE-NJ 2)

4. Utilize Green's Theorem to evaluate line integrals (GE-NJ 2)

B. Assessment Instruments

A. tests

B. cumulative final examination
C. projects/problems
D. laboratory products
E. quizzes

VII. Grade Determinants

Factors that may enter into the determination of the final grade:

A. homework
B. weekly problems
C. quizzes
D. laboratory products
E. projects
F. tests
G. cumulative final examination
H. individual teacher determinant

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. weekly problems
F. quizzes
G. projects
H. tests
I. cumulative Final Examination

VIII. Texts and Materials

B. 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

XI. Resources

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

X. Check One: ☐Honors Course ☒ N/A