

RARITAN VALLEY COMMUNITY COLLEGE ACADEMIC COURSE OUTLINE

MATH 152H CALCULUS II HONORS

I. Basic Course Information

A. Course Number and Title: MATH 152H Calculus II Honors

B. New or Modified Course: New

C. Date of Proposal: Spring 2020

D. Effective Term: Fall 2020

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. Prerequisites: GPA of 3.5 or permission of the instructor; AND
 MATH 151 Calculus I or Math 151H Calculus I Honors

I. Laboratory Fees: None

J. Name and Telephone Number or E-Mail Address of Department Chair and Divisional Dean at time of approval:

Department Chair: Dr. Lori Austin, Lori.Austin@raritanval.edu, x8576

Divisional Dean: Dr. Sarah A. Imbriglio, Sarah.Imbriglio@raritanval.edu, x8241

II. Catalog Description

Prerequisite: GPA of 3.5 or permission of the instructor; AND
MATH 151 Calculus I or Math 151H Calculus I Honors.

The second semester of a three-semester sequence of introductory calculus with a technology-based computer laboratory component. Topics include integration techniques, integration applications in various coordinate systems, indeterminate forms, improper integrals, and infinite series. Proofs, and calculus application problems from business, the natural sciences, and mathematics.

III. Statement of Course Need

- A. This course also serves as a prerequisite for MATH 251 Calculus III. This course also serves as a math requirement for programs in Chemistry, Computer Science, Engineering Science, General Science, and Mathematics.

~~Enrollment History:~~

~~In the fall 2014 semester we have approximately 80 students who registered for Calculus II. Students from such a cohort can opt to take Calculus II Honors instead of the regular calculus section. (Note that a Calculus I Honors course ran last fall and is again running this fall.)~~

Additional Value for Students;

Honors courses in mathematics have been developed to provide mathematically talented students the opportunity to obtain a level of rigor above the level currently available in existing courses.

- 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 course in the mathematics program and as a program elective in technical (physical science, computer science) fields.

IV. Place of Course in College Curriculum

- A. This course is a free elective ~~and a Mathematics elective for all programs.~~
- B. This course serves as a General Education requirement in Mathematics.
- C. This course meets a program requirement in Chemistry, Computer Science, Engineering Science, ~~General Science~~, and Mathematics.
- D. This course transfers as a second 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. Applications of Integration
 - 1. Velocity and Net Change
 - 2. Regions Between Curves
 - 3. Volume by Slicing
 - 4. Volume by Shells
 - 5. Length of Curves
 - 6. Surface Area
 - 7. Physical Applications
- B. Logarithmic, Exponential, and Hyperbolic Functions
 - 1. Logarithmic and Exponential Functions Revisited
 - 2. Exponential Models

3. Hyperbolic Functions

C. Integration Techniques

1. Basic Approaches
2. Integration by Parts
3. Trigonometric Integrals
4. Trigonometric Substitutions
5. Partial Fractions
6. Integration Strategies
7. Other Methods of Integration
8. Numerical Integration
9. Improper Integrals

D. Differential Equations

1. Basic Ideas
2. Direction Fields and Euler's Method
3. Separable Differential Equations
4. Special First-Order Linear Differential Equations
5. Modeling with Differential Equations

E. Sequences and Infinite Series

1. An Overview
2. Sequences
3. Infinite Series
4. The Divergence and Integral Tests
5. Comparison Tests
6. Alternating Series
7. The Ratio and Root Tests
8. Choosing a Convergence Test

F. Power Series

1. Approximating Functions with Polynomials
2. Properties of Power Series
3. Taylor Series
4. Working with Taylor Series

G. Parametric and Polar Curves

1. Parametric Equations
2. Polar Coordinates
3. Calculus in Polar Coordinates
4. Conic Sections

H. Enrichment and proofs

1. Selected Proofs appropriate to the level of the course

I. Application Problems

1. Applied Math applications
2. Engineering/Physics applications
3. Natural science applications
4. Business applications

II. Educational Goals and Learning Outcomes

A. General Education Learning Outcomes

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

1. Use algebraic techniques such as trigonometric substitutions, partial fractions, and by parts, to evaluate integrals (GE – NJ 2)
2. Utilize integration techniques to solve problems involving volumes and surface areas of solids of revolution, centroids, and arclength (GE – NJ 2)
3. Use the concept of limit to evaluate improper integrals and indeterminate forms (GE – NJ 2)
4. Test infinite series for convergence and or divergence (GE – NJ 2)
5. Use Taylor polynomials to estimate function values (GE – NJ 2)
6. Operate in alternate reference frames including polar and parametric coordinates (GE – NJ 2)
7. Prove selected theorems appropriate to the level of the course. (GE – NJ 2)
8. Demonstrate proficiency in the computer algebra software designated for calculus labs (GE – NJ 4)

B. Course Learning Outcomes

See above.

C. Assessment Instruments:

- A. homework
- B. weekly problems
- C. quizzes
- D. laboratory products
- E. projects
- F. tests
- G. cumulative final examination, or designated portions thereof

III. 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

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

IV. 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

II. 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