

Quinsigamond Community College School of Math, Science, & Engineering

Instructor's Information

Instructor: Professor XX (she/her/hers)
Office: 200A
Email: xxxxx@qcc.mass.edu
Telephone: 508-854-xxxx

Course Information

Course: MAT 235 Calculus III – Section XX
Meets: Tuesdays and Thursdays from 8:00am – 9:40am
Room: 175A
Credits: 4 credits
Semester: Fall 2024

Course Description

This course covers conic sections, rotation of axis, plane curves, parametric equations, vectors; polar, cylindrical, and spherical coordinates and graphs; vector-valued functions, differentiation, and integration; functions of several variables, partial derivatives, gradients; applications of extrema of functions, Lagrange multipliers; multiple integrations; area, volume, center of mass, moment of inertia, change of variables, Jacobians; Green's divergence and Stokes' theorems. Students learn to use calculus to solve engineering and scientific problems. The course concludes with some elementary differential equations.

Prerequisites

MAT 234 Calculus II

Required Textbook/Materials/Website

Textbook: *Calculus: Early Transcendentals*, by Briggs, 3rd edition, Pearson © 2019
Materials: Graphing calculator (recommended)
Website: Access to Pearson's MyLab Math

Student Learning Outcomes

Upon completion of this course, students will be able to:

1. Express functions in XY plane as parametric equations and find their derivatives.
2. Convert to and from polar coordinate system to rectangular coordinate system.
3. Graph lines, planes, polar curves, conic sections, cylinders and quadric surfaces.
4. Apply derivative and integration rules for vector valued functions to solve velocity, acceleration and force problems.
5. Apply partial derivatives to the concepts of directional derivatives, the gradients, and application problems involving optimization, with or without constraints.

6. Evaluate double integrals and triple integrals over real valued regions and apply them to finding centers of mass.
7. Apply Green's Theorem, Divergence Theorem and Stoke's Theorem to solve problems in an assumed vector field.

Course Topics & Required Section Readings/Assignments

Parametric and Polar Curves

- Parametric Equations
- Polar Coordinates
- Calculus in Polar Coordinates
- Conic Sections

Vectors and the Geometry of Space

- Vectors in the Plane
- Vectors in Three Dimensions
- Dot Products
- Cross Products
- Lines and Planes in Space
- Cylinders and Quadratic Surfaces

Vector-Valued Functions

- Vector-Valued Functions
- Calculus of Vector-Valued Functions
- Motion in Space
- Length of Curves
- Curvature and Normal Vectors

Functions of Several Variables

- Graphs and Level Curves
- Limits and Continuity
- Partial Derivatives
- The Chain Rule
- Directional Derivatives and the Gradient
- Tangent Planes and Linear Approximations
- Maximum/Minimum Problems
- Lagrange Multipliers

Multiple Integration

- Double Integrals over Rectangular Regions
- Double Integrals over General Regions
- Double Integrals in Polar Coordinates
- Triple Integrals
- Triple Integrals in Cylindrical and Spherical Coordinates
- Integrals for Mass Calculations
- Change of Variables in Multiple Integrals

Vector Calculus

- Vector Fields
- Line Integrals

- Conservative Vector Fields
- Green's Theorem
- Divergence and Curl
- Surface Integrals
- Stokes' Theorem
- Divergence Theorem

Instructional Objectives

- Graph and analyze parametric equations.
- Evaluate derivatives of parametric equations.
- Plot polar equations using the Cartesian-to-polar method.
- Evaluate the slopes of the lines tangent to polar equations.
- Identify and graph the equation in rectangular and polar coordinates of the Ellipse, Parabola, and Hyperbola.
- Evaluate vector operations in terms of components in the plane and in three dimensions.
- Apply vectors to describe velocities and forces.
- Define Dot Products and Cross Products.
- Find the orthogonal projection of one vector onto another.
- Find parametric equations for lines and curves in space.
- Compute the derivative, definite, and indefinite integral of a Vector Valued Function.
- Use the derivative rules for Vector Valued Functions.
- Find the velocity and acceleration from position in two and three dimensions.
- Evaluate the length of curves.
- Calculate the curvature for vector valued functions.
- Find the Unit Tangent Vector and the Principal Unit Normal Vector.
- Find the equation of planes.
- Define and sketch Cylinders and Quadric Surfaces.
- Sketch and find level curves and level surfaces.
- Calculate the limit of a function of two and three variables.
- Evaluate partial derivatives and higher-order partial derivatives.
- Apply the chain rule with one and several independent variables.
- Evaluate directional derivatives and the gradient.
- Calculate the equation for tangent planes to surfaces.
- Solve maximum/minimum problems using the second derivative test.
- Apply the method of the Lagrange Multipliers with two and three independent variables.
- Evaluate double integrals over general regions.
- Calculate double integrals in polar coordinates.
- Evaluate triple integrals in cylindrical and spherical coordinates.
- Use integrals for mass calculations.
- Calculate the Jacobian of a transformation of two and three variables.
- Apply the Change of Variables in Multiple Integrals.
- Sketch vector fields.
- Evaluate line integrals.

- Use correctly the test for Conservative Vector Fields.
- Apply Green's Theorem in circulation form and flux form.
- Calculate the Divergence and Curl of a vector field.
- Evaluate Surface Integrals.
- Apply Stokes' Theorem.
- Apply the Divergence Theorem.

Grading Breakdown

20%	Homework
10%	Quizzes
10%	<Attendance>
35%	Exams
25%	Comprehensive Final Exam

Grade	Range	Grade	Range	Grade	Range
A	95 – 100	B –	80 – 82	D +	67 – 69
A –	90 – 94	C +	77 – 79	D	63 – 66
B +	87 – 89	C	73 – 76	D –	60 – 62
B	83 – 86	C –	70 – 72	F	0 – 59

Teaching Procedures

Most classes will be a combination of lectures, group activities, and in-class assignments. You will be given homework assignments to be completed outside of class. Occasionally, a quiz or exam will be given in class.

Attendance Policy

Students are expected to attend all classes for the entire period. Attendance will be taken in every class. If you are absent from class, proper documentation will excuse your absence.

Diversity, Equity, and Inclusion Statement for the School of Math & Science

The School of Math and Science is motivated to teach and learn from the diverse community we have at QCC. In Science, Technology, Engineering, and Mathematics (STEM), it is advantageous to approach problems from multiple perspectives. The power of diversity, equity and inclusion allows us to persevere and overcome challenges.

The faculty of the School of Math and Science pledge to help students meet the demands of STEM regardless of race/ethnicity, gender identity and expression, sexual orientation, faith, abilities/disabilities, age, socioeconomic background, political leaning, ancestry, national origin, home language and all other identities. We are dedicated to nurturing a culture of collaboration, mutual respect and understanding; and to empowering members of our community to embrace their full potential.

Accessibility Statement

Quinsigamond Community College is committed to providing access and inclusion for all persons with disabilities. Students who require an accommodation in this course should notify

the professor as soon as possible. Students are responsible for forwarding the Accommodation Letter to the professor (via email or hard copy). Students may request accommodations at any time during the semester, which begin upon receipt (accommodations are not retroactive). Please discuss any barriers which may arise during the semester with your professor or coordinator in the Student Accessibility Services office.

Contact Information for Student Accessibility Services (SAS):

Call: 508-854-4471

Sorenson Video Phone: 508-502-7647

Email: disabilityservices@qcc.mass.edu

Services for Veterans

If you are a veteran of the US Armed Forces, please visit the Veteran Affairs Office located in 258A (Administration Building) or contact them at veteranaffairs@qcc.mass.edu.

Academic Honesty and Plagiarism

Our purpose of education is to seek the truth; this work requires trust and honesty between teacher and student. If we are not honest about what we know and don't know, our learning will always be impaired. Because our teaching and learning depends on this honest communication, we expect all students to understand what plagiarism is and why it is unacceptable.

Plagiarism means taking someone else's ideas or words and presenting them as one's own. The offense can take many forms including cheating on a test, passing in a paper taken from the Internet or from another student, or failing to properly use and credit sources in an essay. Sometimes the issue is subtle, involving getting too much help on an assignment from someone else. In every instance, plagiarism means cheating both oneself and the owner of the source. Since cheating sabotages a student's learning experience, consequences range from no credit for the assignment to failure for the course and possible expulsion from the college.

The penalty for getting caught cheating in this course is a failure of the quiz or test, or failure of the entire course. This is solely at the discretion of the instructor.

For further information concerning plagiarism, refer to the QCC Student Handbook.

Math Center & QCC Math YouTube Channel

The Math Center provides free, drop-in tutoring assistance for students in any QCC mathematics course. Located on the second floor of the Harrington Learning Center (HLC), the Math Center is a welcoming place where students have the opportunity to work collaboratively with tutors and classmates. Students can work intensively to improve their mathematical skills or simply drop by to ask a few questions. In addition to tutoring, the Math Center houses various math-related resources, and computers and software for math coursework. Visit their website for details and the semester schedule: <https://www.qcc.edu/services/tutoring/math-center>

Assignment & Test Schedule

<list all assignments, quizzes, and exam dates>