Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: MATH203 **Year: 2023-2024**
Course Title: Calculus III **Credit Hours: 4**

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Course Description

A continuation of Calculus II, this course is intended for students in the Computer Science, Engineering Science, Liberal Arts - Adolescence Teacher Education: Mathematics and Physics concentrations, and the Liberal Arts-Math/Science A.S. degree programs. Topics include vectors, lines and planes and surfaces in space, cylindrical and spherical coordinates, differentiation and integration of vector-valued functions, tangent vectors and normal vectors, partial derivatives, directional derivatives and gradients, tangent planes and normal lines, multiple integrals, multiple integrals in cylindrical and spherical coordinates, line integrals, conservative vector fields and independence of path, Green's theorem, surface integrals, divergence theorem, flux, and Stoke's theorem. MATH 203 fulfills the SUNY General Education Mathematics requirement. Prerequisites: C or better grade in MATH 202 or equivalent; RDNG 116 if required by placement testing; prior completion or concurrent enrollment in ENGL 100 or ESL 120, 121, and 122 (or prior completion of ESL 103). 4 Cr. (4 Lec.) Fall semester.

Course Context/Audience

This course is required in the Engineering Science and the Liberal Arts and Sciences - Adolescence Education - Mathematics and Physics Concentration (Teacher Education Transfer) A.S. degree programs. Students in the Liberal Art Math/Science and Computer Science A.S. degree programs may want to take it as an elective. The course extends calculus to three dimensions, and provides an introduction to infinite series. It is also the only course at the College to cover matrix operations in some detail. It fulfills the TC3 General Education mathematics requirement.

Basic Skills/Entry Level Expectations

Writing: WC College level writing skills are required. See course co-requisites or pre-requisites.

Math: MC College level math skills – Course requires college level math skills. See course description for co-requisite and/or prerequisite requirement(s).

Reading: R4 Before taking this course, students must satisfactorily complete RDNG 116 or have assessment indicating that no reading course was required.

Course Goals

By successfully completing this course, the student will:

1. Learn how to work with vectors in space.

2. Learn how to work with lines and planes in space.
3. Be able to work with cylindrical and spherical coordinates.
4. Differentiate and integrate vector-valued functions.
5. Be able to find partial derivatives, directional derivatives and gradients.
6. Be able to write equations of tangent planes and normal lines.
7. Learn how to compute multiple integrals in rectangular, cylindrical, and spherical coordinates.
8. Be able to find divergence and curl of a vector field.
9. Learn how to compute line integrals and use Green's theorem.
10. Understand conservative vector fields and independence of path.
11. Be able to use the divergence theorem to calculate flux.
12. Understand Stoke's theorem and use curl to analyze the motion of a rotating liquid.

Course Objectives/Topics

Objective/Topic	% Course
Unit I: Vector valued functions and Geometry of space - The student will: Compute dot product and cross product of vectors; learn how to use both symmetric form and parametric form of line equation; learn how to use both general form and point-normal form of plane equation; learn how to write the equation of a plane given points and/or lines that define the plane; learn how to find the point of intersection of a line and a plane and the line of intersection of two planes; understand graphs and equations of 3-D conics, especially ellipsoids.	25%
Unit II: Differential calculus in three dimensions - The student will: Learn how to sketch level curves of a function of two variables; learn how to find the limit at a point of a function of two variables along a given path to the point; learn how to find partial derivatives; learn how to compute the gradient of a function; learn how to take the directional derivative of a function; learn how to find a tangent plane and a normal line to a given surface.	25%
Unit III: Multiple integrals - The student will: Learn how to set up and evaluate double integrals in rectangular co-ordinates; learn how to set up and evaluate double integrals in polar co-ordinate; learn how and when to switch a double integral from rectangular to polar co-ordinates; learn how and when to switch the order of integration of double integrals in rectangular co-ordinates; learn how to set up and compute triple integrals in rectangular co-ordinates; acquire an understanding that without a computer algebra system to use, some triple integrals will be easier to evaluate in cylindrical or spherical co-ordinates.	25%
Unit IV: Vector Analysis - The student will: acquire an understanding of the concept of vector fields and learn to determine whether a vector field is conservative; acquire an understanding of the concept of independence of path; learn how to find divergence and curl of a vector field; learn to write equations for piecewise smooth curves; learn to write and evaluate line integrals along a line segment or along a helix; learn how to use Green's theorem to evaluate line integrals; learn how to evaluate surface integrals and orient the surface; learn the divergence theorem and use it to calculate flux; learn how to use Stoke's theorem and curl to analyze the motion of a rotating liquid.	25%

General Education Goals - Critical Thinking & Social/Global Awareness

CRITICAL THINKING OUTCOMES	HOW DOES THE COURSE ADDRESS THE OUTCOMES (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
udents will be able to ➢ develop meaningful questions to address problems or issues. ➢ gather, interpret, and evaluate relevant sources of information. ➢ reach informed conclusions and solutions.	Students learn to solve higher level mathematics/engineering problems via various techniques. Lecture, examples, drill. Students learn that calculators can give erroneous results.

➢ consider analytically the viewpoints of self and others.	Students need to consider the reasonableness of their solutions, "Does the answer make sense?"
SOCIAL/GLOBAL AWARENESS OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
➢ Students will begin to understand how their lives are shaped by the complex world in which they live.	Smart phone apps can be used by students and are more readily available than computer software programs.
➢ Students will understand that their actions have social, economic and environmental consequences.	Cheating is discussed.

Instructional Methods
The instructional method should be mainly lecture. A take-home project on series or other topic may be assigned to further student learning.

Methods of Assessment/Evaluation

Method	% Course Grade
Four or five unit exams	75-100%
Final exam. This may be treated as an optional exam that can only be used to raise a student's course grade, OR half of the final may be used as another unit exam with the second half comprehensive over the previous units.	0-25%

Text(s)
Calculus, Larson and Edwards, 10th Edition, © 2014 Brooks/Cole

Bibliography
Other multi-variable calculus texts by Stewart or Anton, etc.

Other Learning Resources

Audiovisual No resources specified
Electronic DERIVE computer software
Other DYNAMIC Calculus web page: www.monroecc.edu/wusers/pseeburger