Calculus 3 (CRN: 5861)
Fall 2023
MATH 311.01 (4 credits), M_F, 1:00-1:50P, Tu_Th, 1:10-2:00P, Roddy 261

Prerequisites: A grade of C- or better in MATH 211 (*Calculus 2*) is the prerequisite for this course.

Description: Continuation of MATH 211. Vector calculus, functions of several real variables, partial differentiation, implicit functions, multiple integrals, line and surface integrals and applications.

Instructor: Dr. Buchanan
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Office Hours: 11:00A–12:00N (M–F) or by appointment
Email: Robert.Buchanan@millersville.edu **(preferred)**

Textbook: *Calculus Volume 3*, G. Strang, E. Herman, *et al.*, OpenStax, Houston, (2016), ISBN: 978-1-50669-805-2 (print paperback) 978-1-947172-16-6 (digital).

This is an open source textbook available from OpenStax. Students may download a portable document format (PDF) version of the text, view the text online, or (if a student prefers) order a print copy. The text can be read on portable tablets, smart phones, laptops, and desktop computers.

You will also need a graphing calculator such as the TI-84 Plus.

Objectives: Upon successful completion of this course the student will:

- Understand the algebra and geometry of vectors in 2 and 3 dimensions.
- Understand the calculus of curves in $\mathbb{R}^2$ and $\mathbb{R}^3$, the unit tangent and unit normals vectors, curvature, and motion along a trajectory.
- Learn the three-dimensional vector algebra required by linear algebra courses: dot and cross products, projections, and equations of line and planes in $\mathbb{R}^3$.
- Understand spherical coordinates and cylindrical coordinates.
- Understand partial differentiation, and will apply partial derivatives to the computation of gradients, directional derivatives, tangent planes, and differentials.
- Understand differentiable functions of several variables.
- Locate and classify critical points of functions of several variables, and will solve applied optimization problems.
- Understand definite integrals in higher dimensions. The student will set up and evaluate multiple integrals, and will be able to interchange the order of integration.
- Understand line and surface integrals, potential functions, and path independence. The student will apply Green's theorem in the plane, and Gauss's and Stokes' theorems in $\mathbb{R}^3$.

Course Contents: Textbook chapters and topics covered during this class will include:

- Vectors in Space (Chap. 2)
- Vector–valued Functions (Chap. 3)
- Differentiation of Functions of Several Variables (Chap. 4)
- Multiple Integration (Chap. 5)
- Vector Calculus (Chap. 6)

Attendance: Students are expected to attend all class meetings. If you must be absent from class on the day that an assignment is due, you must complete and submit the assignment prior to the absence. If you know you will be absent on the day of a test, you must notify me before the time the test is scheduled in order to schedule a make-up test. Students who miss a test should provide a valid excuse, otherwise you will not be allowed to make up the test. No final exam exemptions.

Merely attending class will not earn you a passing grade. Regular class attendance (see Class Attendance Policy) includes being on time to class and actively engaging and participating in classroom activities. It does not include texting, listening to music, watching videos, browsing the internet, playing video games, checking email, *etc.* Students engaging in these types of activities may be asked to leave the classroom and/or be counted absent for the class meeting. Do not expect a warning or announcement before these sanctions.

Homework: Students are expected to do their homework and participate in class. Students should expect to spend a minimum of three hours outside of class on homework and review for every hour spent in class. Homework exercises help students review and reinforce concepts covered in class. This semester we will use the webassign.net online learning system for most homework assignments in the course. A link to webassign.net has been created under the "Assignments" folder of our D2L course shell. Follow that link to get registered for the online learning system. The cost will be $37.95.

You will need the following class key to enroll in the proper section: `millersville06681090`

If you have created an account with Cengage (the parent company of WebAssign) for another course in the past, you can use your existing login and password. If this is your first time using Cengage, you will be asked to create an account.

All assigned homework exercises must be worked (and, if necessary re-worked) until successfully completed. Students should expect to spend a *minimum* of twelve hours per week reviewing notes taken during class and working assigned homework exercises. Preparation for the tests and final exam will require additional hours of study. Students will find it beneficial to review all lecture notes and other relevant material collected from the beginning of the semester until the present time at least once per week.

Tests: There will be three tests and a comprehensive final examination administered face-to-face in the classroom. The tests and final examination are scheduled as follows.

Test 1	September 15, 2023 (Friday)
Test 2	October 13, 2023 (Friday)
Test 3	November 17, 2023 (Friday)

The final exam is scheduled for Wednesday, December 6, 2023, 10:15A–12:15P.

If you are unable for any reason (illness, family emergency, military commitment, *etc.*) to take the test or exam at these times you must notify me **before** the test is given. A make-up test or exam will be scheduled at a mutually convenient time. Students who engage in academically dishonest behavior on a test or final examination will receive a grade of 0 for the assessment activity.

I will not "curve" test grades. If you feel that an error was made in the grading of a test, you should explain the error on a separate sheet of paper and return both it and the test to me within three class periods after the test is returned to you. In no case will adjustments amounting to less than 3 points be made. After three class periods, changes to graded material will be made at the instructor's discretion.

Grades: Course grade will be calculated as follows.

Test Average	50%
Exam	25%
Homework Average	25%

Tests and the final examination will be graded individually on a 100-point scale. Graded homework assignments may consist of a variable number of problems and points. I keep a record of students' test, homework, and exam scores. Students should also keep a record of graded assignments, tests, and other materials. As an example of the calculation of the numerical course grade, suppose a student's three test grades were 87, 78, and 70 (out of a maximum of 100 points on each test), the student's final examination grade was 71 (again, out of a maximum of 100). Suppose the average of all the student's homework assignments is 85. This hypothetical student's numerical course grade would be calculated according to the formula

$$\frac{87+78+70}{3} \cdot 0.50 + 71 \cdot 0.25 + 85 \cdot 0.25 = 78$$

I will not "curve" course grades. There will be no extra credit assignments during the semester. Therefore students should take all assignments seriously from the beginning of the semester.

Course grades will be assigned according to the following scale.

90-92	A−	93-100	A		
80-82	B−	83-86	B	87-89	B+
70-72	C−	73-76	C	77-79	C+
60-62	D−	63-66	D	67-69	D+
		0-59	F		

Course Repeat Policy: An undergraduate student may not take an undergraduate course of record more than three times. A course of record is defined as a course in which a student receives a grade of A, B, C, D, (including + and −) F, U, Z or W. The academic department offering a course may drop a student from a course if the student attempts to take a course more than three times.

The last day to withdraw from this course and receive a W grade is Friday, October 27, 2023 at 4:30P. The withdrawal forms are online.

Inclement Weather Policy: If we should miss a class day due to a school delay or cancellation, any activities planned for that missed day will take place the next time the class meets. For example, if a test is scheduled for a day that class is canceled on account of snow, the test will be given the next time the class meets.

Cell Phones: Silence (or better yet, turn off) all cellular telephones upon entering the classroom. Leaving class to initiate or receive a telephone call will not be tolerated and students doing so will not be re-admitted to the classroom until the following class meeting. Texting or tweeting during class interferes with the learning process. Students distracted by their cell phones are not engaged in class and will find, over the course of the semester, that learning and course grade will suffer.

Title IX Reporting Responsibilities: Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with requirements of Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, *et seq.*, and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.

Information regarding the reporting of sexual violence, and the resources that are available to victims of sexual violence, is set forth at: https://www.millersville.edu/titleix/.

Academic Honesty: Students are required to avoid plagiarism, falsification of their work, cheating (including assisting others in cheating), and other forms of academic misconduct. For more information including definitions and examples of academic dishonesty, please see the Academic Honesty Policy.

Land Acknowledgement: Millersville University would like to recognize the Native peoples of the lower Susquehanna River basin, those known and those unknown to us, who have stewarded the land, upon which Millersville University sits, for thousands of years. We acknowledge that the land on which we gather, study, and work is the ancestral land of the Conestogas, Susquehannocks, Shawnee, and others. One group, the Shenks Ferry people, had a village adjacent to the campus. We pay our respects to the traditional occupants and caretakers of this land.

Other University Policies: Students may wish to consult the links provided below outlining Millersville University's policies on:

- Inclusivity
- Preferred names
- Student rights under FERPA
- Student conduct and community standards

Final Word: Mathematics is not a spectator sport. What you learn from this course and your final grade depend mainly on the amount of work you put forth. Daily contact with the material through homework assignments and review of notes taken during lectures is extremely important.