

MATH-2415 MULTIVARIATE CALCULUS

The University of Texas at Tyler, Fall 2024

Time and Place: MoWeFr 10:30AM - 11:45AM, Ratliff Building North (RBN) 04019

Instructor: Pamela Delgado, Ph.D

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Office Hours: Mondays from 1 pm to 2 pm, Wednesdays from 9 am to 10 am, Fridays from 9 am to 10 am. Room RBN 4009.

Office hours can also be arranged at a different time if the times above do not work for you, please email me 2 business days in advance so we can find a common time to meet.

Overview: The goals of the course are to teach the student basic concepts of multivariate calculus. You will improve your skills in applied problem solving and reasoning requiring techniques of multivariate calculus.

Prerequisites: A grade of C or better in Calculus II.

Textbook: Calculus: Volume 3, by OpenStax.

You can access the textbook online, or download it from: <https://openstax.org/details/books/calculus-volume-3>

Grading procedure:

Three exams 60% (each worth 20%)

Final exam 25% (comprehensive)

Quizzes 15%

Grading scale: A:90-100%, B: 80-89%, C: 70-79%, D: 60–69%, F:<60%.

Final exam date: Wednesday, December 11, from 10:15 a.m. to 12:15 p.m.

Important Dates:

- September 9th. Census date: Date to withdraw without incurring grades of “W” or “Q”.
- November 4th. Last day to withdraw from one or more courses with a W.

For more important dates visit:

<https://www.uttyler.edu/schedule/files/2024-2025/academic-calendar-2024-2025-main-20240724.pdf>.

Evaluations: We will have three exams and a comprehensive final exam. The dates for the exams can be found on the schedule below. We will also have quizzes regularly, the quizzes will be announced in class the lecture prior.

Make-up evaluations: Make-up evaluations are **only given if you have a legitimate justification; documentation to support your justification must be provided.** Make-up evaluations must be completed within three days of your return to your academic duties. It is the responsibility of the student to communicate with me promptly and regularly until arrangements for the missed evaluation have been established. If this criterion is not met, the make-up evaluation won't be granted.

Legitimate justifications for make-up evaluations include illness (affecting you or your child), pregnancy related absences, or academic conflict that will prevent you from being in class. If you know you will be missing classes, you need to contact me as soon as you become aware of the lecture you will miss. **In case of illness as justification for a missed evaluation, you will need to present a doctor's note dated within 72 hours of the missed lecture.** You can also go to the Health Clinic on campus, to make an appointment call (903) 939-7870. Pregnant and parenting students must work with the Parenting Student Liaison to satisfy the requirement of documentation supporting your justification. You can reach out to Parenting Student Liaison at parents@uttyler.edu. Approval for

make-up evaluations due to personal reasons will be granted only in exceptional circumstances for substantial grounds, and documentation will still be required. Early flights home, bus tickets to leave town, and family vacations are NOT valid excuses to miss or reschedule a final exam.

Learning outcomes:

- Understand and analyze functions of multiple variables, including limits, continuity, and partial derivatives.
- Apply vector algebra and calculus, including dot and cross products, gradients, divergences, and curls, to solve problems in three-dimensional space.
- Evaluate double and triple integrals in various coordinate systems (Cartesian, polar, cylindrical, and spherical) and apply these integrals to compute areas, volumes, and other physical properties.
- Understand and apply key theorems of vector calculus, such as Green's Theorem, Stokes' Theorem, and the Divergence Theorem, to solve problems involving line integrals, surface integrals, and flux.

Preparing for quizzes and exams: I will regularly provide lists of suggested exercises for the different topics covered in class. Most of these exercises will come from our textbook. As time permits, we will dedicate some lecture time to solving these exercises. I strongly encourage you to actively participate in these exercise-solving lectures. Quizzes and exams will have similar exercises to those from these lists, making it crucial that you understand how to solve them. For any exercises we cannot cover together in class due to time constraints, you should ensure you solve them on your own, and seek help from me during office hours if needed. You are encouraged to collaborate with your classmates, and you may use any resources you prefer to solve the exercises, but keep in mind that for evaluations you must show all your work for full credit, and you are only permitted to use results that were covered in class. Moreover, struggling with an exercise is a vital part of the learning process. It challenges you to think deeply and helps solidify your understanding. Don't skip this important step in your mathematical development by immediately searching for solutions elsewhere. Make sure to give each exercise a serious attempt on your own first; only then will discussing the exercise with your classmates or looking at others' solutions add real value to your exam/quiz preparation.

Artificial Intelligence Statement:

From the University Policies and Information:

*“UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools’ ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler’s Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that **may appear correct but is sometimes shown to be incomplete, inaccurate**, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler’s Academic Integrity Policy.”*

For Math-2415:

As stated above, you may use any resources to solve the suggested exercises assigned in class. For this course, **the use of AI tools is permitted outside of the lecture, but it is important to understand that you do so at your own risk**, given that you might obtain incorrect answers; and while AI may sometimes provide correct answers, relying solely on these tools **defeats the purpose of the suggested exercises as a learning tool**. Suggested exercises are designed to help you understand and apply the material, which is essential for your success in this course. If you merely copy answers from AI without fully engaging with the problems, **you may find yourself unprepared for in-class evaluations, where NO electronic devices, including AI tools, will be allowed**. Ultimately, this approach could negatively impact your performance on exams and your overall understanding of the subject.

Academic Integrity: All students have the responsibility to exhibit honesty and to respect the ethical standards of academic conduct in carrying out his or her academic assignments. Academic dishonesty will be dealt with seriously.

Resources:

- The Mathematics Learning Center (MLC), RBN 4021, is an open access computer lab for math students. There are tutors on duty for several hours each day to assist students, mostly on early-career courses. For more information about the MLC including the tutoring schedule visit: <https://www.uttyler.edu/academics/colleges-schools/arts-sciences/departments/mathematics/math-learning-center>.
- Upswing (Online Tutoring Service) Online tutoring for undergraduate UT Tyler courses is available 24 hours per day, 7 days per week. Through Upswing, an online tutoring platform, students can connect with professional tutors without having to be present on campus. Upswing services are free to currently enrolled, undergraduate UT Tyler students. For more information about Upswing visit <https://www.uttyler.edu/academics/success-services/tutoring/online/>

University Policies: See <https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf> for important information on University policies and resources including Student Accessibility and Resources, student rights and responsibilities, Withdrawing from Class, Incomplete Grade and Grade Appeal Policy, Military Affiliated Students, Students on an F-1 Visa, Academic Honesty and Academic Misconduct, FERPA, Absences Policy, and campus carry.

UT Tyler is proud to be a tobacco-free campus.

Schedule: The following is a TENTATIVE schedule for lectures and is subject to change.

Exams	SECTIONS
TOPICS FOR EXAM 1	2.1 = Vectors in the Plane
	2.2 = Vectors in 3-D
	2.3 = Dot Product
	2.4 = Cross Product
	2.5 = Equations of Lines and Planes
	2.6 = Quadratic Surfaces
	2.7 = Cylindrical and Spherical Coordinates
	3.1-3.2 = Vector-valued Functions and Space Curves
	3.3 = Arc Length and Curvature
	3.4 = Motion in Space
	4.1 = Functions of Several Variables
Sep 23rd	EXAM 1
TOPICS FOR EXAM 2	4.2 = Limits and Continuity
	4.3 = Partial Derivatives
	4.4 = Tangent Planes and Linear Approximations
	4.5 = Chain Rule
	4.6 = Directional Derivative and Gradient Vector
	4.7 = Maximum and Minimum
	4.8 = Lagrange Multipliers
	5.1 = Double Integrals over Rectangles
	5.2 = Double integrals over General Regions
	5.3 = Double integrals in Polar Coordinates
Oct 21st	EXAM 2
TOPICS FOR EXAM 3	5.4 = Triple integrals
	5.5 = Triple integrals in Cylindrical and Spherical Coordinates
	5.7 = Change of Variables in Multiple Integrals
	6.1 = Vector fields
	6.2 = Line integrals
	6.3 = Conservative Vector Fields
	6.4 = Green's Theorem
	6.5 = Divergence and Curl
	6.6 = Surface Integrals
	6.7 = Stokes' Theorem
	6.8 = The Divergence Theorem
Nov 18	Exam 3
Dec 9 - Dec 13th	Final exams

A message from your instructor:

To make the most out of the learning journey we are about to embark on, it is important we create an environment in our class that is safe and supportive for everyone to participate and share their input, regardless of race, gender, class, sexual orientation, etc. Both you and I have a duty to treat everyone with respect and courtesy, and you can expect the same treatment for yourself. This will allow for a space in which our individualities enrich the learning process.

The instructor reserves the right to change this syllabus, with due notice to the class, to best benefit the needs of the students.