math 2730: Multivariate Calculus (Section 004, Spring 2026)

Syllabus
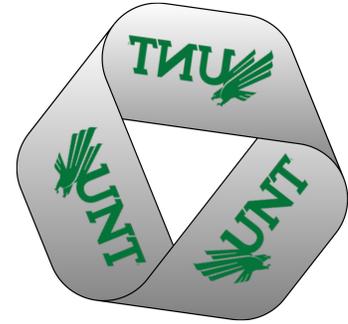
Location:	GAB (General Academic Building) 112
Meeting time:	Tuesday/Thursday, 8:00am--9:20am

Instructor:	Dr. Jiajie Zheng
Office:	GAB 418A
Office hours:	Tuesday 10am--11am, Wednesday 11am--noon, or by appointment
e-mail address:	Jiajie.Zheng@unt.edu

Email policy

Emails should be sent from your UNT email address. Please include the course and section number in the subject. While I try to reply as soon as possible to all emails, please allow up to **two (2) business days** before expecting a response.

Couse information

Course description

3 hours. This course covers vectors and analytic geometry in 3D-space, partial and directional derivatives, extreme values, multiple integrals and applications, cylindrical and spherical coordinates, vector fields and line integrals.

Course structure

This is a 15-week, face-to-face course. There will be *one midterm exam*, plus *a comprehensive final exam*.

Course Prerequisites or Other Restrictions

A grade of C or higher in math 1720: Calculus II.

Texts and course materials

All lecture notes will be uploaded on Canvas.

> *No textbook is required.*

Course Learning Objectives

Upon successful completion of this course, students will

1. Perform algebraic operations on vectors and establish basic (but precise) mathematical formulation of smooth geometric objects;

2. Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, and acceleration;

3. Perform calculus operations on functions of several variables, including total derivatives, partial derivatives, directional derivatives, and multiple integrals; and

4. Understand the applications and methodology of calculus in optimization.

ADA Policy

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the Office of Disability Access website at https://studentaffairs.unt.edu/office-

disability-access. You may also contact ODA by phone at (940) 565-4323.

Course Technology & Skills

This course has digital components. To fully participate in this class, students will need internet access to reference content on the *Canvas Learning Management System.*

Technology Requirements

The technology needed for this course include

1. Computer, compatible with `Canvas`;
2. Reliable internet.

Calculator policy

Scientific and graphing calculators (`TI-84` or equivalent) are permitted in this class. However, a calculator such as a `TI-89`, `TI-Nnspire`, and other calculators that can perform algebraic operations are not allowed. If you are unsure if your calculator is permitted, ask me before the day of the first exam.

Course Grades

Your grade in the course will be based on the following:

1. `Homework assignments: 30%`
2. `Exams: 70%`

Letter grade assignments

- A: $[90\%, \infty)$,

  (Outstanding, excellent work. The student performs well above the minimum criteria.);

- B: $[80\%, 90\%)$,

  (Good, impressive work. The student performs above the minimum criteria.);

- C: $[70\%, 80\%)$,

  (Solid, college-level work. The student meets the criteria of the assignment.);

- D: $[60\%, 70\%)$,

  (Below average work. The student fails to meet the minimum criteria.);

- F: $[0, 60\%)$,

  (Sub-par work. The student fails to complete the assignment.).

Policies/information directly affecting grades/grading

Homework

Format

Each week there will also be a written homework assignment.

You are expected to *show your work as completely as possible* in written homework.

Exams will be graded on both the correctness and the completeness of your solution, so it is important that you get feedback on your written work.

The homework will be due at the beginning of class of **Thursday** of the following week. *You are required to submit the physical copies of your work at the lectures.* ***I will strictly not accept any submission online or by email!***

Because I will post the solutions one day after each assignment is due, *NO late work will be accepted under any circumstances.* Your lowest 25% of written homework scores will be dropped.

Late policy

Late work will not be accepted in this course regardless of the reason.

However, your lowest 25% of homework scores will be dropped.

Exams

Examination policy

Exams are closed book, on paper and done in class during the time listed on the syllabus unless an announcement of a change is made in class. Scientific and graphing calculators (`TI-84` or equivalent) are permitted in exams.

I work hard to structure my course in such a way that balances the time necessary for students to learn the necessary content with the need to have regular midterm exams. As such, students are expected to take the exams on the given day. In the event of a schedule conflict with a *university excused absence,* (see Student Attendance and Authorized Absences) the student must take the test early if at all possible. I request a week's notice for this accommodation via email. In the event that an unavoidable conflict/illness comes up, reach out to me as soon as you can. If a student does not take a scheduled exam, a score of **zero** (0) will be recorded for that exam.

Midterm exam

One in-class exams will be administered in person during lecture for this semester.

Keep a record of all your scores. Be sure to review your exam upon receiving it. Check your written exam grade

with the grade posted online to ensure that they are the same.

Final exam

One in-class, comprehensive final exam is planned for this course.

For a full list of Final Exam dates and time see this Link. The format of the final exam will be the same as the format of the midterm exams, except longer.

Dates and grades

Tentative (subject to changes) dates are

- **Midterm exam:** `March 3, Tuesday`, (the Tuesday before spring break) at the lecture.
- **Final exam:** `7:30am -- 9:30am`, `May 5, Tuesday`, at the lecture meeting room.

In calculating the `Exams` portion of the course grade, if your final exam grade is higher than your midterm exam grade, the final exam grade will be your `Exams` grade (70% of your course grade), otherwise the average of the two exam grades will be your `Exams` grade (70% of your course grade).

Attendance and Participation

Research has shown that students who attend class are more likely to be successful. You should attend every class and participate fully unless you have a university excused absence such as active military service, a religious holy day, or an official university function as stated in the Student Attendance and Authorized Absences Policy (PDF). If you cannot attend a class due to an emergency, please let me know. Your safety and well-being are important to me. Even if you are unable to attend, students are responsible for all information given in class.

Classroom etiquette

Appropriate behavior is expected of all students taking this course. Arrive to class promptly and do not leave until the scheduled ending time of the class. If you must arrive late or leave early, please do so as discreetly as possible and take a seat near the door. Turn off all non-medical electronic devices such as pagers, cell phones, laptops, etc. Take off your headphones. Do not play on your phone or work on unrelated assignments during class. I reserve the right to ask disruptive students (texters, those using a computer for non-class related work, etc.) to leave class. You will be considered absent if you are asked to leave. Again, it is considered a serious violation of your responsibilities as a student to be on a computer or your mobile device during class. It distracts you, lowers your performance in class and does the same for those around you. Please read the New

Yorker article I've posted on `Canvas` for more information about this. Students misusing electronic devices for non-academic reasons distract others and may be asked to leave. See also #8 on the 10 academic rights that is linked here.

Additional Information

Instructor responsibilities and feedback

My goal in this course is to provide an environment conducive to your learning. I will work hard to be available outside of class during my tutoring/office hours, via email or via Zoom. I welcome questions about any portion of the course and am happy to clarify any issues if they come up. Most homework assignments are automatically graded and you can review your work on the `Canvas` assignments the day after they are due. I make it a priority to grade exams quickly, but my past experience suggests that this can take me up to two weeks to get them back to you.

Drop/Withdrawal policy

If the student is unable to complete this course, it is his/her/their responsibility to formally withdraw from the course. You can find more details about dropping the course at this link.

If the student does not properly withdraw from the course but stops attending, the student will receive a performance grade, usually an F.

If you are considering dropping, it is strongly recommended that you discuss the matter with me as soon as possible.

Key dates

Review the registrar's Academic Calendar & Key Dates.

- `January 16, Friday:` Last day to add/swap a class.

- `January 24, Friday:` Last day to drop a course without a "`W`".

- `February 20, Friday:` Last day to change to pass/no pass.

- `April 10, Friday:` Last day for a student to drop a course or all courses with a grade of "`W`"/

- `April 11, Saturday:` Beginning `April 11, Saturday`, a student that qualifies may request a grade of I, *incomplete*. An "I" is a non-punitive grade given only if ALL three of the following criteria are satisfied. They are:

  - The student is passing the course;

- The student has a justifiable (and verifiable) reason why the work cannot be completed as scheduled; and

- The student arranges with the instructor to complete the work within one academic year.

Syllabus change policy

This syllabus is subject to change. Any changes will be announced in class and the updated syllabus will be posted in `Canvas`.

Supporting your success and creating an inclusive learning environment

Every student in this class should have the right to learn and engage within an environment of respect and courtesy from others. We will discuss our classroom's habits of engagement and I also encourage you to review UNT's student code of conduct so that we can all start with the same baseline civility understanding (Code of Student Conduct).

Academic Integrity Policy

Cheating on tests, quizzes or final exams is a serious breach of academic standards and will be punished severely and generally result in a student failing the course. All work done on exams and quizzes must represent only the student's own work, unless otherwise stated in the directions. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. See Academic Integrity for details on academic integrity policies at UNT.

Emergency notification and procedures

UNT uses a system called `Eagle Alert` to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to `Canvas` for contingency plans for covering course materials.

Recommended Steps to Succeed

I hope this advice will be helpful for you. It consists of my observations in the time I have been teaching. I have observed two character traits common to successful students. The traits are maturity and time commitment. Learning requires working when you don't want to – that requires maturity. Learning also requires consistent and diligent dedication of time.

Some additional specific steps:

- Learning math requires a great deal of time and honest effort along with regular and consistent work.

- After class review your notes. If you have questions, ask immediately.

- Actively read through all recommended readings.

- Complete the Exam Reviews prior to each exam. Form a study group with your classmates. Create online groups. Make use of the tutoring options available to you: the Math Lab, the Learning Center, and your instructor's tutoring hours.

- The Learning Center offers several tutoring options: Drop-In Tutoring, One-on-One Tutoring, Group Tutoring and Online Tutoring. Additional links for places you can get help at UNT is on the Academic Support and Student Services page in the `Canvas` Start Here module.

- Work on the assignments consistently well ahead of due date. Waiting until the last minute is a horrible idea.

- Math is not a spectator sport. You must try the problems, finish problems, ask questions, correct your mistakes, put concepts in your own words, and practice, practice, practice. You learn math by doing, not by watching others do math.

- Contact your instructor immediately if you are having problems.

One last thought: As an adult, you need to *self-advocate*. If you are having problems, you are expected to seek help. Most of you, at some point in your college career you will run into problems and need to ask for help – don't wait, reach out as soon as you realize you have an issue.

Tentative Schedule of Topics (subject to changes)

Topics	Number of Lectures
Unit 1: Vector geometry and linear spaces	
§1.1: Points and vectors	1
§1.2: Angles and orthogonality	1
§1.3: Area of parallelogram and volume of parallelepiped	1.5
§1.4: Lines and planes	1.5
Unit 2: Smooth curves and smooth surfaces	
§2.1: Parametrization of smooth curves	1.5
§2.2: Differential calculus of smooth curves	1.5
§2.3: Smooth surfaces	1
Unit 3: Functions of multiple variables	
§3.1: Linear functions	1
§3.2: Concepts of differentiation	1
§3.3: Techniques of differentiation	2
Unit 4: Optimization with several variables	
§4.1: Inverse Function Theorem (Reading)	n/a
§4.2: Tangent spaces	2
§4.3: Extreme values and optimization	2
§4.4: Gradient descents	1
Unit 5: Integration of multivariate functions	
§5.1: Riemann's multiple integrals	.5
§5.2: Fubini's Theorem and iterated integrals	.5
§5.3: Change of variables and change of coordinates	1.5
Unit 6: Vector calculus	
§6.1: Line integrals	1