

# Vector Calculus (Math 3740)

## Class info:

MWF 12-12:50pm in Business Leadership Building 035

## Instructor:

Dr. Sean Griffin

Assistant Professor

GAB 409

sean.griffin@unt.edu

## Office hours (in GAB 409):

Mon 9-10am and 3:30-4pm

Wed 10-11am

Fri 3-3:30pm

Also by appointment.

## Textbooks:

Course content (homework, quizzes, exams) will be based on lectures, but the following two books will be helpful for studying before and after lecture:

- **[ET]** *Thomas' Calculus: Early Transcendentals*, by Joel Hass
  - Any edition, but preferably 15th if you can find it. Any section numbers mentioned below will refer to the 15th edition
  - eBook or physical copy. The physical copy is very heavy, so probably eBook is better, and you can rent it for \$10/month
  - We will use Chapters 12, 13, 14, Section 15.8, and Chapter 16 of the 15th Edition.
- **[VC]** *Vector Calculus*, by Susan Jane Colley
  - 4th or 5th edition
  - Contains a chapter on differential forms, which we will cover at the end of the course

## Important Dates:

Jan 12 - First day of class!

Jan 16 - Last day to add

Jan 24 - Last day to drop without a W

Feb 20 - Last day to switch to Pass/No Pass

April 10 - Last day to drop

May 4 - Final Exam

### **Course description:**

As the name suggests, vector calculus is calculus involving vectors in 2D, 3D and higher dimensions. Why do these ideas deserve their own separate course, you may ask? You've already studied some topics in calculus of functions with 1 or 2 variables. In this course, we will often instead work with **vector-valued** functions and vector fields in multiple dimensions, a topic central to many concepts in Physics and Engineering. We will use Calculus to compute how much fluid is flowing across a body, or how "twisty" a curve or vector field is, or solving optimization problems from Economics and Physics in multiple variables with complicated constraints.

### **Learning objectives:**

- Curves in space and their tangents, osculating planes, arc length, curvature
- Tangent plane approximation of a surface
- Implicit function theorem
- Lagrange multiplier method for solving optimization with constraints
- Taylor's theorem for two variable functions
- Line integrals and vector fields
- Div, Flux, Curl
- Path independence, conservative vector fields
- Surface integrals
- Green's, Stoke's, Divergence Theorems
- Differential forms
- If time permits: derivatives as derivations, an introduction to manifolds and differential geometry or other topics related to vector calculus

### **ODA accommodations:**

If you have ODA accommodations, please let me know early so that we can figure out the best way to accommodate you. We can discuss further by appointment (see more info below).

### **Exams:**

There will be 2 midterm exams and 1 final exam:

- Midterm 1, in class on **Wed, Feb 18**
- Midterm 2, in class on **Wed, April 8**

- Final Exam (cumulative), in our usual classroom on **Wed, May 6, 10am-12pm**

You will **not** be allowed to use notes or a calculator on the exams and quizzes.

### **Homework/Quizzes:**

Each week, there will be homework due on **Wednesday at start of class**, except on exam weeks.

There will be **5 mini quizzes** (10-15 min) on the following Wednesdays in class that will be based on the homework:

Jan 21, Feb 4, March 4, March 25, and April 22

Week 1: No HW due.

Week 2: HW due on Wednesday at start of class, and a 10 min quiz in class on Wednesday

**\*Your lowest 2 homework grades and your lowest (only 1) quiz grade will be dropped.\***

### **GenAI policy:**

Use of Generative AI (e.g. ChatGPT, Gemini, etc.) or other online aids like Chegg or WolframAlpha to solve the specific problems assigned as homework is **NOT** allowed in this class.

However, feel free to use it to study for quizzes and exams is allowed in this class. Just be aware that if you do use GenAI to study for quizzes/exams, you are responsible for verifying whether its explanations are accurate or not. Generative AI is known to hallucinate and fill in its knowledge gaps with false information, so use it at your own risk for studying.

### **Grades:**

Grades will be broken down with the following percentages:

- Quizzes + Homework: 20%
- Midterm 1: 20%
- Midterm 2: 20%
- Final Exam: 40%

If your overall score falls in the following percentage ranges, you are guaranteed at least the letter grade listed below. (These ranges might be curved during the semester to benefit you depending on class performance on the exams)

- A:  $\geq 90\%$

- B:  $\geq 80\%$
- C:  $\geq 70\%$
- D:  $\geq 60\%$
- F: Below 60%

**Attendance:**

Attendance outside of quizzes and exams is not required, but obviously I strongly encourage you to come to class!

**Late homework/missing exams**

A penalty of 10% (of the overall point total) per day will be deducted for each day your homework assignment is late.

If you need to miss a quiz or an exam because of an [authorized absence](#), please let me know as soon as possible.

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Other important things:

**Academic integrity:**

Please review the academic integrity policy here:

<https://policy.unt.edu/sites/policy.unt.edu/files/06.003%20Student%20Academic%20Integrity.pdf>

**ODA (expanded):**

The University of North Texas makes reasonable accommodation for students with disabilities. Students needing a reasonable academic accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the student will request their letter of accommodation. ODA will provide faculty with a reasonable accommodation letter via email to begin a private discussion regarding a student's specific needs in a course. Students 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 meet with faculty regarding their accommodations during 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.