MTH 254: VECTOR CALCULUS I

Fall 2022

(4 credits – CRN 10217)

Terms Offered: Fall, Winter, Spring, Summer

Instructor: Tat Hatase, hataset@oregonstate.edu

Instructor Office Hours: See Canvas

Teaching Assistant (TA): Addison Day, dayadd@oregonstate.edu

TA Office Hours: See Canvas

Class Meetings: Kidder 364 at 4pm on MWF

Recitation Meetings: Thursdays in Batcheller 144

Prerequisites: Math 252 (or Math 252H) with a C- or better.

Course Credits: This course expects approximately 120 hours of your effort for 4 credits. In particular, that means for 1 hour in-class, you are expected to put in an additional 2 hours of out-of-class, some of which may come in the form of pre-class work.

Inclusion Statement: It is my intent to make an equitable and inclusive course for all students, where all feel welcome, respected and appreciated. The diversity of students, in terms background, perspective and lived experience is an immense resource, as we can learn and grow by constructively communicating and collaborating with each other. It is always my intent to present materials and activities that are respectful of race, ethnicity, gender identity, sexual orientation, disability, age, socioeconomic factors, religion, culture, perspective, and other background characteristics. Your suggestions about how to improve the equity, justice and inclusiveness of this course are encouraged and greatly appreciated.

Textbook: OpenStax Calculus Volume 3 (free, go to Canvas files or to openstax.org/details/books/calculus-volume-3). There is also associated online homework (not free, but low cost).

Catalog Course Description: Vectors, vector functions, and curves in two and three dimensions. Surfaces, partial derivatives, gradients, and directional derivatives. Multiple integrals in rectangular, polar, cylindrical, and spherical coordinates. Physical and geometric applications.

Course Content: Vectors, dot products, cross products, vector-valued functions and curves, the calculus of curves, arc length, functions of many variables and their limits, partial derivatives, the Chain Rule, directional derivatives and the gradient, tangent planes, optimization of functions of two variables, double integrals, polar coordinates and double integrals in polar coordinates, triple integrals, spherical coordinates and cylindrical coordinates including triple integrals in these coordinate systems, change of variables.

Student Conduct Code: Students are expected to be familiar with Oregon State University's Expectations for Student Conduct. Please review these at the following web link:

https://studentlife.oregonstate.edu/studentconduct/student-info

Course Specific Learning Outcomes: A successful student in Math 254 will be able to:

1. Represent vectors both algebraically and geometrically and be able to use vector methods effectively in problem solving.
2. Use the dot and cross product to solve problems in a geometrical or physical setting.
3. Differentiate and integrate vector-valued functions.
4. Apply partial derivatives, directional derivatives, and gradients to solve problems of multivariable differential calculus such as max-min problems and rates of change of physical processes in space.
5. Evaluate multiple integrals in rectangular, polar, spherical, and cylindrical coordinates with applications such as volumes and mass.

Grading: Your grade is determined by online homework,recitation activities, written homework and reflection, in-class activitied/quizzes, four midterm exams, and one cumulative final.

The course will be graded as follows

- Online homework 14%
- Recitation activities 12%
- Written Homework 14%
- Written Homework Reflection, In-class Activities/quizzes 5%
- Midterm Exams 40% (each at 10%)
- Final 15%

Your grade in the course ***is assigned based on the following scale***:
A 92% - 100%, A- 90%-91.99%, B+ 88% - 89.99%, B 82% - 87.99%, B- 80% - 81.99%, C+ 78% - 79.99%, C 70% - 77.99% D 60%-69.99%, F 0%-59.99%.

Exams: There will be four non-cumulative exams and a cumulative final exam. They will be closed-book, closed-notes exams and calculators will not be allowed. Your exams will be graded in Gradescope (linked through Canvas). There you will be able to see your graded exams. Your performance on the cumulative final exam replaces your lowest score from exam 1-4 if it is better.

- Exam 1: Friday, Oct. 7th, during class.
- Exam 2: Friday, Oct. 21st, during class.
- Exam 3: Friday, Nov. 4th, during class.
- Exam 4: Friday, Nov. 18th, during class.
- Cumulative Final Exam: Wednesday, Dec. 7th (Location TBD).

Written Homework and Reflection: Every week, there will be a written homework assignment posted on Canvas. In these assignments, students are to show all their works neatly and give explanations where appropriate. Assignments that are not neat, clear, and legible will not be graded. The written homework needs to be submitted to Gradescope as a PDF file by the due date. Usually the due date will be 9:00pm on Thursday. For each written homework, at least one of the problems will be graded for correctness (and the work shown) and some for completion. Free pdf scanners are available in the Valley Library. After the due date for the written homework, a discussion with solutions to the problems will be posted on Canvas. Students are required to reflect on how they did by comparing their work to the solutions provided. The lowest score will be dropped.

In-Class Activities/Quizzes: These can be 'lecture discussion problems' during the MWF lecture problems given in lecture that you are expected to discuss and solve with fellow students. These can be worksheets that we will go over in class (and require a later submission to Canvas or Gradescope). These can be low-stakes quizzes held in Recitation. These can include Pre-class reading and questions.

Recitation Activities: Each week in recitation you are going to work through an activity with your peers and your teaching assistant, who will help facilitate conversation and provide guidance. Arriving to recitation on time, staying for the entire 80 minutes, and participating in activity or quiz is required for the recitation grade. Your recitation activities will be graded based on your participation (not simply attendance), and you are expected to complete the entire activity. An unexcused absence from recitation can be partially made up (up to 80% credit) by submitting a completed worksheet with all of the work shown. The lowest score will be dropped.

Online Homework: Online homework, through a system called Achieve, is linked to the textbook and can be accessed through Canvas. E-mail me ASAP if it doesn't work. See the Canvas calendar for the due dates. Students can work on the online assignments past due dates with a late penalty.

Students With Disabilities: Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Reach Out for Success: University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at

oregonstate.edu/ReachOut. If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

Course Calendar (Tentative):

Week	Monday	Tuesday	Wednesday	Thursday	Friday
0			Intro.	Recit.	Vectors
1	Dot Product		Cross Product	Recit.	Vector Functions
2	Calculus of Curves		Arc Length & Curvature	Recit.	*Exam 1*
3	Quadratic Surfaces		Functions of Many Variables	Recit.	Limits
4	Partial Derivatives		Chain Rule	Recit.	*Exam 2*
5	Directional Derivatives		Gradient	Recit.	Tan. Planes & Lin. Approx.
6	Optimization		Lagrange Multipliers	Recit.	*Exam 3*
7	Double Integrals		Double Integrals	Recit.	No class
8	Integrals in Polar Coord.		Triple Integrals	Recit.	*Exam 4*
9	Int. in Cyl. Coord.		Int. in Sph. Coord.	No recit.	No class
10	Applications		Catch-up/Review	Recit.	Review

Student Bill of Rights: Oregon State University students have the right to...

1. ...express differing opinions and dissent on campus.
2. ...associate and assemble to collectively express, promote and defend common interests.
3. ...exercise the practice of religion free from discrimination.
4. ...academic advising that is accurate and can be relied upon for progress towards graduation.
5. ...have their voice heard in all university policymaking decisions that impact students.
6. ...a campus free of discrimination and harassment based on one's race, color, gender identity or expression, religion, age, national origin, disability, marital status, parental status, sex, sexual orientation, genetic information or veteran status.
7. ...complete a course of study should the university discontinue a course of study.
8. ...due process in all university disciplinary processes.
9. ...an equal opportunity to learn and to participate and benefit from the academic community.
10. ...meet with and engage with course instructors and professors during their office hours.
11. ...the protection of student educational records and confidential information.
12. ...be graded in accordance with the course syllabus and the quality of their work.