

MA1024 -Tilley WPI

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MA 1024 - Calculus IV

D-Term: 2025

Prof. B. S. Tilley

Department of Mathematical Sciences

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Office: SH 419

PLA: Aidan Cook

Tilley Office Hours: M: 2:00-2:50pm, TR: 5:00-5:50pm.

Cook Office Hours: T: 12:00-12:50pm; W: 5:00-6:00pm, R: 6:00-7:00 pm (Zoom)



Meeting Times/Location:

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- *Lecture:* MTRF 4:00-4:50 pm, Stratton Hall 205
- *Discussion:* F 3:00-3:50, Stratton Hall 313

Course Description: This course provides an introduction to multivariable calculus. Topics covered include: vector functions, partial derivatives and gradient, multivariable optimization, double and triple integrals, polar coordinates, other coordinate systems and applications. Recommended background: MA 1023. Although the course will make use of computers, no programming experience is assumed.

Text:

[Calculus, Volume 3, G. Strang and E. Herman, OpenStax \(2024\) ISBN: ISBN-13: 978-1-938168-07-9](#)

Classroom Culture

Behavior Expectations: Collaborative learning and active engagement are expected. *Collaborative learning* means that students collaborate together to learn the material in the course. *Active engagement* by students means that students accept the responsibility for their own learning of the material and do not perceive the instructor (Professor or PLA) as a source of all knowledge.

In order to meet these expectations, the classroom environment must be professional and supportive. Students are expected to treat each other with mutual respect, provide constructive feedback to other students, and to realize that as humans we all need guidance at times.



Lecture Schedule: Click calendar link on right.

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Sun.	Monday	Tuesday	Wednesday	Thursday	Friday
3/16	Course Introduction, Functions of Several Variables	Limits and Continuity		Partial Differentiation	The Chain Rule
3/23	Directional Derivatives and Gradient	Directional Derivatives and Gradient		Tangent Planes and Differentials	Quiz 1
3/30	<u>No Classes: Wellness Day</u>	Tangent Planes and Differentials		Multivariable Optimization	Quiz 2
4/6	Multivariable Optimization, Double Integrals	Double Integrals over General Regions		Double Integrals over General Regions	Quiz 3
4/13	Area by Double Integrals	Double Integrals in Polar Form		Moments and Centers of Mass for Plates	Triple Integrals
4/20	<u>No Classes: Patriot's Day</u>	Review for Exam 1		<u>Exam 1</u>	<u>No Classes: Project Presentation Day</u>
4/27	Triple Integrals in Cylindrical Coordinates	Triple Integrals in Spherical Coordinates		Substitutions in Multiple Integrals	Substitution in Multiple Integrals
5/4	Review for Exam 2	<u>Exam 2</u>	Make Up Day		



Course Objectives

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This course is both a culmination of the topics from calculus of one dimension and an introduction to topics and methods used in advanced undergraduate courses in mathematics, science, and engineering. Particular objectives of this course include:

- Understand multivariable functions, limits, and continuity
- Become fluent in differentials, chain rule, directional derivatives, and gradients
- Become fluent in multivariable integrals in Cartesian, cylindrical, and spherical coordinates
- Understand the roles of definition, theorem, and proof



Course Organization

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The class typically meets 5 times per week: 4 *lectures* on MTRF, and 1 *discussion* section on F, along with 3 computer laboratory sessions over the term. Students are responsible for all material presented in lecture and discussion, along with the specific textbook sections presented each week. Each week will have a theme:

- Week 1: Functions, Partial Derivatives, and Chain Rule
- Week 2: Directional Derivatives, Gradients, and Tangent Planes
- Week 3: Multivariable Optimization
- Week 4: Introduction to Double Integrals
- Week 5: Integrals in Polar Coordinates, Triple Integrals, Centers of Mass
- Week 7: Triple Integrals in Cylindrical and Spherical Coordinates, Change of Variable

For more details, see the link to the **Lecture Schedule** shown earlier on this page.

Class Materials:

- *Canvas*: Course materials can be found on the Canvas page. The material is organized by Week and then by topic. In the event that lectures need to be delivered remotely, they will take place through Zoom.

Class Meeting Format

- *Lectures (MTRF)*: Initial presentation of the material which will vary in terms of theory and practice. Students are expected to attend lecture to participate in the class, such as asking questions. Note that attendance will be taken during the first week of class in order for the instructor to learn all of your names, but attendance is not part of the final grade (see below). All lectures are recorded on Echo 360, my lecture notes are typically posted on Canvas a day before lecture to help students prepare, and the lecture slides used in the lecture will be posted on Canvas after the lecture. **Students are not expected to be expert in the topic of the lecture by the end of the lecture.**
- *Discussion (F)*: Opportunity for students to ask specific questions on a homework or any relevant topic covered in the class so far, and a space for students to work on their assignments with the PLA present. No lectures are given during this time, and reviews for the Friday quizzes are planned prior to the quiz in lecture.

Students are expected to spend an additional **8-12 hours per week** studying outside of class: reading the text, organizing notes, and solving problems. In previous years, the average time, self-reported, spent outside of class on this course is **10 hours**

Course Grades and Policies

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Grades will be determined based on homework assignments, labs, and in-person quizzes and exams:

- **WebWork: 10%:** There will be weekly assignments using this online tool to understand your basic knowledge of the topics for that week. You receive full credit for correct answers, independent of the number of attempts made. Each week's assignments will be made available Monday evening of that week. All of the assignments are due on **May 7, 2025 at 11:59pm. The lowest three assignment scores by percentage are not included in this portion of the final grade.**
- **Labs: 10%:** During this term, you will attend 3 in-person lab sessions. In each session, a short lecture will be presented, and then you will have time to start working on the lab assignment in groups of two or three. The goal of the lab assignments is to extend the ideas presented in lecture as well as explore applications of the material using a variety of software.

All logistical information related to the labs may be found on the Calculus 4 Lab Canvas site.

The dates of the in-person sessions are,

Wednesday March 19th and Thursday March 20th

Wednesday April 2nd and Thursday April 3rd

Wednesday April 16th and Thursday April 17th

All questions/ concerns related to the labs should be directed to the lab instructors :

Jane Bouchard bouchard@wpi.edu

Caroline Labenski clabenski@wpi.edu

- **Quizzes: 30%:** There are three 20-minute quizzes during the first half of the course. These quizzes cover topics from the first part of the course, but will focus on material taught the previous two weeks. Quizzes are written and are closed book, closed notes, no calculators and no use of any other electronic device. The dates and topics for the quizzes are:
 - Quiz 1: March 28, 2025 - Weeks 1 Material
 - Quiz 2: April 4, 2025- Weeks 1-2 Material
 - Quiz 3: April 11, 2025 - Weeks 2-3 Material
- **Exams: 50%** Two in-class 45-minute exams will take place at the dates below. **The exams are cumulative: students are responsible for all the prior material presented in class.** Exams are closed book, closed notes, no calculators and no use of any electronic devices.

The exam dates are:

- Exam 1 (25%): April 24, 2025: Weeks 1-5 Material
- Exam 2 (25%): May 6, 2025: Weeks 1-7 Material

Policies:

- **Grading Policy:** Students have **two business days** to contact the instructor about potential errors in grading any assignment (homework, quizzes, exams) after receiving their graded work via Gradescope. Beyond this time, the grade on that assignment is final.
- **Make-Up Day:** The last day of term (May 7, 2025) is an opportunity for students to retake either one quiz or Exam 1. **The grade from the retake quiz/exam replaces the grade in the Canvas gradebook for that assignment. Students can only make-up one written assignment over the term and only on this day.**
- **Accommodations:** Students with approved academic accommodations should plan to submit their accommodation letters through the [Office of Accessibility Services Student Portal](#). Should you have any questions about how accommodations can be implemented in this particular course, please contact me as soon as possible. Students who are not currently registered with the Office of Accessibility Services (OAS) but who would like to find out more information about requesting accommodations, documentation guidelines, and what the accommodated interactive process entails should plan to contact OAS either by email: AccessibilityServices@wpi.edu, by phone (508) 831-4908, or by stopping by the office on the 5th floor of Unity Hall.

Final Grades

In general, grades will follow the general distribution

A: 90-100

B: 79-89

C: 68-78

NR: < 68



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