Math 251 - Multivariable Calculus, Spring 2026
Course Syllabus

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Office: Learning Resource Center 323J
Office hours: Mon: 1-2, Tues: 11-12, Wed: 1-3, Thurs: 12-1, Fri: 11-12 (or by appointment)
Class Room/Time: INN-B 311, MTWF 12:00-12:50 pm

Course website: community.wvu.edu/∼bal0018/math251S26.html (as a backup website, I will also try to keep the eCampus site updated)

Please be sure to regularly check the website and check the email address you have on record for any course announcements. You are responsible for any information posted on the course website.

Textbook: OpenStax *Calculus Volume 3*, available to download for free at
https://openstax.org/details/books/calculus-volume-3.

Catalog Data: MATH 251 Multivariable Calculus (4-0) Credits 4. Introduction to solid analytic geometry, vector algebra, and calculus of several variables.
Prerequisite: MATH 156 with a grade of C- or better

Course material: This course is a study of multidimensional space. First, we gain an understanding of three dimensional space using both an analytical geometry approach and a vector approach in Chapter 2. Then we begin to use calculus to analyze 3D objects in Chapter 3, analogous to how we used calculus to analyze curves. We find in Chapter 4 that partial derivatives can be used to give a 3D analog of the tangent line considerations of Calc 1, and we study how to use multiple integrals to compute general volumes and surface areas of surfaces in Chapter 5. Finally, we finish in Chapter 6 by studying vector calculus, which is the calculus of functions that map points to vectors.
A rough schedule of the topics covered can be found on the last page.

Course Objective: This course continues the study of calculus, covering mainly three-dimensional analytic geometry, differentiation/integration of functions of several variables, and vector calculus. An important objective is also to develop a deeper insight and sophistication of learning mathematics.

Course Outcomes: Upon successful completion of the course, the student will be able to do the following:

1. Use equations to describe curves/surfaces in space and find arc length and curvature of a curve.
2. Perform operations on vectors and use vector functions to describe/analyze motions in space.
3. Find domains, limits, and partial derivatives of multivariable functions and apply derivative analysis to geometric problems, approximation problems, and optimization problems.
4. Evaluate double and triple integrals and use them in applications, including finding volume, center of mass, moments, and surface area.
5. Evaluate line and surface integrals, and understand and use major theorems in vector calculus (Fundamental theorem of line integrals, and Green's/Stokes'/Divergence theorems).

Grading: Your final grade will be based on homework, quizzes, four exams during the semester, and the final exam. Your final course score will be the maximum of the following two grading schemes:

- 10% Homework + 5% Quizzes + 16% Exam 1 + 16% Exam 2 + 16% Exam 3 + 16% Exam 4 + 21% Final Exam
- 10% Homework + 5% Quizzes + 20% (highest grade of the four exams) + 20% (2nd grade of the four exams) + 16% (3rd grade of the four exams) + 29% Final Exam

Letter Grade Cutoffs: A: 90%, B: 80%, C: 70%, D: 60%, F: below 60%

Homework: Homework will be completed online with MyOpenMath.com. When you sign-up, you will use the Course ID and Enrollment Key given in class. Homework assignments will be due most Fridays.
Note that most problems on the homework assignments may be resubmitted as often as needed until they are correct, so you should strive for a homework percentage near 100%! Furthermore, the only real point of the homework is for you to do it. The time you spend thinking, trying things, getting wrong answers, and (hopefully) getting right answers is the purpose of the homework. The exams are where your course grade will really be decided, and the homework is your training for the exams. Don't skip your training!

Exams: There will be four exams, tentatively scheduled for Wednesday, January 28; Friday, February 13; Wednesday, March 11; and Friday, April 10. These will be 50 minute exams taken during the regular lecture time. The final exam time will be set by the university, and is scheduled for Wednesday, May 6 from 10:00 am to 11:50 am. Make-up exams will only be given to students with excused absences, and such make-up exams must be scheduled within 24 hours of the missed exam.

Quizzes: There will be a quiz given most weeks in which there is no exam. This will be a very brief quiz given at the beginning of class, intended to test you with more immediacy than the exams and with less consequence. The problems that appear on the quiz will be taken from the homework problems I assign. Only your best 5 quizzes will count toward your grade, and there will be absolutely NO make-up quizzes.

Getting Help: Always remember: asking for help when you need it is not a sign of weakness, but a sign of strength! Please feel free to attend my office hours or email me if you have questions about the course material. If you are unable to make it to my regularly scheduled office hours, I am willing to make an appointment to meet at another time if possible. Free tutoring is also available through the Student Success Center, located in the library on the second floor of LRC. You may also qualify for TRIO SSS, located in Benedum 100, which also provides tutoring services. Additionally, for quick math questions, you can feel free to stop by the Math Department in LRC 323 and ask any math professor with an open door. Finally, I would also encourage the formation of study groups, to learn from each other and help each other learn.

Class policies:

- Graphing calculators will never be allowed during any exams. Scientific calculators will be considered on an exam by exam basis. You may use any calculator to help you do the homework if you wish, but you should keep in mind that you may be required to solve similar problems without a calculator on the quizzes and exams.
- While class attendance does not directly factor into your grade computation, attendance of each lecture is highly recommended. Regular attendance will tend to lead to better understanding of the course material, which tends to lead to better performance on exams.
- If you believe a problem on a homework assignment or midterm exam has been graded incorrectly, you must notify the instructor of your complaint within 7 days of the date the exam is handed back. If you are unable to retrieve your graded material at the time it is handed back, it is your responsibility to make arrangements with the instructor to retrieve the material at another time.

Institutional Policies: Students are responsible for reviewing policies on inclusivity, academic integrity, incompletes, sale of course materials, sexual misconduct, adverse weather, student evaluation of instruction, and other statements. For these detailed policies of West Virginia University, please review:
https://facultysenate.wvu.edu/resources/syllabus-policies-and-statements.

Figure 1: *
QR Code for Course Website

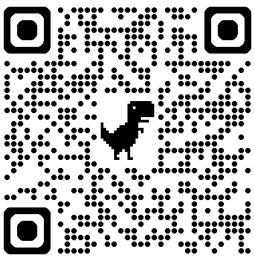

Figure 2: *
QR Code for MyOpenMath

Date	Topic
12-Jan	Syllabus, 2.1-2.2: Vectors
13-Jan	2.2: Vectors in Three Dimensions
14-Jan	2.3: The Dot Product
16-Jan	2.4: The Cross Product
20-Jan	2.4: The Cross Product
21-Jan	2.5: Equations of Lines and Planes in Space
23-Jan	2.6: Quadric Surfaces
26-Jan	2.7: Cylindrical and Spherical Coordinates
27-Jan	Review
28-Jan	Exam 1
30-Jan	3.1: Vector-Valued Functions & Space Curves
2-Feb	3.2: Calculus of Vector-Valued Functions
3-Feb	3.2: Calculus of Vector-Valued Functions
4-Feb	3.3: Arc Length and Curvature
6-Feb	3.3: Arc Length and Curvature
9-Feb	3.4: Motion in Space
10-Feb	3.4: Motion in Space
11-Feb	Review
13-Feb	Exam 2
16-Feb	4.1: Functions of Several Variables
17-Feb	4.1: Functions of Several Variables
18-Feb	4.2: Limits and Continuity
20-Feb	4.3: Partial Derivatives
23-Feb	4.4: Tangent Places & Linear Approximations
24-Feb	4.5: The Chain Rule
25-Feb	4.6: Directional Derivatives and the Gradient
27-Feb	4.7: Maxima/Minima Problems
2-Mar	4.7: Maxima/Minima Problems
3-Mar	4.8: Lagrange Multipliers
4-Mar	4.8: Lagrange Multipliers
6-Mar	Catch-Up
9-Mar	Catch-Up
10-Mar	Review
11-Mar	Exam 3

Date	Topic
13-Mar	5.1: Double Integrals over Rectangles
23-Mar	5.2: Double Integrals-General Regions
24-Mar	5.3: Double Integrals-Polar Coordinates
25-Mar	5.4: Triple Integrals
27-Mar	5.4: Triple Integrals
30-Mar	5.5: Cylindrical and Spherical Coordinates
31-Mar	5.5: Cylindrical and Spherical Coordinates
1-Apr	5.6: Centers of Mass & Moments of Inertia
6-Apr	5.7: Change of Variables
7-Apr	5.7: Change of Variables
8-Apr	Review
10-Apr	Exam 4
13-Apr	6.1: Vector Fields
14-Apr	6.2: Line Integrals
15-Apr	6.2: Line Integrals
17-Apr	6.3: Conservative Vector Fields
20-Apr	6.4: Green's Theorem
21-Apr	6.5: Divergence and Curl
22-Apr	6.6: Surface Integrals
24-Apr	6.7: Stokes' Theorem
27-Apr	6.8: The Divergence Theorem
28-Apr	Catch-Up
29-Apr	Review
1-May	Review