Course Syllabus

Course title: Multivariable Calculus
Class section: MATH **-** 220 **-** 001
Term: 2025F
Course credits: 3
Total hours: 75
Delivery method: In-Person

Territorial acknowledgment

Camosun College respectfully acknowledges that our campuses are situated on the territories of the Lək̓ʷəŋən (Songhees and Kosapsum) and W̱SÁNEĆ peoples. We honour their knowledge and welcome to all students who seek education here.

Instructor details

Name: George Ballinger
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Office hours: Mon-Thu 2:30pm-3:20pm in E260

Course description

Course Description:
This course is an introduction to multivariable calculus. Topics include: vectors, solid analytic geometry, differentiation of vectors, differential calculus of several variables, multiple integrals, and the

theorems of Green, Gauss and Stokes.

Prerequisites:
All of:

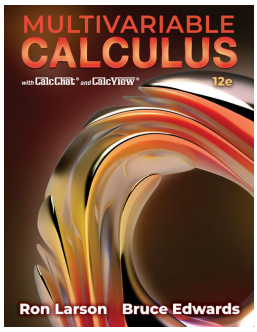
- C in MATH 101

Learning outcomes

Upon successful completion of this course, the learner will be able to

1. Solve three dimensional geometry problems involving points, lines, planes, vectors, vector projections, and distances
2. Sketch, differentiate, and integrate vector-valued functions to find velocities, accelerations, tangents, and normals
3. Differentiate functions of many variables and use chain rules to differentiate composite functions. Compute gradients, directional derivatives, and multivariable Taylor series
4. Setup and evaluate multiple integrals to find areas, volumes, masses, centres of mass, and moments of inertia
5. Change variables in multiple integrals to cylindrical, spherical, or general coordinates
6. Compute the divergence or curl of a vector field, and find the potential function for conservative fields
7. Setup and evaluate line and surface integrals
8. Use Stokes theorem and the divergence theorem to evaluate line and surface integrals

Course reading materials



Title: Multivariable Calculus
Authors: Ron Larson and Bruce Edwards
Publisher: Cengage Learning
Publication Date: 2023
Edition: 12th
Required/Optional: Required

Course materials

Sharp EL-531 (or EL-510R) scientific calculator.

Course schedule

Tests

Two term tests are tentatively scheduled for the following dates:

Test 1 on Friday, October 10 on Sec 11.1-11.7, 12.1-12.5 and 13.1-13.2

Test 2 on Friday, November 21 on Sec 13.3-13.10, 14.1-14.8 and Multivariable Taylor Series (notes)

A comprehensive, 3-hour final exam will take place during the final exam period of December 8-16.

Chapters and Sections

11. Vectors and the Geometry of Space

11.1 Vectors in the Plane

11.2 Space Coordinates and Vectors in Space

11.3 The Dot Product of Two Vectors

11.4 The Cross Product of Two Vectors in Space

11.5 Lines and Planes in Space

11.6 Surfaces in Space

11.7 Cylindrical and Spherical Coordinates

12. Vector-Valued Functions

12.1 Vector-Valued Functions

12.2 Differentiation and Integration of Vector-Valued Functions

12.3 Velocity and Acceleration

12.4 Tangent Vectors and Normal Vectors

12.5 Arc Length and Curvature

13. Functions of Several Variables

13.1 Introduction to Functions of Several Variables

13.2 Limits and Continuity

13.3 Partial Derivatives

13.4 Differentials

13.5 Chain Rules for Functions of Several Variables

13.6 Directional Derivatives and Gradients

13.7 Tangent Planes and Normal Lines

13.8 Extrema of Functions of Two Variables

13.9 Applications of Extrema

13.10 Lagrange Multipliers

Multivariable Taylor Series *(notes)*

14. Multiple Integration

14.1 Iterated Integrals and Area in the Plane

14.2 Double Integrals and Volume

14.3 Change of Variables: Polar Coordinates

14.4 Center of Mass and Moments of Inertia

14.5 Surface Area

14.6 Triple Integrals and Applications

14.7 Triple Integrals in Other Coordinates

14.8 Change of Variables: Jacobians

15. Vector Analysis

15.1 Vector Fields

15.2 Line Integrals

15.3 Conservative Vector Fields and Independence of Path

15.4 Green's Theorem

15.5 Parametric Surfaces

15.6 Surface Integrals

15.7 Divergence Theorem

15.8 Stokes's Theorem

Assessment and evaluation

Type	Description	Weight
Assignment	Assignments (best 9 of 10)	20
Exams (Midterms and finals)	Test 1	20
Exams (Midterms and finals)	Test 2	20
Exams (Midterms and finals)	Final Exam	40

Course guidelines and expectations

Homework: There will be periodic assignments (10 all together) to be completed and handed in for marking. They must be completed on the worksheets provided (not on blank paper), copies of which will be handed out in class. While collaboration with your classmates is permitted, you must submit your *own* work and ensure you don't let collaboration turn into plagiarism. You may not post assignment questions to, or copy solutions from, "cheat" websites such as Chegg and ChatGPT.

Due dates for assignments will be posted on the course webpage, and assignments are due by the end of class on the due dates. If you are unable to hand in a hard copy of your assignment solutions, you may scan and email me a single PDF file (not JPG images) of your assignment so long as it prints

legibly and arrives by the deadline. Solutions will be posted soon after assignments are collected. As such, *late assignments will not be accepted under any circumstances.* To further accommodate situations where a student is unable to submit his or her assignment on time (e.g. due to illness), the lowest assignment mark will be dropped when computing the assignment average.

Test Absences: If you miss a test for a legitimate reason such as illness, accident or family affliction, you should notify me (by email, phone/voicemail, or in person) *as soon as possible* and *before* the test, and be prepared to provide supporting documentation upon your return. There will be no "make-up" tests, but instead, in the event of an excused absence, the mark from your final exam, or relevant subset thereof, will replace your test mark.

School or departmental information

Math Lab (Ewing 224): This drop-in centre is freely available for your use to work on math homework and to seek help from the instructional assistant. Hours are posted on the door or online at camosun.ca/services/academic-supports/help-centres/math-help.

Academic Integrity: The Department of Mathematics and Statistics has prepared a handout called *Student Guidelines for Academic Integrity* to help you interpret college policies involving student conduct, academic dishonesty, plagiarism, etc. It is your responsibility to become familiar with the contents of the document and the college policies it references.

Calculator Policy: As per department policy, the only calculator permitted for use on tests and the final exam is the Sharp EL-531 (or EL-510R) scientific calculator. No other calculator or any other electronic device including cell phones, smartwatches, etc. is allowed.

College policies and student responsibilities

The college expects students to be responsible, respectful members of the college community. Responsible students meet expectations about attendance, assignments, deadlines, and appointments. They become familiar with academic policies and regulations, and their rights and responsibilities.

College polices are available online at the Policies and Directives page. Academic regulations are detailed on the Academic Policies and Procedures for Students page.

Policies all students should be familiar with include the Academic Integrity Policy. This policy expects students to be honest and ethical in all aspects of their studies. It defines plagiarism, cheating, and other forms of academic dishonesty. Infractions of this policy can result in loss of marks or a failing grade. To learn more about plagiarism and cheating, including the use of artificial intelligence, review the Academic Integrity Guide.

The Academic Accommodations for Students with Disabilities Policy defines how Camosun provides appropriate and reasonable academic accommodations. The Centre for Accessible Learning (CAL) coordinates academic accommodations. Students requiring academic accommodations should request and arrange accommodations through CAL. Contact CAL at least one month before classes start to ensure accommodations can be put in place in time. Accommodations for quizzes, tests, and exams must follow CAL's booking procedures and deadlines. More information is available on the CAL website.

Students must meet the grading and promotion standards to progress academically. More information is available in the Grading Policy.

The college uses two grading systems. A course will either use the standard letter grade system (A+ to F) or a competency-based approach with grades of complete, completed with distinction or not completed. Visit the Grades/GPA page for more information.

Students must meet the college's academic progress standards to continue their studies. A student is not meeting the standards of progress when a GPA falls below 2.0. The college offers academic supports for students at risk of not progressing. The Academic Progress Policy provides more details.

If you have a concern about a grade, contact your instructor as soon as possible. The process to request a review of grades is outlined in the Grade Review and Appeals Policy.

The Course Withdrawals Policy outlines the college's requirements for withdrawing from a course. Consult the current schedule of deadlines for fees, course drop dates, and tuition refunds.

If students experience a serious health or personal issue, they may be eligible for a medical or compassionate withdrawal. The Medical/Compassionate Withdrawal Request Form outlines what is required.

The Acceptable Technology Use policy ensures the use of the college network and computers contribute to a safe learning environment. This policy also applies to the use of personal devices with the college network.

Students experiencing sexual violence can get support from the Office of Student Support. This Office of Student support is a safe and private place to discuss supports and options. More information is

available on the sexual violence support and education site. Students can email oss@camosun.ca or phone 250-370-3046 or 250-370-3841.

The Student Misconduct Policy outlines the college's expectations of conduct. Students should behave to contribute to a positive, supportive, and safe learning environment.

The Ombudsperson provides an impartial, independent service to help students understand college policies.

Services for students

Successful students seek help and access college services. These services are recommended to make the most of your time at college.

Services for Academic Success

- Career Lab: Connects students with work-integrated learning experiences, including co-op placements and career fairs.
- English, Math, and Science Help Centres: Get one-on-one help with homework.
- Library: Get help with research, borrow materials, and access e-journals and e-books. Libraries at both campuses provide computers, individual and group study spaces.
- Makerspace: A place to innovate, collaborate, and learn new skills and technology in a fun, dynamic, inclusive environment.
- Writing Centre & Learning Skills: Get assistance with academic writing or meet with a learning skills specialist for help with time management, preparing for exams, and study skills.

Enrolment, Registration, and Records

- Academic Advising: Talk to an academic advisor for help with program planning.
- Financial Aid and Awards: Learn about student loans, bursaries, awards, and scholarships.
- Registration: Get information about Camosun systems, including myCamosun, and college policies and procedures.
- Student Records: Get verification of enrolment to access funding, request a transcript, or credential.

Wellness and Cultural Supports

- Counselling: It's normal to feel overwhelmed or unsure of how to deal with life's challenges. The college's team of professional counsellors are available to support you to stay healthy. Counselling is free and available on both campuses. If you need urgent support after-hours, contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

- Centre for Indigenous Education and Community Connections: Provides cultural and academic supports for Indigenous students.
- Camosun International: Provides cultural and academic supports for international students.
- Fitness and Recreation: Free fitness centres are located at both campuses.

For a complete list of college services, see the Student Services page.

Changes to this syllabus

Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change the course content or schedule. When changes are necessary the instructor will give clear and timely notice.