



## MATH-201 – Multivariable Calculus

University Arts and Science

**Effective Term & Year:** Fall 2025  
**Course Outline Review Date:** 2030-04-01

**Program Area:** Math and Sciences

### Description:

This course takes calculus from the two-dimensional world of single variable functions into the multi-dimensional world of multivariable functions. Topics include graphing, and performing calculus on parametric curves; graphing, directional limits, and derivative operations on multivariable functions; double and triple integrals and their applications; changing variables, Lagrange multipliers and Taylor series of higher than one dimension.

### Program Information:

This course can be used as either a required or elective course in an Associate of Science degree, with transfer to several degree programs at other institutions. It is recommended for second-year students wishing to major in Mathematics and designed for both to be taken for best transfer and knowledge acquisition.

**Delivery Methods:** On-campus (Face-to-Face)

**Credit Type:** College of the Rockies Credits

**Credits:** 3

**Course type/s:** Sciences

### Instructional Activity and Hours:

Activity	Hours
Classroom, Directed Studies or Online Instruction	45

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Seminar/Tutorials	
Laboratory/Studio	
Practicum/Field Experience	
Co-op/Work Experience	
Other	
Total	45

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**Course Requisites:**

- Complete all of the following
  - Completed the following:
    - [MATH104](#) – Integral Calculus (3)
  - PHYS 104 is strongly recommended.

**Prior Learning and Recognition: Yes**

Students are able to request formal recognition of their prior learning or experience outside the classroom. Challenge examination, portfolio-assisted assessment, work-based assessment or a combination of assessments that is appropriate to identify, assess, and recognize prior skills, competencies, and knowledge to achieve course credit. Tuition fees apply, refer to [Policy 2.5.5 Prior Learning Assessment and Recognition \(PLAR\)](#) or contact an education advisor for more information.

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**Course Transfer Credit:**

For information about receiving transfer credit for courses taken at either British Columbia or Alberta institutions, please see <https://www.bctransferguide.ca/> or <https://transferalberta.alberta.ca> . For more transfer credit information, please visit <https://www.cotr.bc.ca/Transfer>

All requests for course transfer credit from institutions in British Columbia or elsewhere should go to the College of the Rockies Enrolment Services office.

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**Textbook Resources:**

Textbook selection varies by instructor and may change from year to year. At the Course Outline Effective Date the following textbooks were in use:

Hass, Joel R., Heil, Christopher E., Weir, Maurice D., *Thomas's Calculus: Early Transcendentals*, 14th Edition, Pearson Education (2018)

Please see the instructor's syllabus or check COTR's online text calculator <https://textbook.cotr.bc.ca/> for a complete list of the currently required textbooks.

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## Learning Outcomes:

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

- Determine the tangent to a parametric curve in cartesian and polar coordinates;
  - Calculate arc length, curvature and torsion; and find the Frenet frame of the curve;
  - Interpret and plot Multivariable functions using level curves;
  - Calculate limits and partial derivatives for functions of several variables, calculate gradients and directional derivatives;
  - Solve applied optimization problems both without and with constraints, and use Lagrange multipliers;
  - Perform double or triple integrals in cartesian and curvilinear coordinates; and
  - Change variables of a double or triple integral, modifying the limits of the integral accordingly.
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## Course Topics:

- Parametric curves
  - Plotting
  - Tangent lines
  - calculating areas beneath
- Vector Valued Functions and Motion in Space
  - Curves in Space and Their Tangents
  - Integrals of Vector Functions, Projectile Motion
  - Arc length in Space
  - Curvature and Normal Vectors of a Curve
  - Tangential and Normal Components of Acceleration
  - Velocity and Acceleration in Polar Coordinates
- Partial Derivatives
  - Functions of several variables
  - graphing and Level curves
  - Limits and continuity in Higher Dimensions
  - Partial derivatives
  - The chain rule
  - Directional derivatives and Gradient Vectors
  - Tangent Planes and Differentials
  - Extreme Values and Saddle Points
  - Lagrange Multipliers
  - Partial Derivatives with Constrained Variables
  - Taylor Series with multiple variables

- Multiple integration
  - Double and Iterated integrals
    - In Cartesian coordinates over General Regions
    - In polar coordinates
    - Areas, moments, centers of mass
  - Triple integrals
    - In Cartesian coordinates
    - In cylindrical and spherical coordinates
    - Volumes, moments, centers of mass
  - Substitutions; the Jacobian

See instructor's syllabus for the detailed outline of weekly readings, activities, and assignments.

## Evaluation and Assessments

### Assessment Type: On-Campus (face-to-face)

Assessment Type	% of Total Grade
Assignments	20%
Midterm(s)	30%
Final Exam	50%
Total	100%

### Grade Scheme

A+	A	A-	B+	B	B-	C+	C	C-	D	F
>=90	89-85	84-80	79-76	75-72	71-68	67-64	63-60	59-55	54-50	<50

**Evaluation Notes:** A grade of “D” grants credit, but may not be sufficient as a prerequisite for sequential courses.

### **Exam Attendance:**

Students must attend all scheduled exams at the appointed time and place. Instructors may approve an alternate exam to accommodate an illness or personal crisis. Department heads will consider other written requests. Any student who misses a scheduled exam without prior approval will receive a “0” on the exam.

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### **Academic Policies:**

College of the Rockies policies related to courses can be found at <https://cotr.bc.ca/about-us/college-policies/> and include the following:

- Policy 2.1.4 Course Audit
  - Policy 2.4.1 Credential Framework
  - Policy 2.4.3 Students with Documented Disabilities
  - Policy 2.4.4 Student Rights, Responsibilities and Conduct
  - Policy 2.4.8 Academic Performance
  - Policy 2.4.9 Student Feedback and Concerns
  - Policy 2.4.11 Storage of Academic Works
  - Policy 2.5.3 Student Appeal
  - Policy 2.5.5 Prior Learning Assessment and Recognition (PLAR)
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### **Course Changes:**

The College of the Rockies updates course outlines regularly to meet changing educational, employment and marketing needs. The instructor will notify students in writing of any updates to this outline during the semester. The instructor reserves the right to revise, add or delete material while meeting the learning outcomes of this course outline.