



Multivariable Calculus – MATH 201

University Studies Program

Course Outline

COURSE IMPLEMENTATION DATE: Pre 1998
OUTLINE EFFECTIVE DATE: September 2018
COURSE OUTLINE REVIEW DATE: April 2023

GENERAL COURSE DESCRIPTION:

This course takes calculus from the two dimensional world of single variable functions into the three dimensional world, and beyond, of multivariable functions. Topics include vector geometry and the analytic geometry of lines, planes, and surfaces; calculus of curves in two and three dimensions, including arc length and curvature; calculus of scalar valued functions of several variables, including partial and directional derivatives, the gradient, the chain rule, Lagrange multipliers and optimization problems.

Program Information: This course is a required course for a Bachelor of Science degree in most universities. It can be used as three of the six units in Calculus which are required for an Associate of Science degree at College of the Rockies. A student should take both MATH 201 and 202, or MATH 205.

Delivery: This course is delivered face to face.

COTR Credits: 3

Hours for this course: 45 hours

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours	45
Seminars / Tutorials	
Laboratory / Studio Hours	
Practicum / Field Experience Hours	
Other Contact Hours	
Total	45

Practicum Hours (if applicable):

Type of Practicum	Duration
On-the-job Experience	N/A
Formal Work Experience	N/A
Other	N/A
Total	

Course Outline Author or Contact:

Leslie Molnar, B.Sc., M.A.

Signature

APPROVAL SIGNATURES:

Department Head
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Department Head Signature

Dean Signature

EDCO

Valid from: September 2018 – April 2023

Education Council Approval Date

COURSE PREREQUISITES AND TRANSFER CREDIT:

Prerequisites: MATH 104. PHYS 104 is strongly recommended.

Corequisites: None

Flexible Assessment (FA):

Credit can be awarded for this course through FA Yes No

Learners may request formal recognition for flexible assessment at the College of the Rockies through one or more of the following processes: External Evaluation, Worksite Assessment, Demonstration, Standardized Test, Self-assessment, Interview, Products/Portfolio or Challenge Exam. Contact an Education Advisor for more information.

Transfer Credit: For transfer information within British Columbia, Alberta and other institutions, please visit <http://www.cotr.bc.ca/Transfer>

Students should also contact an academic advisor at the institution where they want transfer credit.

Prior Course Number: N/A

Textbooks and Required 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

<http://go.cotr.bc.ca/tuition/tCalc.asp> for a complete list of the currently required textbooks.

LEARNING OUTCOMES:

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

- perform calculations involving vectors and vector-valued functions in two and three dimensional space including dot and cross products
- sketch, identify, and find intersections of various three dimensional figures including lines, planes, cylinders, and quadric surfaces
- calculate arc length, curvature and torsion; and find the Frenet frame of the curve
- calculate partial derivatives for functions of several variables, calculate gradients and directional derivatives
- solve applied optimization problems both without and with constraints. Use Lagrange multipliers

This course should help students

- use written and oral communication skills effectively, employing methods appropriate to message and context.
 - think clearly and critically, fusing experience, knowledge, and reasoning into considered judgment.
 - identify, interpret, and solve problems, effectively implementing and evaluating proposed strategies.
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COURSE TOPICS:

- Vectors and Geometry of Space
 - Three-Dimensional Coordinate Systems
 - Vectors
 - Dot and cross products
 - Lines and planes in Space
 - Cylinders and quadric surfaces
- 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
 - 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

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

EVALUATION AND ASSESSMENT (Face to Face Delivery):

Assignments	% Of Total Grade
Assignments	20%
Midterm Tests – Best 2 of 3	30%
Final Exam	<u>50%</u>
Total	100%

Please see the instructor's syllabus for specific classroom policies related to this course, such as details of evaluation, penalties for late assignments, and use of electronic aids.

EXAM POLICY:

Students must attend all required scheduled exams that make up a final grade at the appointed time and place.

Individual instructors may accommodate for illness or personal crisis. Additional accommodation will not be made unless a written request is sent to and approved by the appropriate Department Head prior to the scheduled exam.

Any student who misses a scheduled exam without approval will be given a grade of "0" for the exam.

COURSE GRADE:

Course grades are assigned as follows:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Mark (Percent)	≥ 90	89-85	84-80	79-76	75-72	71-68	67-64	63-60	59-55	54-50	< 50

A grade of "D" grants credit, but may not be sufficient as a prerequisite for sequential courses.

ACADEMIC POLICIES:

See www.cotr.bc.ca/policies for general college policies related to course activities, including grade appeals, cheating, and plagiarism.

COURSE CHANGES:

Information contained in course outlines is correct at the time of publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational, employment, and marketing needs. The instructor will endeavour to provide notice of changes to students as soon as possible. The instructor reserves the right to add or delete material from courses.