



MATH-104 – Integral Calculus

University Arts and Science

Effective Term & Year: Fall 2023
Course Outline Review Date: 2028-03-01

Program Area: Math and Sciences

Description:

Students work with polynomial, rational, logarithmic, exponential, trigonometric, inverse functions. They will learn integration techniques (substitution, parts, partial fractions, trigonometric substitution, numerical methods), applications of integration (volumes of revolution, work, l'Hôpital's rule and improper integrals; sequences and series; convergence tests (divergence, integral, comparison, limit comparison, ratio, root, and alternating series tests), Power, Maclaurin and Taylor series, and differential equations.

Calculus is a necessary step in any career in the sciences including Biology, Chemistry, Commerce, Computer Science, Engineering, Geology, Mathematics, Medicine, and Physics. It is also useful in any field which uses Statistics to analyze data.

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.

Delivery Methods: On-campus (Face-to-Face), Online

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
Seminar/Tutorials	
Laboratory/Studio	15
Practicum/Field Experience	
Co-op/Work Experience	
Other	
Total	60

Course Requisites:

- Complete all of the following
 - Completed the following:
 - **MATH103** – Differential Calculus (3)
 - Or a score of 4 or 5 on the AP Calculus.

Flexible Assessment: Yes

In some cases students may be able to apply for recognition of prior learning outside the classroom. This flexible assessment process provides equivalent course credit. It is a rigorous process that may include external evaluation, worksite assessment, demonstration, standardized test, self-assessment, interview, products/portfolio, and challenge exam, or other measures as appropriate. Tuition fees apply. Contact an education advisor for more information.

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.

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:

Guishard, D. *Calculus – Early Transcendentals – An Open Text*, Lyryx Learning, Creative Commons License (CC BY-NC-SA), 2018

Weir, Maurice D., Hass, Joel, and Giordano, Frank R., *Thomas' Calculus, Early Transcendentals*, 11th Edition.

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.

Learning Outcomes:

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

- demonstrate an expansion of knowledge of algebra and differential calculus;
 - employ a variety of formal problem solving methods;
 - formalize methods of problem solving;
 - work with algebraic and transcendental functions, such as logarithmic, exponential, trigonometric, and inverse trigonometric functions;
 - integrate functions, using a variety of techniques (parts, substitution, trig. substitution, partial fractions, numerical, etc.);
 - use integration techniques to find volumes of solids of revolution, surfaces of revolution, arc length;
 - use l'Hôpital's rule to aid in evaluating improper integrals;
 - work with sequences and series, and employ a variety of tests to determine the convergence of series;
 - work with and apply Taylor, Maclaurin, and Power series;
 - solve selected first order differential equation; and
 - use technology (Maple) as a tool in the problem solving process.
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Course Topics:

- Review of antiderivatives
- Riemann sums of areas under curves and fundamental theorem of calculus
- Sigma notation
- Techniques of integration: integration by parts, partial fraction decomposition, trigonometric integrals, trigonometric substitutions, numerical integration
- Applications of integration: volumes, lengths, centres of mass, work,
- Sequences and series
- Tests for convergence: integral test, comparison tests, ratio and root tests, alternating series test; absolute and conditional convergence; and,
- Power series: Taylor and Maclaurin series, applications.

Optional Topics

- Separable differential equations
- Euler's method
- Polar coordinates: graphing, derivatives, integrals and areas
- Parametric Equations: graphing, derivatives, integrals and areas

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 and Quizzes	20%
Midterms	30%
Maple labs	10%
Final Exam	40%
Total	100%

Assessment Type: Online

Assessment Type	% of Total Grade
Assignments	20%
Midterm Exam	30%
Maple Labs	10%
Final Exam	40%
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.

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 2.4.3 Students with Documented Disabilities
 - Policy 2.4.4 Student Conduct (plagiarism, other cheating, behavioral misconduct)
 - Policy 2.5.8 Academic Performance
 - Policy 2.5.3 Grade Appeal
 - Policy 2.4.9 Student Concerns Re Faculty
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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.