Integral Calculus – MATH 104
University Studies Program

Course Outline

COURSE IMPLEMENTATION DATE:	Pre 1998
OUTLINE EFFECTIVE DATE:	September 2023
COURSE OUTLINE REVIEW DATE:	March 2028

GENERAL COURSE 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: This course is delivered face to face or online.

COTR Credits: 3

Hours for this course: 60 hours

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours	45
Seminars / Tutorials	
Laboratory / Studio Hours	15
Practicum / Field Experience Hours	
Other Contact Hours	
Total	60

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:

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Signature

APPROVAL SIGNATURES:

Department Head   Dean of Business and University Studies
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Department Head Signature   Dean Signature

EDCO

Valid from: September 2023 – March 2028

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Education Council Approval Date

COURSE PREREQUISITES AND TRANSFER CREDIT:

Prerequisites: MATH 103 or equivalent; or a score of 4 or 5 on the AP Calculus.

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, 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:

> 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.

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 ASSESSMENT (Face to Face Delivery):

Assignments	% Of Total Grade
Assignments and Quizzes	20%
Midterm(s)	30%
Maple labs	10%
Final Exam	40%
Total	100%

EVALUATION AND ASSESSMENT (Online Delivery):

Assignments	% Of Total Grade
Assignments	20%
Midterm Exam	30%
Maple Labs	10%
Final Exam	40%
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.