



Differential Calculus – MATH 103

University Studies Program

Course Outline

COURSE IMPLEMENTATION DATE: Pre 1998
OUTLINE EFFECTIVE DATE: September 2020
COURSE OUTLINE REVIEW DATE: March 2025

GENERAL COURSE DESCRIPTION:

This course is intended for students who are pursuing a Bachelor of Science degree. Topics include: functions, limits, continuity, derivatives, their interpretation, differentiation rules, techniques of differentiation, implicit differentiation, inverse functions, exponential functions, logarithms, applications of differentiation such as linear approximations, Newton’s method, related rates, analysis of graphs, and optimization, the Mean Value Theorem, definite and indefinite integrals, integration by substitution, Riemann sums, and applications of integration.

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 and 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:

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Department Head Signature

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EDCO

Valid from: September 2020 – March 2025

Education Council Approval Date

COURSE PREREQUISITES AND TRANSFER CREDIT:

Prerequisites: Either a minimum of 65% in Math 090, Math 100, or Principles 12; or Pre-Calculus 11 AND Pre-Calculus 12 with a minimum of 65%; or Pre-Calculus 12 and a minimum of 75% in Calculus 12.

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.

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:

Guichard, D. *Calculus – Early Transcendentals – an Open Text*, Lyryx Learning, Creative Commons Licence (CC-BY-NC-SA), 2018

Weir, Maurice D., Hass, Joel, and Giordano, Frank R., *Thomas' Calculus, Early Transcendentals*, 13th Edition, 2014.

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

- demonstrate an expansion of his/her previous knowledge of algebra;
 - employ a variety of formal problem solving methods;
 - examine, strengthen and formalize own methods of approaching mathematical problem solving;
 - reflect on the usefulness of mathematics by reading about, interpreting and finding applications for all the concepts studied;
 - work with a variety of functions, including polynomials, rational functions, logarithmic, exponential, trigonometric, inverse trigonometric, and hyperbolic functions;
 - calculate limits, and use limits to analyze the continuity of a function and of its derivative;
 - employ a variety of techniques and rules to find derivatives;
 - apply the derivative to solve applied problems including related rates, optimization, rectilinear motion, and curve sketching;
 - recognize the underlying concepts behind derivatives and integrals;
 - summarize how to integrate functions, using both Riemann sums, antiderivatives, and substitution;
 - apply the integral to find areas and volumes;
 - begin to use a computer algebra system (Maple) to find derivatives, integrals, graphs of functions, and other applications of calculus; and
 - discover that math can be both enjoyable and useful!
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COURSE TOPICS:

- Algebra and geometry review
- Functions (including inverse, exponential, logarithmic, trigonometric, inverse trigonometric, and hyperbolic) and transformations of functions
- Limits and continuity, including the epsilon-delta definition of a limit
- Newton's quotient, and derivative rules and techniques
- Analysis of functions and their graphs
- Applications of the derivative, including related rates and optimization
- Newton's method

- L'Hôpital's Rule
- Riemann sums, sigma notation, and integration
- Applications of the integral including areas, volumes, and average value

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
Final exam	40%
Midterms – Best 2 of 3	30%
Assignments	20%
Maple labs	<u>10%</u>
Total	100%

EVALUATION AND ASSESSMENT (Online Delivery):

Assignments	% Of Total Grade
Final exam	40%
Midterm	30%
Lyryx assignments	10%
Online course based assignments	10%
Maple labs	<u>10%</u>
Total	100%

Please see the instructor 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. In the case of online delivery, students are responsible for arranging and paying for properly invigilated midterm and final exams.

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.