MATH-103 – Differential Calculus

University Arts and Science

Effective Term & Year: Fall 2022
Course Outline Review Date: 2025-03-01

Program Area: Math and Sciences

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 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 1 of the following
  - Earned a minimum grade of C+ (65%) in each of the following:
    - PREC 11 – Pre-Calculus 11
    - PREC 12 – Pre-Calculus 12
  - Complete all of the following
    - Completed the following:
      - PREC 12 – Pre-Calculus 12
    - Earned a minimum grade of B (75%) in each of the following:
      - CALC 12 – Calculus 12
  - Earned a minimum grade of C+ (65%) in at least 1 of the following:
    - MATH090 – Mathematics – Provincial Level
    - MATH100 – Pre-Calculus (3)

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 other BC institutions, please see http://www.bctransferguide.ca. All requests for course transfer credit from institutions in BC or elsewhere should go to the College of the Rockies Enrollment 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:

Guichard, D. *Calculus – Early Transcentals – 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 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 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!

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’Hoptial’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 Assessments

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

Assessment Type	% of Total Grade
Final exam	40%
Midterms – Best 2 of 3	30%
Assignments	20%
Maple labs	10%
Total	100%

Assessment Type: Online

Assessment Type	% of Total Grade
Final exam	40%
Midterm	30%
Lyryx assignments	10%
Online course based assignments	10%
Maple labs	10%
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

Pass requirements: None

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

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.