ORIGINAL COURSE IMPLEMENTATION DATE:	January 2006
REVISED COURSE IMPLEMENTATION DATE:	September 2023
COURSE TO BE REVIEWED (six years after UEC approval)**:**	December 2028

Course outline form version: 09/08/2021

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 340	**Number of Credits:** 3 Course credit policy (105)
Course Full Title: Introduction to Analysis **Course Short Title:** Introduction to Analysis	
Faculty: Faculty of Science	**Department (or program if no department):** Mathematics & Statistics

Calendar Description:

Introduces some of the fundamental ideas of mathematical analysis, the subject which forms the rigorous foundation for calculus. Limits and convergence of sequences and functions, continuity, differentiability, Cauchy sequences, the Extreme and Mean Value theorems, uniform continuity, convergence and uniform convergence of infinite series, Taylor series, and the Riemann integral.

Prerequisites (or NONE):	MATH 265.
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number: **MATH 214, MATH 320**

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	50
Total hours	**50**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Course Details

Special Topics course: **No**

(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**

(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Every other year**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See **bctransferguide.ca**.)*

Transfer credit already exists: **Yes**

Submit outline for (re)articulation: **No**

(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**	October 2022
Faculty Council approval	**Date of meeting:**	November 4, 2022
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	December 16, 2022

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

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

1. Prove basic results in real analysis using accepted mathematical reasoning and formal proof structure.
2. Use the definition of convergence or apply basic theorems related to this definition to prove formally that a given sequence does or does not converge.
3. Use the definition of the limit of a function or apply basic theorems related to this definition to prove formally that a given function does or does not have a limit at a particular point.
4. Use the definition of continuity or apply basic theorems related to this definition to prove formally that a given function is or is not continuous at a particular point.
5. Apply core results of calculus such as the Intermediate Value Theorem, the Extreme Value theorem, the Mean Value theorem, and Fundamental Theorem of Calculus.
6. Define the Riemann integral and prove the fundamental properties of this integral.
7. Prove convergence theorems for series such as the Ratio test and apply them to test convergence of series.
8. Apply tests such as the Weierstrass M-test to prove uniform convergence of series and integrals.
9. Construct precise error estimates on Taylor polynomial approximations to smooth functions.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	35%	Assignments:	25%	Quizzes/tests:	40%
	%	[click to select]	%	[click to select]	%

Details:

Students must achieve at least 40% on the final exam in order to receive credit for this course

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	Bartle, R.G. and D. Sherbert	Introduction to real analysis, Wiley	2011
2.	Textbook	Abbot, Stephen	Understanding Analysis	2001
3.	Textbook	Berberian, S.K.	A first course in real analysis, Springer-Verlag	1994
4.	Textbook	Rudin, W.	Principles of mathematical analysis	1976
5.				

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Course Content and Topics

I) Limits, Continuity, Differentiability:
   1) Limit of a sequence, Cauchy sequences, Bolzano-Weierstrass property
   2) Limit of a function
   3) Continuity
   4) Differentiability

II) Applications of continuity and differentiability:
   1) Extreme Value theorem
   2) Mean Value theorem
   3) Fundamental theorem of calculus
   4) Uniform continuity

III) Infinite Series:
   1) Series of constants – convergence, proofs of convergence tests
   2) Series of functions – convergence, uniform convergence, tests for uniform convergence – Weierstrass M-test, Abel and Dirichlet tests – continuity and differentiability of functions defined using series
   3) Taylor series – uniform approximation by polynomials, analytic functions

IV) Integrals
   1) The Riemann integral
   2) Improper integrals – absolute and conditional convergence
   3) Integrals that depend on a parameter – uniform convergence