ORIGINAL COURSE IMPLEMENTATION DATE: January 2006
REVISED COURSE IMPLEMENTATION DATE: September 2015
COURSE TO BE REVIEWED: (six years after UEC approval) February 2021
Course outline form version: 05/29/14

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 (if title exceeds 30 characters):

Faculty: Faculty of Science **Department (or program if no department):** Mathematics & Statistics

Calendar Description:

Provides an introduction to 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, the Riemann integral, and improper integrals.

Note: Students with credit for MATH 214 OR MATH 320 cannot take this course for further credit.

Prerequisites (or NONE): MATH 265

Corequisites (if applicable, or NONE):

Equivalent Courses (cannot be taken for additional credit)
Former course code/number: **MATH 214, MATH 320**
Cross-listed with:
Equivalent course(s):
Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit
Transfer credit already exists: ☐ Yes ☒ No

Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☒ No (if yes, fill in transfer credit form)

Resubmit revised outline for articulation: ☐ Yes ☒ No

To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 45
Typical structure of instructional hours:

Lecture hours	
Seminars/tutorials/workshops	45
Laboratory hours	
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**45**

Special Topics
Will the course be offered with different topics?
☐ Yes ☒ No

If yes, different lettered courses may be taken for credit:
☒ No ☐ Yes, repeat(s) ☐ Yes, no limit

Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 36

Expected frequency of course offerings (every semester, annually, every other year, etc.): Every second year

Department / Program Head or Director: Cynthia Loten	**Date approved:**	September 29, 2014
Campus-Wide Consultation (CWC)	**Date of posting:**	January 23, 2015
Faculty Council approval	**Date approved:**	October 2014
Dean/Associate VP: Lucy Lee	**Date approved:**	October 17, 2014
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	February 27, 2015

Learning Outcomes

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

1. Exhibit an understanding of the notion of convergence and limit by stating definitions and using formal epsilon-N-delta arguments to prove the convergence of sequences and series and to prove the continuity and differentiability of functions.
2. Prove basic theorems in analysis using accepted mathematical reasoning and proof structure.
3. Demonstrate the importance of continuity, differentiability and integrability by applying theorems such as the Extreme Value theorem, the Mean Value theorem, and Fundamental theorem of calculus.
4. Define the Riemann and improper Riemann integrals and prove their fundamental properties.
5. Prove convergence theorems for series such as the Ratio test and apply them to test convergence of series.
6. Use tests such as the Weierstrass M-test to prove uniform convergence of series and integrals.
7. Use Taylor polynomials to approximate smooth functions and give precise error estimates on the approximation.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

This course is primarily lecture-based. Evaluation includes quizzes, tests and a final exam.

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

Typical Text(s) and Resource Materials (if more space is required, download supplemental Texts and Resource Materials form)

	Author Surname, Initials	Title (article, book, journal, etc.)	Current Ed.	Publisher	Year
1.	Bartle, R.G. and D. Sherbert	Introduction to real analysis	☐	Wiley	2011
2.	Berberian, S.K.	A first course in real analysis	☐	Springer-Verlag	1994
3.	Rudin, W.	Principles of mathematical analysis	☐	McGraw-Hill	1976

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

Typical Evaluation Methods and Weighting

Final exam:	40%	Assignments:	20%	Midterm exam:	30%	Practicum:	%
Quizzes/tests:	10%	Lab work:	%	Field experience:	%	Shop work:	%
Other:	%	Other:	%	Other:	%	Total:	100%

Details (if necessary): Students must achieve at least 40% on the final exam in order to receive credit for this course

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☐ No ☒

Typical 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