OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE: May 1977
COURSE REVISED IMPLEMENTATION DATE: January 2014
COURSE TO BE REVIEWED: January 2020
(six years after UEC approval) *(month, year)*

OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

MATH 111	Science/Mathematics and Statistics	4
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS

Calculus I
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

The study of calculus represents a major step in your education. Mathematics, previous to this subject, dealt with the description of static phenomena. During the latter part of the 17th century, a mathematical description was developed to describe and predict changing phenomena. This mathematics of change is now called calculus.

Topics include limits, derivatives, applications of derivatives such as analysis of function behaviour, optimization and related rates, antidifferentiation, polar coordinates, and parametric functions.

Note: Students with credit for MATH 141 (formerly MATH 115) cannot take this course for further credit.
Note: MATH 094 is a prerequisite for MATH 095.

PREREQUISITES: One of the following: (B or better in one of Principles of Math 12, Precalculus 12, or MATH 096) or (B or better in MATH 095) or (C+ or better in MATH 110) or (at least 70% on the MDPT).

COREQUISITES:
PRE or COREQUISITES:

SYNONYMOUS COURSE(S):
(a) Replaces:
(b) Cross-listed with:
(c) Cannot take: MATH 115, 141 for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: **75**
STRUCTURE OF HOURS:

Lectures:	**75**	Hrs
Seminar:		Hrs
Laboratory:		Hrs
Field experience:		Hrs
Student directed learning:		Hrs
Other (specify):		Hrs

TRAINING DAY-BASED INSTRUCTION:
Length of course:
Hours per day:

OTHER:
Maximum enrolment: **36**
Expected frequency of course offerings: Fall & Winter
(every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☒ Yes	☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☐ Yes	☐ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☒ Yes	☐ No

Course designer(s):	**Calculus Group**		
Department Head:	**Cindy Loten**	Date approved:	**April 29, 2013**
Campus Wide Consultation (CWC)		Date of meeting:	**n/a**
Curriculum Committee chair:	**Dave Fenske**	Date approved:	**June 21, 2013**
Dean/Associate VP:	**Lucy Lee**	Date approved:	**June 21, 2013**
Undergraduate Education Committee (UEC) approval		Date of meeting:	**September 27, 2013**

LEARNING OUTCOMES:

Building upon their knowledge of functions and function notation, successful students will be able to:

- demonstrate proficiency with the basic concepts and language of differential calculus,
- work with the derivative graphically and numerically, as well as algebraically,
- explain techniques of differentiation for algebraic and transcendental functions;
- demonstrate proficiency with the use of technology to explore mathematical concepts,
- use their knowledge of the derivative to model and solve problems from various disciplines, and
- communicate their approach to and solution of such problems.

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures are interspersed with problem sessions; evaluation includes assignments, midterms, and a three-hour comprehensive final. Graphing calculators will be used. In addition, mathematical software may be used.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☐ Examination(s) ☐ Portfolio assessment ☐ Interview(s)

☒ Other (specify): Please check online at http://www.ufv.ca/math/challenge.htm for the departmental challenge policy

☐ PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS: *[Textbook selection varies by instructor. Examples for this course might be:]*

The textbook is chosen by a departmental curriculum committee. Recent texts include:
Hughes-Hallett, Gleason, et al., Calculus, second edition, Wiley, 1998.
Stewart, Single Variable Calculus, Early Transcendentals, fourth edition, Brooks/Cole, 1999.

SUPPLIES / MATERIALS:

A graphing calculator (without a computer algebraic system) will be required.

STUDENT EVALUATION: *[An example of student evaluation for this course might be:]*

The weighting of the various components may vary from instructor to instructor and from year to year, although there must be at least two midterms, and the comprehensive final exam must be worth from 30% to 50% of the final grade.

An example of student evaluation for this course:

Quizzes/assignments	20%
Midterm exams	40%
Final exam	40%

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

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COURSE CONTENT: *[Course content varies by instructor. An example of course content might be:]*

Exact course content and ordering may vary slightly from year to year but will encompass the following:

I. Preliminaries:
1. brief review of functions, functional notations, and graphs*
2. review of special functions and their graphs*: power, polynomial, exponential, inverse, logarithmic, trigonometric

II. The Derivative:
1. introduction to derivatives and limits
2. interpretation of the derivative as a rate of change
3. geometric interpretation of first and second derivatives
4. definition of derivatives using numerical methods*
5. formal definition of the derivative
6. limits and continuity
7. local linearity*

Course content continued:

III. Differentiation of Special Functions:
1. power functions
2. exponential functions
3. product, quotient, chain rules
4. trigonometric functions, inverse trigonometric functions
5. implicitly-defined functions
6. logarithmic differentiation

IV. Applications of the Derivative:
1. curve sketching* and analysis of function behaviour; Mean Value Theorem
2. analysis of families of curves
3. optimization problems from various disciplines, which may include physics, chemistry, biology, population studies, economics
4. related rates problems from various disciplines
5. Newton's method*
6. L'Hopital's rule

V. Antiderivatives

VI. Polar Curves and Parametric Functions
1. polar coordinates and curves*, with applications
2. differentiation of polar curves
3. parametric functions* and applications
4. differentiation of parametric functions

*While graphing calculators and/or technology are used throughout the course, they are particularly useful in helping students explore these concepts.