COURSE IMPLEMENTATION DATE: January 2006
COURSE REVISED IMPLEMENTATION DATE:
COURSE TO BE REVIEWED: September 2009
(Four years after UPAC Final Approval Date) (MONTH YEAR)

OFFICIAL 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 and the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **Science, Health & Human Services / Mathematics & Statistics**

MATH 265		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Transition to Advanced Mathematics
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

Students will learn to understand the language of mathematics through careful statement of definitions and construction of proofs. Important topics will be strategies for writing proofs of theorems, and how to effectively communicate mathematics to others. Upon completion of this course students will be better prepared to take upper-level mathematics courses.

The mathematical contexts are the elementary theories of sets, integers, and the real numbers, which themselves form an essential background for subsequent courses.

This course is a prerequisite for the mathematics major degree and an important course for anyone studying mathematics.

Note: Students who have credit for Math 214 may not take Math 265 for further credit.

PREREQUISITES: **Math 112 with a C+ or higher**
COREQUISITES:

SYNONYMOUS COURSE(S)
(a) Replaces: _____ *(Course #)*
(b) Cannot take: **Math 214** *(Course #)* for further credit.

SERVICE COURSE TO: _____ *(Department/Program)* _____ *(Department/Program)*

TOTAL HOURS PER TERM: **60**
STRUCTURE OF HOURS:

Lectures:	**60**	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:

MAXIMUM ENROLLMENT: **36**
EXPECTED FREQUENCY OF COURSE OFFERINGS: **annually**

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

AUTHORIZATION SIGNATURES:

Course Designer(s): Greg Schlitt / Erik Talvila / Ian Affleck
Chairperson: Gillian Mimmack *(Curriculum Committee)*
Department Head: Gillian Mimmack
Dean: Jacalyn Snodgrass
UPAC Approval in Principle Date:
UPAC Final Approval Date: September 30, 2005

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

Successful students will:
(1) Be able to read, criticize, and construct mathematical arguments:
(a) Understand the common means of communication of mathematics: definition, proof, example, counterexample, etc. and be able to communicate elementary ideas via those means.
(b) Understand the basic ideas of propositional logic, and the role these play in formulating definitions and proofs.
(c) Recognize basic argument forms (contradiction, induction etc) in written mathematics, and write such arguments.

(2) Be able to reason effectively about a mathematical proposition and work towards proof or counterexample and be able to employ reasoning techniques such as generalization, specialization, method of counterexample, alternate representation etc.

(3) Communicate mathematical constructions and arguments clearly and effectively in written form:
(a) Be able to clearly guide a reader through an argument or construction of an example.
(b) Anticipate what needs to be provided to a reader, and what may be assumed.

(4) Be familiar with basic notions of elementary set theory and in particular understand the notions of subset, Cartesian product, functions, relations, equivalence relation, quotient structure etc.

(5) Be familiar with the elementary structure of the real numbers:
(a) Understand the meaning of the axioms for the real numbers (and the significance of the axiomatic approach in general).
(b) Understand and be able to construct elementary arguments and examples using concepts of order, cardinality, density, supremum.
(c) Recognize the complex numbers, understand their properties (as a field enlarging the reals) and be able to calculate effectively with them.

(6) Be familiar with the elementary structure of the integers:
(a) Understand the meaning of the axioms for the integers.
(b) Understand and construct elementary arguments and examples using concepts such as primality, factorization, modulus etc.

METHODS:

The course will be primarily lecture-based

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check:) ☒ Yes ☐ No

METHODS OF OBTAINING PLAR:

Please check online at http://www.ucfv.ca/math/challenge.htm for the departmental challenge policy.

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

The text is chosen by a departmental curriculum committee.

Recommended texts are:
Daepp & Gorkin. 2000. Reading, Writing and Proving, A Closer Look at Mathematics. Springer Verlag.
Galovich. 1993. Doing Mathematics. Brooks/Cole.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

Assignments	20%
Quizzes	20%
Tests	30%
Final Exam	30%

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

COURSE CONTENT:

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

The techniques of construction and communication of mathematical argument are an essential part of the course, to be covered explicitly, rather than assumed. They will be distributed throughout the course as part of the material being discussed at the time, rather than dealt with in the abstract. In particular the following will be included:

(1) Argument forms (methods of proof): contradiction, contrapositive, direct, induction, cases etc.

(2) "How to prove it:" softer notions of how to solve a problem/construct an argument: generalization, specialization, working backwards, representation.

(3) "How to write it:" communicating an argument (guiding a reader towards your solution).

(4) Language of mathematics: this material would be covered near the beginning of the course
- (a) Logic (propositional logic), notions of converse, contrapositive etc.
- (b) Basic set theory (include infinite index sets for unions, Cartesion products etc.), functions.
- (c) Relations, equivalence relations, quotient set.
- (d) Quantifiers (predicate calculus) negation of statements. Proving and disproving universal and existential statements.

An example: The integers. The integers provide a natural place to learn how to read and construct arguments, and a natural source of examples to illustrate the ideas of logic, quantifiers etc.
- (a) The integers (from the axioms)
- (b) Primes/divisibility
- (c) Modular arithmetic (example of quotient structures)

An example: The real numbers. Basic arguments/facts from analysis are covered both to provide a concrete place for the students to construct arguments, and also just to provide some basic analysis.
- (a) Axioms for the reals (and basic facts which follow, as an exercise in proof construction from axioms)
- (b) Supremum, infimum, completeness
- (c) Density of rationals, dense sets in general
- (d) Cardinality (uncountability of R, countability of Q, general cardinality arguments)
- (e) Sequences (if time) an introduction to epsilon-N arguments, basic theorems, another statement of the completeness axiom, decimal representation. (If time is short, decimal representation could be done via supremum infimum (Dedekind cuts))