UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE: September 2008
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 444		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Metric Spaces
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

Metric spaces are sets with a generalized notion of distance. This is a wide-reaching concept and it allows us to define properties such as continuity and convergence in many more settings than the real line. Topics will include examples of metric spaces, topological concepts such as open and closed sets, convergence, completeness, and continuity. Further topics will be drawn from contraction mappings, normed spaces, topological spaces, and fractals.

PREREQUISITES: **MATH 340 or MATH 320**
Note: As of September 2009 the prerequisites will change to the following: MATH 221 and either MATH 320 or MATH 340.

COREQUISITES:

SYNONYMOUS COURSE(S)
(a) Replaces: _____ *(Course #)*
(b) Cannot take: _____ *(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: **Every third year**

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
Chairperson: Gillian Mimmack *(Curriculum Committee)*
Department Head: Gillian Mimmack
Dean: Jacalyn Snodgrass
PAC Approval in Principle Date:
PAC Final Approval Date: Aug. 31, 2007

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

On completion of the course, the successful student will be able to:
1. State the definition of metric space, recognize metric spaces as such, establish that a given space is a metric space.
2. Be able to define the appropriate topological concepts such as connectedness, compactness, completeness, boundary, limit point. Exhibit understanding of these concepts by constructing formal arguments to establish elementary results and establishing the truth or falsity of elementary statements.
3. Discuss convergence in terms of Cauchy sequences, construct the completion of a metric space, be able to state and use the theorems regarding completeness and compactness.
4. State various definitions of continuity, and use them to establish the continuity or discontinuity of given functions. Show via elementary formal arguments an understanding of the role continuity plays in the various minor and major results (e.g. preservation of compactness under continuous functions, fixed point theorems).
5. Exhibit a good knowlege and understanding of the various applications of the theory of metric spaces (e.g. to establish the existence of solutions to integral equations) .

METHODS:

This 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 textbook is chosen by a departmental curriculum committee. Recommended texts are:

V. Bryant. 1985. Metric Spaces. Cambridge University Press.
T. W. Gamelin and R. E. Greene. 1999. Introduction to Topology. Dover.
S. Lipschutz. 1965. Schaum's Outline of Theory and Problems of General Topolgy. McGraw-Hill.
R. B. Reisel. 1983. Elementary Theory of Metric Spaces. Springer-Verlag.
W. A. Sutherland. 1975. Introduction to Metric and Topological Spaces. Oxford University Press.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

Assignments	40%
Term Tests	20%
Final Exam	40%

Students must obtain at least 40% on the final exam in order to pass the course.

COURSE CONTENT:

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

1. Definition of metric spaces, examples.
2. Subspaces, product spaces.
3. Toplogy--open, closed, bounded, connected, compact, interior, boundary.
4. Equivalent metrics, isometries.
5. Sequences--convergence, Cauchy sequences.
6. Complete spaces, completions.
7. Limit points, perfect sets.
8. Continuous functions--mapping properties of functions and inverses, homeomorphisms, extreme value theorem.
9. Contraction mapping theorem--proof, applications to algebraic, differential or integral equations.
10. Topological spaces--open sets, neighbourhoods, compactness, bases, continuous functions.