UNIVERSITY COLLEGE of the FRASER VALLEY

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 440		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Fourier Analysis
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

Fourier analysis is the study of functions by decomposing them into expansions in trigonometric functions. This can be done on the circle, real line or on groups. These expansions have many applications in mathematics to such areas as ordinary and partial differential equations, signal processing and rapid numerical computations. Topics are: Fourier series and their properties, Fourier transforms, distributions, and Fast Fourier transform.

PREREQUISITES: **Math 255 and one of 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 second 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): Erik Talvila
Chairperson: Gillian Mimmack *(Curriculum Committee)*
Department Head: Gillian Mimmack
Dean: Jacalyn Snodgrass
PAC Approval in Principle Date:
PAC Final Approval Date: September 30, 2005

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

On completion of the course, the successful student will be able to:

1. Prove properties of Fourier expansions in three settings: the circle, the line, and finite Abelian groups.
2. Demonstrate the differences and uses of pointwise, mean-square and summability covergence.
3. Apply Fourier series and transforms to solution of boundary value problems.
4. Prove results such as the Riemann-Lebesgue Lemma and Poisson summation formula.
5. Use the Fast Fourier Transform to compute discrete Fourier coefficients.
6. Formulate Fourier theorems on distributions.

METHODS:

This course is 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:

D. Kammler. 2000. A First Course in Fourier Analysis. Prentice-Hall
T.W. Korner. 1998. Fourier Analysis. Cambridge University Press.
E.M. Stein and R. Shakarchi. 2003. Fourier Analysis. Princeton University Press.
A. Vretblad. 2003. Fourier Analysis and its Applications. Springer-Verlag.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

Assignments	30%
Term Tests	30%
Final Exam	40%

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

COURSE CONTENT:

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

1. Periodic functions, Fourier coefficients, differentiation and integration of Fourier series. Proofs of basic properties.
2. Pointwise convergence, summability of Fourier series.
3. Orthogonal functions, mean-square convergence, Parseval equality, Bessel inequality.
4. Applications to boundary value problems: heat, wave or Laplace equation.
5. Fourier transforms, Riemann-Lebesgue Lemma, convolution.
6. Further applications chosen from: isoperimetric problem, Poisson summation formula, Weierstrass approximation theorem, etc.
7. Distributions: linear functionals, test functions, Fourier analysis of tempered distributions.
8. Discrete Fourier analysis, Fast Fourier Transform, Fourier analysis on groups.