UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: July 1994
REVISED COURSE IMPLEMENTATION DATE: September 2019
COURSE TO BE REVIEWED: (six years after UEC approval) December 2024
Course outline form version: 09/15/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: MATH 445	**Number of Credits:** 3 Course credit policy (105)
Course Full Title: Introduction to Graph Theory **Course Short Title (if title exceeds 30 characters):**	
Faculty: Faculty of Science	**Department (or program if no department):** Math and Stats

Calendar Description:

Graphs are used to model a wide variety of practical problems, such as scheduling and network architecture, facilitating the visualization of small instances of problems with diagrams. Topics covered include connectivity, trees, planarity, colouring, matchings, independent sets, and Eulerian and Hamiltonian graphs.

Prerequisites (or NONE):	One of (MATH 221, MATH 265, or MATH 225) and (at least two MATH courses 300-level and above).
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	

Equivalent Courses (cannot be taken for additional credit)

Former course code/number:

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: 50

Typical structure of instructional hours:

Lecture hours	50
Seminars/tutorials/workshops	
Laboratory hours	
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**50**

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 3 years.

Department / Program Head or Director: Ian Affleck	**Date approved:**	August 21, 2017
Faculty Council approval	**Date approved:**	October 5, 2018
Campus-Wide Consultation (CWC)	**Date of posting:**	November 16, 2018
Dean/Associate VP: Lucy Lee	**Date approved:**	October 5, 2018
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	December 14, 2018

Learning Outcomes

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

1. Proficiently use the extensive vocabulary that is inherent in the study of graph theory (ie vertices, edges, subgraphs, degrees, walks, trees, etc.
2. Write a proof using either strong or weak induction as applied to various graph parameters or substructures, as appropriate;
3. Write a proof using the direct approach, contrapositive or contradiction, as appropriate;
4. Apply simple algorithms to graphs (e.g. finding spanning trees, using the greedy algorithm to find a colouring, etc);
5. Apply fundamental theorems (e.g. Kuratowski's, Menger's, Brooke's, Vizing's);
6. Model problems using graph theory (e.g. model scheduling problems using graph colouring).

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 will be primarily lecture-based. Evaluation will include quizzes, tests, assignments, and a final exam.

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

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.	Chartrand, Lesniak, Zhang	Graphs and Digraphs, 6th Ed	☒	CRC Press	2015
2.			☐		
3.			☐		
4.			☐		
5.			☐		

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

Typical Evaluation Methods and Weighting

Final exam:	40%	Assignments:	20%	Midterm exam:	%	Practicum:	%
Quizzes/tests:	**40**%	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.

Typical Course Content and Topics

1. Graphs and sub-graphs: Isomorphism, sub-graphs, adjacency matrix, paths, cycles and vertex degrees.
2. Trees: Cut-vertices, cut-edges and Cayley's formula.
3. Connectivity: Blocks and applications of connectivity.
4. Eulerian and Hamiltonian graphs: Euler tours, Hamiltonian cycles and applications.
5. Matchings: Matchings, coverings and the assignment problem.
6. Edge and vertex colorings: Chromatic number, chromatic index, Vizing's Theorem, Brooks' Theorem and chromatic polynomials.
7. Independence: Independent sets, cliques, Ramsey's Theorem and applications.
8. Planar graphs: Plane and planar graphs, dual graphs, Euler's formula and Kuratowski's Theorem.