UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 2006
REVISED COURSE IMPLEMENTATION DATE: September 2015
COURSE TO BE REVIEWED: (six years after UEC approval) October 2020
Course outline form version: 11/22/13

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

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

Course Code and Number: MATH 345 **Number of Credits: 3** Course credit policy (105)

Course Full Title: Modern Geometries
Course Short Title:

Faculty: Faculty of Science **Department (or program if no department):** MATH & STATS

Calendar Description:

Euclidean and non-Euclidean geometries, such as projective geometry, spherical geometry, and hyperbolic geometry, including transformations, symmetries, and applications

Prerequisites (or NONE): MATH 265, MATH 211, and MATH 221, all with a C or better.

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 (Note: 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: 45
Typical structure of instructional hours:

Lecture hours	**45**
Seminars/tutorials/workshops	
Laboratory hours	
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**45**

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, etc.): alternate years

Department / Program Head or Director:	Cynthia Loten	**Date approved:**	August 27, 2014
Campus-Wide Consultation (CWC)		**Date of posting:**	n/a
Faculty Council approval		**Date approved:**	October 3, 2014
Dean/Associate VP:	Lucy Lee	**Date approved:**	October 3, 2014
Undergraduate Education Committee (UEC) approval		**Date of meeting:**	October 24, 2014

Learning Outcomes

Upon successful completion of this course, students will be able to:
1) explain the foundations of Euclidean and at least 3 different non-Euclidean geometries – e.g., projective, hyperbolic, and spherical.
2) state precise definitions of fundamental concepts in the geometries studied,
3) prove basic theorems in geometry,
4) classify transformations and symmetries in different geometries,
5) discuss properties of various transformations, including invariants,
6) discuss the general notions of distance and geodesics, independent of any particular geometry.

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)

The course will be primarily lecture-based.

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.	G.A. Jennings	Modern Geometry with Applications	☐	Springer-Verlag Universitext	1994
2.	J.N. Cederberg	A course in Modern Geometries	2	Springer	2001
3.	P.J. Ryan	Euclidean And Non-Euclidean Geometry: An Analytic Approach	☐	Cambridge University Press	1986
4.	D.A. Brannan, M.F. Esplen, J.J. Gray	Geometry	2	Cambridge University Press	2012

Required Additional Supplies and Materials (Eg. Software, hardware, tools, specialized clothing)

Possible computer software: Geometer's Sketchpad, NonEuclid (freeware), Maple.

Typical Evaluation Methods and Weighting

Final exam:	40%	Assignments:	25%	Midterm exam:	35%	Total:	100%

Details (if necessary): Students must achieve at least 40% on the final exam in order to receive credit for this course

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

Typical Course Content and Topics

Euclidean geometry:
- n-dimensional Euclidean space
- Isometries: reflections, rotations, and translations
- The parallel postulate, angles, and the Pythagorean theorem
- Symmetries

Projective geometry:
- Projective coordinates
- Projective line, plane, and n-space
- Projective transformations
- Perspective drawing, Desargues' theorem
- Homogeneous polynomials, algebraic curves

Hyperbolic geometry:
- Parallels in hyperbolic geometry
- Area and angular defect
- Circles and distance
- Poincare's model
- Hyperbolic transformations

Spherical geometry:
- Geodesics on spheres
- Spherical triangles
- Spherical symmetries
- Application: mapmaking

Other geometries:
- Fractal geometry
- Spacetime geometry