



COURSE OUTLINE		
TERM: Fall 2019	COURSE NO: MATH 139	
INSTRUCTOR:	COURSE TITLE: The Mathematics of Visual Art	
OFFICE: LOCAL: E-MAIL: @capilanou.ca	SECTION NO(S):	CREDITS: 3.0
OFFICE HOURS:		
COURSE WEBSITE:		

Capilano University acknowledges with respect the Lil'wat, Musqueam, Squamish, Sechelt, and Tseil-Waututh people on whose territories our campuses are located.

### COURSE FORMAT

Three hours of class time, plus an additional hour of supplemental activity delivered through on-line or other activities for a 15 week semester, which includes two weeks for final exams.

### COURSE PREREQUISITES/CO-REQUISITES

None.

### CALENDAR DESCRIPTION

This course investigates relationships between mathematics and visual art and design. With a focus on problem solving, students will learn the numerical and geometric aspects of the Golden Ratio, one, two and three point linear perspective, tilings, fractals and Frieze patterns. As time permits, a number of other topics may be covered such as the mathematics of M.C. Escher, Latin square puzzles, or Flatland.

### COURSE NOTES

MATH 139 is an approved Numeracy course for Cap Core requirements.

MATH 139 is an approved Quantitative/Analytical course for baccalaureate degrees.

### REQUIRED TEXTS AND/OR RESOURCES

**Calculator:** Students must have a calculator for arithmetic. A graphing calculator is permitted.

**Class Notes:** Some instructors will have class notes available for purchase in the Bookstore.

**Other Requirements:** Students must have a ruler, protractor and compass. Note: the ruler must have length at least 30 cm.

**Textbook:** Details of additional readings and/or textbook to be provided by the instructor.

Abbot, Edwin. Flatland, A Romance in Many Dimensions NY Dover. First Published: 1884.

**Reference Texts:** A set of reference texts will be available on reserve in the Library.

## **COURSE STUDENT LEARNING OUTCOMES**

**On successful completion of this course, students will be able to do the following:**

- solve problems related to ratio and proportion;
- construct arithmetic and geometric sequences and represent them visually with spirals;
- calculate and construct arithmetic and geometric means;
- construct golden figures such as the golden rectangle, Golden and Fibonacci spirals;
- calculate the value of the golden ratio from its definition;
- solve quadratic equations;
- identify types of symmetry that arise from reflections and translations;
- classify and enumerate Frieze patterns;
- recognize Frieze patterns in design;
- solve linear equations;
- determine the measure of the angle in a regular polygon;
- identify possible regular and semi-regular tilings;
- use rotations and regular tilings to create Escher-like tilings;
- construct simple geometric figures in 1-, 2- and 3-point perspective;
- use geometry to determine viewing distance and viewing target for figures (such as buildings) drawn in linear perspective;
- apply appropriate formulas to numerically render a 3-D representation of an object onto a 2-D picture plane;
- construct a selection of well-known fractals;
- use fractals to model naturally-occurring phenomena, such as trees, mountain ranges, and coast lines;
- use correct mathematical notation and terminology to present solutions and results.

**Students who complete this Numeracy course will be able to do the following:**

- Apply both analytical and numerical skills to solve problems.
- Summarize and analyze data in quantitative forms.
- Interpret and draw conclusions from an analysis of quantitative data.
- Represent quantitative information in a variety of forms (e.g. symbolically, visually, numerically, and verbally).
- Incorporate quantitative evidence in support of an argument.

**COURSE CONTENT**

<b>Topics</b>	<b>Weeks (approx.)</b>
Ratio and proportion	2.0
Fibonacci numbers and the Golden Ratio	2.0
Symmetry and Frieze Patterns	1.0
Fractals	1.0
Polygons and Tilings	2.0
Linear Perspective	3.0
Additional topics such as the art of M. C. Escher, Latin Square Puzzles	1.0
Tests	1.0
Final Exam period	2.0

**EVALUATION PROFILE**

Final grades for the course will be computed based on the following schedule:

2 Term Tests	30 – 40%
Projects, quizzes, in-class assignments, take-home assignments	25 – 35%
Final Exam	*25%
Personal Evaluation	10%
<b>TOTAL</b>	<b>100%</b>

\* If the percentage achieved on the Final Exam is higher than the percentage achieved on the Term Tests component, then the Final Exam weight will be increased to 35% and the Term Tests weight will be decreased by 10%.

While the weighting of individual tests, etc. is at the discretion of the instructor, no single test will exceed 25% of the final total. The weight of tests, quizzes and assignments will be announced in class in advance. The use of a calculator may be restricted on tests and exams.

**TESTS**

Dates for tests will be announced beforehand in class.

**HOMEWORK**

It is expected that students spend at least 8 hours per week doing course work outside of class time.

**ASSIGNMENTS**

Assignments are due at the beginning of class, unless otherwise announced. Late assignments may receive a grade of zero.

## PERSONAL EVALUATION

In the absence of exceptional circumstances, which are determined at the instructor's discretion, the personal evaluation component of the final grade will be pro-rated to the rest of the grade. For example, a 10% personal evaluation component would be determined by dividing the remaining mark out of 90 by 9. The most common circumstance justifying an increased personal evaluation mark is a student's improved performance in the final examination relative to the term work, which the instructor feels justifies an elevated letter grade.

## GRADING PROFILE:

A+	90 - 100	B+	77 - 79	C+	67 - 69	D	50 - 59
A	85 - 89	B	73 - 76	C	63 - 66	F	0 - 49
A-	80 - 84	B-	70 - 72	C-	60 - 62		

Students should refer to the University Calendar for the effect of the above grades on grade point average.

## Incomplete Grades

Grades of Incomplete "I" are assigned only in exceptional circumstances when a student requests extra time to complete their coursework. Such agreements are made only at the request of the student, who is responsible to determine from the instructor the outstanding requirements of the course.

## Missed Exams/Quizzes/Labs

Will be assigned a score of zero unless the student meets all of the following conditions:

1. Circumstances clearly beyond the control of the student caused the exam, test, quiz, lab, etc. to be missed. Such circumstances include serious illness or injury, or death of close family member. They do not include forgetting about the test, lack of preparation for the test, work-related or social obligations.
2. The student has notified the instructor (or the School of STEM office staff, if the instructor is not available) that they will miss the exam, test, quiz, lab, etc. Such notification must occur in advance, if possible, or at the latest, on the day of the exam, test, quiz, lab, etc.
3. Proof of the circumstances is provided. Proper proof of illness or injury requires a medical certificate from a doctor.
4. The student has been fully participating in the course up until the circumstances that prevented the writing of the exam, test, quiz, lab, etc. Fully participating means attending almost all of the classes and turning in almost all assignments in the course.

The options for making up any missed grades offered to the student who meets the four conditions are decided by the instructor. They will not necessarily meet the convenience of the student.

Make-up exams, quizzes and/or tests are given at the discretion of the instructor. They are generally given only in medical emergencies or severe personal crises. Some missed labs or other activities may not be able to be accommodated. Please consult with your instructor.

**Attendance**

Regular attendance is essential. If classes are missed, it is the student's responsibility to become aware of all information given out in the classes or tutorials, including times of examinations and assignment deadlines.

**English Usage**

Students are expected to use correct standard English in their written and oral assignments, exams, presentations and discussions. Failure to do so may result in reduced grades in any part of the Evaluation Profile. Please refer to the guidelines provided in the Capilano Guide to Writing Assignments (available from the University Bookstore).

**Electronic Devices**

Students may only use electronic devices approved by their instructor during assessments (e.g. exams, in-class assignments).

**Mathematical Language**

Use of proper Mathematical terminology and notation is an important component of Mathematics. Marks may be deducted for improper usage. For full details, please refer to instructor's website.

**Mathematics Learning Centre**

Instructional help and reference texts are available to students in the Math Learning Centre located in the Learning Commons (LB 126).

**On-line Communication**

Outside of the classroom, instructors will (if necessary) communicate with students using either their official Capilano University email or Moodle; please check both regularly. Official communication between Capilano University and students is delivered to students' Capilano University email addresses only.

**UNIVERSITY OPERATIONAL DETAILS****Tools for Success**

Many services are available to support student success for Capilano University students. A central navigation point for all services can be found at: <http://www.capilanou.ca/services/>

**Capilano University Security: download the [CapU Mobile Safety App](#)**

**Policy Statement (S2009-06)**

Capilano University has policies on Academic Appeals (including appeal of final grade), Student Conduct, Cheating and Plagiarism, Academic Probation and other educational issues. These and other policies are available on the University website.

**Academic Integrity (S2017-05)**

Any instance of academic dishonesty or breach of the standards of academic integrity is serious and students will be held accountable for their actions, whether acting alone or in a group. See policy S2017-05 for more information: <http://www.capilanou.ca/about/governance/policies/Policies/>

Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances, are prohibited and will be handled in accordance with the Student Academic Integrity Procedures.

**Academic dishonesty** is any act that breaches one or more of the principles of academic integrity. Acts of academic dishonesty may include but are not limited to the following types:

**Cheating:** Using or providing unauthorized aids, assistance or materials while preparing or completing assessments, or when completing practical work (in clinical, practicum, or lab settings), including but not limited to the following:

- Copying or attempting to copy the work of another during an assessment;
- Communicating work to another student during an examination;
- Using unauthorized aids, notes, or electronic devices or means during an examination;
- Unauthorized possession of an assessment or answer key; and/or,
- Submitting of a substantially similar assessment by two or more students, except in the case where such submission is specifically authorized by the instructor.

**Fraud:** Creation or use of falsified documents.

**Misuse or misrepresentation of sources:** Presenting source material in such a way as to distort its original purpose or implication(s); misattributing words, ideas, etc. to someone other than the original source; misrepresenting or manipulating research findings or data; and/or suppressing aspects of findings or data in order to present conclusions in a light other than the research, taken as a whole, would support.

**Plagiarism:** Presenting or submitting, as one's own work, the research, words, ideas, artistic imagery, arguments, calculations, illustrations, or diagrams of another person or persons without explicit or accurate citation or credit.

**Self-Plagiarism:** Submitting one's own work for credit in more than one course without the permission of the instructors, or re-submitting work, in whole or in part, for which credit has already been granted.

**Prohibited Conduct:** The following are examples of other conduct specifically prohibited:

- Taking unauthorized possession of the work of another student (for example, intercepting and removing such work from a photocopier or printer, or collecting the graded work of another student from a stack of papers);
- Falsifying one's own and/or other students' attendance in a course;
- Impersonating or allowing the impersonation of an individual;
- Modifying a graded assessment then submitting it for re-grading; or,
- Assisting or attempting to assist another person to commit any breach of academic integrity.

### **Sexual Violence and Misconduct**

All Members of the University Community have the right to work, teach and study in an environment that is free from all forms of sexual violence and misconduct. Policy B401 defines sexual assault as follows:

Sexual assault is any form of sexual contact that occurs without ongoing and freely given consent, including the threat of sexual contact without consent. Sexual assault can be committed by a stranger, someone known to the survivor or an intimate partner.

Safety and security at the University are a priority and any form of sexual violence and misconduct will not be tolerated or condoned. The University expects all Students and Members of the University Community to abide by all laws and University policies, including B.401 Sexual Violence and Misconduct Policy and B.401.1 Sexual Violence and Misconduct Procedure (found on Policy page <https://www.capilanou.ca/about-capu/governance/policies/>)

**Emergencies:** Students are expected to familiarise themselves with the emergency policies where appropriate and the emergency procedures posted on the wall of the classroom.