Course Information

Description

This course is designed for anyone with an interest in mathematics, art, design, illustration, or programming. We'll take a look at a wide variety of topics in mathematics: symmetry, geometry, number systems, projections, knot theory, self-similarity, functions, spirals, and much more. Rather than cover each of these topics in depth, we'll focus on the fundamentals of each as applied to the creation of traditional art, music, digital art, architecture, and newly emerging techniques like computer generated art. If you're an artist, you might learn a few new tricks or inspiring ideas. However, our discussions will not end there. We'll also see how artists have contributed to mathematics, forming a close relationship between the fields of math and art that has lasted for thousands of years.

Objectives

In this course, you will:

- use the language of mathematics to describe objects, patterns, and structures,

- raise thoughtful questions about mathematics and its role in art,

- understand how to apply mathematical theories and concepts to create works of art,

- explore how artists have attempted to illustrate complex mathematical ideas in their work,

- solve basic algebraic problems and equations as related to the course.

Office Hours

Drop in with any questions or just to chat during the times shown at right - no appointment or notice required. If you need to meet with me outside those times, please email me to arrange a time. Zoom appointments on evenings and weekends are also possible with prior notice.
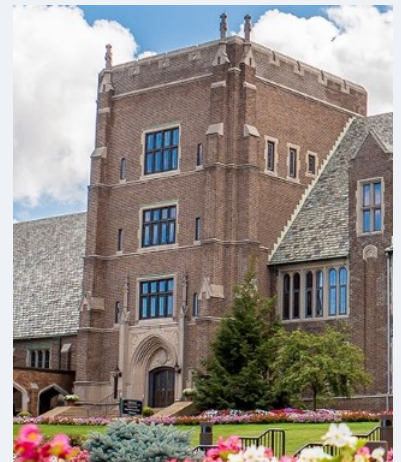
Section Information

MWF 1 - 1:50
Hirt 214
3 Credits

Instructor

Lauren Williams, PhD
lwilliams@mercyhurst.edu
(814) 824-2226
Old Main 404

Office Hours

Monday 10 - 11
Tuesday 9 - 11
Tuesday 1 - 1:50
Wednesday 10 - 11
Friday 10 - 11
and by appointment

Course Topics

Roughly every week or two, we'll look at a new topic that relates mathematics to art. Some topics will tend more towards the math side, others toward art.

Topics may also change, and my hope is that you help influence the direction of the class. We can spend more time on topics you find interesting, and less time on things that seem less useful. If you have any suggestions for topics that you don't see here, let me know!

A Brief History and Euclidean Geometry:

The history and significance of geometry, its "father" Euclid, and his book *The Elements*. We'll also review some useful definitions and properties of shapes.

Non-Euclidean Geometry:

Euclid laid the foundation, but we've come a long way since then. We'll see how mathematicians created new geometries, and how the artist M. C. Escher helped them understand it.

Symmetry and Tilings:

Creating large and visually pleasing patterns is easy with a little mathematics. We'll see how mathematicians understand patterns and how that view can help us create more. This topic will be a bit longer, as we'll see how artists and mathematicians alike have viewed patterns throughout the centuries and around the world.

The Fourth Dimension:

We can't see it, we're not sure what it really is, so what can we do with it? Some artists, including Picasso, were determined to find a way of interpreting dimensions we can't see. We'll also look at some literature that helps us understand dimensions (and perhaps ghosts?).

Number Systems and Color:

The rise of digital art and graphics meant we needed a numerical way of understanding color - fortunately, math already had the answer. We can use these systems to create color palettes, avoid clashing, and apply simple photo filters.

Ratios and Music:

Pythogoras, a philosopher that you may remember from his famous triangle theorem, was the first to connect mathematics and sound. We'll see how musicians and mathematicians have exploited these connections to create challenging new music.

Curves, Spirals, and Envelopes:

From snails and hurricanes to graceful bridges and photography, we'll see how understanding curves through nature and calculus can help us improve art.

Other Topics:

There are a few more interesting topics that won't take long to mention, so we'll fit them in where we can. Anamorphic art, optical illusions, fractals, art created by artificial intelligence, and more.

Grades

Homework

Your grade in this course will be based entirely on homework assignments, to be completed via Blackboard. These assignments will be posted on most Fridays, and due the following Friday.

- Your lowest assignment grade, including a 0 for a missed assignment, will be dropped when calculating your final grade.

- Most assignments will involve multiple choice, short answer, or short calculation questions.

- Each assignment will have a posted due date, but there is no time limit. You may work on the assignment all at once, or save your work and continue later. All work you have done will be automatically submitted when the due date is reached.

- You will have two attempts at each assignment. You will not see scores on individual questions after submitting your work, but you will see your overall score and have one opportunity to redo the assignment if you are not satisfied with your grade. The highest of the two scores will be kept for your final grade.

- Leave yourself time to work on assignments. Most assignments are intended to be completed within a three hour time period. Please do not wait until an hour before the deadline to get started.

- You will be given at least one week to complete all assignments, but sometimes life can get in the way. If you need additional time on an assignment, please let me know *before the assignment is due* and I will work with you to find an appropriate extension without a grade penalty. In most cases, requests for extensions after the due date will not be fulfilled.

- Let me know as soon as possible if you have a technical issue that prevents you from submitting your work. If you're on campus, be sure to report the problem to IT as well, particularly if it is not a campus wide issue. Again, I will be more lenient in extensions if you contact me before the assignment is due.

Attendance

Attending class is the best way to keep up with the material and the class. Make your best effort to attend. You can miss 5 classes without any effect on your grade. Each unapproved absence beyond five will result in a 1 point deduction from your final grade. So, if you miss 8 classes total, you'll lose 3 points from your final grade.

Mathematics Department Grading Scale

The weighted average of your homework scores will be calculated after removing your lowest homework score. This average will be assigned a letter grade according to the following chart, after any points for more than 5 abscences have been deducted.

F	D	D+	C	C+	B	B+	A
0%	60%	67%	70%	77%	80%	87%	90%

Grades will be updated on Blackboard, along with any points deducted for more than five abscences. Please let me know if you see any potential mistakes or issues with your grade throughout the semester.

University Policies and Information

Food and Drink in the Classroom

In light of the COVID-19 situation, eating is not permitted in classrooms, labs, or other academic spaces. A water bottle or cup with a lid (and preferably a straw) is permitted to be used in classrooms and labs.

ADA

Mercyhurst University values inclusion and is committed to the goal of providing equal opportunities for all. Mercyhurst abides by federal, state, and local laws in admissions, employment, academic programs, and all services provided. Mercyhurst University is committed to complying with its obligations under the Americans with Disabilities Act (ADA), Section 504 of the Rehabilitation Act and the Fair Housing Act to ensure that a person with a disability is granted reasonable accommodations, when such accommodations are necessary, to afford that person equal opportunity to obtain a Mercyhurst education and use university facilities. Please refer to the HUB

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Services tab, then ADA Accommodations from the dropdown for instructions to request an accommodation. You may also contact Susan Reddinger, ADA Coordinator, ADA@mercyhurst.edu, 814-824-2362, Egan Hall 200. For students with questions about Academic Support, please refer to the HUB

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Academic Resources tab, then Academic Support for more information.

Title IX Information

Mercyhurst is committed to providing an environment free from sex discrimination, including sexual harassment and sexual violence. Please refer to the HUB:

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Resources tab, then Title IX – Sexual Respect from the dropdown for more information. If you would like to file a sexual misconduct complaint, please contact Ann Miller, Title IX Coordinator and Compliance Officer, titleix@mercyhurst.edu, 814-824-2363. Please be aware that in compliance with Title IX, educators must report incidents of sexual assault/harassment, stalking, and domestic/dating violence. If you disclose any of these situations in class, in papers, or to me personally, I am required to report it to the Title IX Coordinator (or any of the Deputy Title IX Coordinators).

Academic Honesty

Students are expected to contribute actively to the development of an atmosphere of academic integrity. Mercyhurst University assumes, therefore, that students will not resort to plagiarism or any other form of academic dishonesty. Students who engage in willful academic dishonesty may be subject to a broad range of sanctions. At the discretion of their instructor, they may be required to redo the plagiarized assignment, or they may receive an automatic F for the exam/assignment and/ or course. Students found to be in collaboration with other students involved in willful academic dishonesty are also subject to disciplinary action.