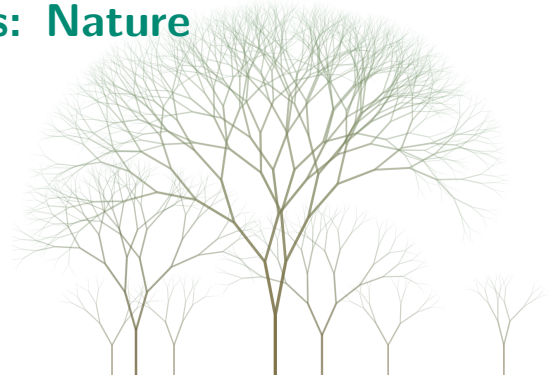


# MATH 110 Math Applications: Nature

Fall 2016 · Syllabus



## Class Information

**Instructor:** Dr. Lauren Williams

**Class Meeting:** TTh 11:00-12:15, Hirt 200

**Office:** Old Main 404 (Tower)

**Office Phone:** (814) 824-2226

**Office Hours:** Mon 9:15 - 10:45, Wed 12:15 - 1:45, Thur 12:30 - 3:00, Fri 9:15 - 10:45

**Email:** [lwilliams2@mercyhurst.edu](mailto:lwilliams2@mercyhurst.edu)

**Website:** <http://math.mercyhurst.edu/~lwilliams/math110/Nature/index.html>

## Section Note

This course is open to Honors students or those with instructor permission only.

## Course Description

This course will explore the connections between mathematics and the world around us. We will cover a variety of topics in mathematics, and see how easily we can find examples of those principles and definitions in our natural surroundings. Topics to be covered throughout the semester will include

- Types of numbers, sets of numbers, and their existence or absence in the natural world
- Euclidean geometry, construction of 2- and 3-dimensional shapes, and the reason why geometric shapes are so abundant in nature
- Functions modeling natural events, such as spirals, population growth, the spread of infectious disease, ocean waves, and weather prediction
- Mathematical sequences
- The nature of symmetry and symmetry in nature
- Graphs and networks, with applications in biology
- Simulating patterns in nature and prediction of pattern changes
- How mathematicians and engineers have made new discoveries by studying the natural world

## Course Learning Outcomes

After completing the course, students will be able to

- find connections between mathematics and the natural world
- define basic mathematical terms and provide descriptions of the major fields of mathematics introduced in class
- explain how the subject of mathematics has developed in response to our study of nature
- solve algebraic problems and equations as related to the course

## Textbook

No textbooks or other materials are required for this course. Any readings or necessary materials will be provided.

At least one assignment will require the use of a digital camera and the ability to submit photographs electronically. If you do not have access to a camera, let me know.

## Class Policies

Attendance is not required, but you are encouraged to attend class whenever possible. Many class meetings will involve a high degree of discussion, and you are expected to come to class prepared to join in the conversation.

There is also no course policy on the use of electronic devices in class. If you must use a device during class, please be respectful of classmates. Keep the volume off, dim the screen, and avoid creating a distraction for those around you. Also keep in mind that participation means more than just being in the room.

## Projects and Assignments

Several assignments and projects will be assigned throughout the semester. These may include brief writing assignments or creative works based on topics in class. You will generally have at least one week to complete an assignment.

If you are having trouble with an assignment, please come talk to me during office hours, ask questions in class, or seek help from a classmate.

## Class Project

Near the end of the semester, the entire class will participate in a project that will involve the material we've learned in class. The exact topic and goal of the project will be determined as the course progresses. Your participation is all that is required to satisfy this component of the class; individual effort will not be graded.

## Exams

There will be a midterm and a final exam for this course. A comprehensive review sheet will be provided for each exam at least one week in advance. This exam is scheduled for **Tuesday, October 11**. If you know in advance that you will not be able to attend class that day, please see me to schedule a time to take the exam in my office.

The final exam is scheduled for **Tuesday, December 13, 10:30 - 12:30**.

## Final Grades

Grades will be calculated as follows:

- 60% - Assignments and Projects
- 15% - Class Project
- 10% - Midterm Exam
- 15% - Final Exam

Grades will be posted on Blackboard, so you can keep track of your progress at any time. There are no opportunities for extra credit or additional points, and a curve will not be applied to the grades.

Grading scale:

F	D	D+	C	C+	B	B+	A
0-59	60-64	65-69	70-77	78-83	84-89	90-93	94-100

## Support of the Mercy Mission

This course supports the mission of Mercyhurst University by creating students who are intellectually creative. Students will foster this creativity by: applying critical thinking and qualitative reasoning techniques to new disciplines; developing, analyzing, and synthesizing scientific ideas; and engaging in innovative problem solving strategies.

## Learning Differences

In keeping with college policy, any student with a disability who needs academic accommodations must call Learning Differences Program secretary at 824-3017, to arrange a confidential appointment with the director of the Learning Differences Program during the first week of classes.

**Math 110 Math Applications: Nature**  
Course Schedule - Fall 2016

Week 1	Aug 25	Class Introduction, Types of Numbers
Week 2	Aug 30	Sets of Numbers, Discrete, Continuous
	Sep 1	Shapes and Polyhedra: Euclidean Geometry
Week 3	Sep 6	Shapes and Polyhedra in Nature
	Sep 8	Shapes and Polyhedra in Nature
Week 4	Sep 13	Functions
	Sep 15	Exponential Functions: Growth and Decay
Week 5	Sep 20	Calculus in One Hour
	Sep 22	No Class: Mass of the Holy Spirit
Week 6	Sep 27	Mathematics of Sequences
	Sep 29	Sequences in Nature
Week 7	Oct 4	Mathematics of Spirals
	Oct 6	Spirals in Nature
Week 8	Oct 11	Midterm Exam
	Oct 13	No Class: Mid Semester Break
Week 9	Oct 18	Linear Algebra in One Hour
	Oct 20	Leslie Models
Week 10	Oct 25	Mathematics of Symmetry
	Oct 27	Symmetry in Nature
Week 11	Nov 1	No Class: Advising Day
	Nov 3	Patterns: The Angelfish and Alan Turing
Week 12	Nov 8	Graphs and Networks: Mathematical Models
	Nov 10	Graphs and Networks: Biological Applications
Week 13	Nov 15	Dynamical Systems
	Nov 17	Dynamical Systems
Week 14	Nov 22	Mathematical Trees, Biological Trees, and Fractals
	Nov 24	No Class: Thanksgiving
Week 15	Nov 29	Learning from Nature: Computer Generated Patterns
	Dec 1	Learning from Nature: Robotics
Week 16	Dec 6	Learning from Nature: Unsolved Problems in Mathematics
	Dec 8	Additional Topics