

MATH 109: MATHEMATICS FOR DESIGN

Spring 2009 Course Syllabus

In our contemporary culture the dialogue between math and art, while sometimes strained by misunderstandings, is a dynamic and living one. Art continues to inspire and inform mathematical thinking, and mathematics helps artists qualify abstract reasoning about the content and structure of their work. The tools of mathematics also aid in the construction of conceptual frameworks that artists can use to develop critical thinking.

This course will introduce students to ideas in mathematical thinking that are related to artistic considerations. Students will need to show proficiency with some mathematical ideas and then apply those ideas in creating their own works of art. In the process, students will also be called to analyze existing artwork with a mathematical eye. In this way, students will be provided a new tool to use in their approach to art and aesthetics.

COURSE GOALS

As an F2 course, students are expected to gain a sense of how mathematics can be used for presenting and interpreting data. In this course specifically, I propose the following goals:

1. Students will be able to create an effective representation of data – this may be graphical, verbal, or numerical, depending on the data. Students will be able to effectively choose the appropriate method for presenting data, and will be able to create a presentation that is both useful and aesthetic.
2. Students will be able to recognize and discuss relevant mathematical content in new artwork. They will be able to discuss the intentionality of the mathematical content.
3. Students be able to create an original piece of art utilizing and/or illustrating mathematical concepts. Concepts students should be able to incorporate in their artwork will include fractals, the geometry of perspective, Euclidean objects (polygons, polyhedra, circles, etc.), and geometric transformations (rotations, translations, dilations, etc.).

MATERIALS FOR CLASS

Students are responsible for bringing materials to class. Each student should purchase the following materials for use during the course:

- (a) Pencils – either mechanical pencils or wood pencils with a portable blade-sharpener.
- (b) Eraser – the little nub on the back of your pencil is not enough. Buy a pink eraser.
- (c) Colored pencils
- (d) Ruler – at least 12 inches (18 inches is even better), marked with both inches and centimeters
- (e) Scissors and scotch tape
- (f) Paper – you should have 8.5 by 11 inch loose-leaf paper, both lined and blank. Do not submit work that has been ripped out of a spiral notebook.

These materials should be brought to class each day.

In addition, if you have a computer of your own, I recommend purchasing the student's version of *Geometer's Sketchpad*. Further, you will need to purchase materials for completion of your projects during the semester.

Course details

Time: MWF 8:50-10:00am

Place: PPHAC 235

Instructor: Kevin Hartshorn

Office: PPHAC 215

Hours: TuW 2:15-3:30pm,
Th 1:00-2:00pm,
or by appointment

e-mail: hartshorn@math.moravian.edu

ASSESSMENT

Your grade will be based on attendance, active reading, work on problem sets, creative projects, original analysis, and several exams. How these various activities are weighted in the final grade will be up to you, subject to the following constraints.

- (a) (10%) Attendance and participation in class
- (b) (5% to 15%) Active engagement with the readings and class materials
- (c) (5% to 25%) Completion of worksheets and homework sets
- (d) (5% to 25%) Creative works that utilize or demonstrate mathematical ideas
- (e) (5% to 20%) Original analysis of artwork
- (f) (10% to 25%) Two midterms (weighted equally)
- (g) (10% to 25%) Final exam

During the first week of class, each of you will decide the precise weights you would like to apply to each of these assessment activities.

You can translate percentage grades to letter grades by this rough guide: 85% or above is an A (+ or –), 70 – 85% is a B (+ or –), 60 – 70% is a C (+ or –) and 50 – 60% is a D (+ or –). You will find it useful to review the student handbook (page 43) for an interpretation of the grades “A,” “B,” and so on.

Remember that the final assignment of grades will be based on my judgement as professor of the course.

ATTENDANCE

Everyone starts with a score of 75% for their attendance.

Any time you are late, I will deduct 3 points from this total.

Any time you are absent, *regardless the reason for your absence*¹, I will deduct 10 points from this total. You will be forgiven three absences. That is, if you have three absences (and not late days), you will not be penalized, but your fourth absence will result in a 10 point deduction for your attendance score.

While everyone is expected to actively engage in the course, points will be added to your attendance score through particularly insightful, energetic, or unique contributions to class discussion or activities.

New York trip: attendance will not be taken on the day of the art trip to New York City.

ENGAGEMENT WITH THE MATERIAL

I will regularly assign short reflection assignments to see that you are engaging with the material and the class. Reflection assignments must be written neatly with complete sentences and appropriate paragraph structure.

Each such assignment will have two questions: a “basic” engagement question and an “advanced” engagement question. Effectively answering the basic question will garner a \checkmark (equivalent to 80%), while responding to the advanced question garners a $\checkmark+$ (equivalent to 100%). A $\checkmark-$ indicates work below the level expected in a college course (equivalent to 40%).

WORKSHEETS & HOMEWORK

Throughout the semester, you will complete various activities to help internalize the ideas presented in class. Some of these activities will be graded.

¹ **Note that there are no “excused” absences.** Any time you miss class incurs a cost – it is up to you to decide whether the cost is worth missing the class. If you find that you will not be able to make it to class, be sure to contact me as soon as possible – depending on the reason for your absence, you may be able to make up missed work.

CREATIVE ACTIVITIES

There will be several projects assigned through the semester. Typically, you will be asked to create a piece of artwork based on given parameters (often specified mathematical ideas) and write a short description of the artwork, including the role that mathematics played in your creation.

ANALYSIS OF ARTWORK

Everyone will have several opportunities to provide original analysis of artwork from a mathematical perspective. There will be two types of analysis required:

1. Each person will be asked to write a short analysis (approximately 1/2 page each) of fellow students' artwork during the semester.
2. Everyone will need to visit an art gallery or museum and write a review (approximately 4 pages) of the artwork/architecture/design and its relation to mathematics. This may be done as part of the art trip to New York or by visiting museums in the Lehigh valley.
3. Each person will need to write a short research paper on the intersection of mathematics and art. Details on this paper will be provided later in the course.

MIDTERMS & FINAL EXAM

There will be two midterms: **Wednesday, February 25** and **Wednesday, April 8**. Be sure to mark these dates on your calendar, as make-up exams are generally not given. There will also be a final exam. The date for the final exam will be posted when it is available.

Note that for each of the midterms, you will be given an opportunity to correct any problems that you missed. Details on this will be provided with the first midterm.