MATH 109: MATHEMATICS FOR DESIGN

Spring 2010 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 details**
> **Time:** MWF 8:55–10:05am
> **Place:** SHILL 209 (Mon, Wed)
> PPHAC 113 (Fri)
>
> **Instructor:** Kevin Hartshorn
> **Office:** PPHAC 215
> **Hours:** MTuW 2:30–4:00pm,
> *or by appointment*
>
> **e-mail:** hartshorn@math.moravian.edu
> **Web:** http://math.moravian.edu/hartshorn/109/
> **Text:** *Squaring the Circle: Geometry in Art and Architecture*, by Paul Calter

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) Required text – *Squaring the Circle: Geometry in Art and Architecture*, by Paul Calter
(b) Pencils – either mechanical pencils or wood pencils with a portable blade-sharpener.
(c) Eraser – the little nub on the back of your pencil is not enough. Buy a pink eraser.
(d) Colored pencils
(e) Ruler – at least 12 inches (18 inches is even better), marked with both inches and centimeters
(f) Scissors and scotch tape
(g) 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*, but this is not required. Further, you will need to purchase materials for completion of your projects during the semester.

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.

    (h) (10% to 25%) Completion of problem sets/quizzes

    (i) (10% to 25%) *Geometer's Sketchpad* worksheets

    (j) (10% to 25%) Creative works that utilize or demonstrate mathematical ideas

    (k) (5% to 20%) Writings about math/art connections

    (l) (10% to 30%) Average of two midterms (weighted equally)

    (m) (10% to 30%) 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. At the midterm, you will have a chance to revise your choices.

For this class, 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 can review the student handbook (http://www.moravian.edu/studentLife/handbook/academic/academic.html) for a qualitative 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.

HOMEWORK AND ATTENDANCE

Every day some homework or a quiz will be due at the beginning of class. If you are late or miss class, you may be penalized or receive a "0" for the assignment. There are no "excused" or "unexcused" absences. Missing a quiz or homework submission merits a "0" regardless the reason for missing class (including illness, sporting events, or family emergencies).

At the end of the semester, I will drop the 3 lowest homework grades from the gradesheet. Thus you may miss up to 3 classes without penalty.

If you know that you will be missing a class, be sure to inform me as soon as possible so you may get any missed worksheets or assignments.

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

GEOMETER'S SKETCHPAD

Geometer's Sketchpad is available on all campus computers – both Mac and Windows machines. In addition, you can purchase a student version (http://www.keypress.com/x24119.xml) if you wish to install it on your own computer.

Every week, the class will meet in a computer lab to work with *Geometer's Sketchpad*. Computer assignments will be completed and submitted electronically.

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.

A rubric for these activities will be provided during the semester.

ANALYSIS OF ARTWORK

Everyone will be asked to write several short essays connecting mathematics and art. There will be no "due date" for these assignment, but you need to have at least two of the essays completed by the midterm (February 26). Details on these pieces will be provided in a separate handout.

1. Everyone will need to visit an art gallery or museum and write a review 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.
2. Short paper in response to a question from the book (twice).
3. Short paper in response to an article.
4. Short paper describing a math/art relation that you have found out "in the world."

At least two of these write-ups need to be done before midterm grades are submitted.

MIDTERMS & FINAL EXAM

There will be two midterms: **Wednesday, February 24** and **Wednesday, March 31**. Be sure to mark these dates on your calendar, as make-up exams are generally not given. The final exam will be on **Wednesday, May 5 at 1:30pm**.

Details will be provided with the first midterm.

OTHER ITEMS OF NOTE

- Everyone is expected to adhere to Moravian College's Academic Honesty policy, as described in the Student Handbook (http://www.moravian.edu/studentLife/handbook/academic/academic2.html).
- If you are in need of any special considerations, please contact Learning Services and let me know what is needed.
- If you have any questions, concerns, or comments about the course, please feel free to contact me in my office or by e-mail.
- This syllabus is subject to change. The latest version of this syllabus can be found on the class website (http://math.moravian.edu/hartshorn/109).