

Department of Mathematical Sciences
Fall 2010
MATH 306: STRUCTURE OF MATHEMATICS IV:
DEVELOPMENT OF GEOMETRIC IDEAS

READ THIS SYLLABUS CAREFULLY. YOU ARE RESPONSIBLE FOR KNOWING THIS INFORMATION!

Prerequisites: Math 213 (C- or higher)
Math 115, 119 or 124 (C- or higher)

Course Description: Exploration of geometric concepts via hands-on activities and computer software. Topics include congruence, similarity, transformations, tessellations, and fractals. **Elementary Education and Special Education certification students only.** Can be used to meet requirements of a major or minor in mathematics only for students seeking elementary, early childhood, middle level or special education certification. Not recommended for use in meeting certification requirements for secondary school mathematics.

Instructor: Dr. S. Louise Gould

Phones: Office: 860-832-0047
Home: 860-224-6978 before 9:30 PM

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Office: Marcus White 103

Office Hours: Monday and Wednesday 3:30-5:00 PM
Tuesday and Thursday 11:00 AM-12:00 PM
and by appointment

Textbook: *Symmetry, Shape, and Space: An Introduction to Mathematics Through Geometry.* L Christine Kinsey and Teresa E. Moore, Key College Press, 2003 and the accompanying Lab Manual. You should purchase Key Curriculum Press software Geometer's Sketchpad. Kaleidomania is another useful software which we will use in class.

Students will also be asked to read *Flatland*, Edwin Abbott, 1884. It is available on the Internet at <http://www.geom.uiuc.edu/~banchoff/Flatland/>
Or <http://www.math.brown.edu/~banchoff/gc/Flatland/>

Other references used in class:

Exploring the Shape of Space. Jeffrey R. Weeks, 2001, Key Curriculum Press

Non-Euclidean Adventures on the Lenart Sphere: Activities Comparing Planar and Spherical Geometry. Istvan Lenart, 1996. Key Curriculum

Press.

Supplies: Tracing paper, compass, ruler, graph paper (1/4" grid), 7 colors of pencils or markers, scissors, tape. **Be sure that you have these supplies daily.**

Class Meeting Times: Tuesday and Thursday, 9:30-10:15 AM in Maria Sanford Room 204

Course Requirements: Regular attendance in class
Completion of assigned exercises including email reflections
You will be asked to sign yourself in for each class and place your homework in a folder which will be passed around the classroom.
Completion of a group problem solving exercise and Powerpoint Presentation of your results
PLEASE NOTE you should expect to spend about twice as much time each week on your out of class assignments as you spend in class – roughly 5 hours. Some individuals may need to spend more time.
Completion of a final individual or paired project and presentation of the project
Successful participation in performance assessment/examinations and portfolio

Calculator Use: A TI-83 Graphing Calculator may be used in class although **computer use of Geometer's Sketchpad will be much more critical to the topics studied.**

Computer Use: **Geometer's Sketchpad, Available in the computer lab or from the bookstore or**
<http://www.keypress.com/catalog/products/software/index.html>

Kaleidomania (will be available for class use) can also be purchased from Key Curriculum Press see above).

Students must have access to the University computer system and will be required to provide e-mail addresses and submit some projects by e-mail.

Useful Websites: **<http://www.peda.com/poly/> for constructing polyhedra**
<http://www.northnet.org/weeks/> See page 93 and 146 in your text
<http://www.tessellations.com/index.html> See 126 in your text
<http://torus.math.uiuc.edu/jms/java/dragsphere/>
<http://cs.unm.edu/~joel/NonEuclid/>

University Policies:

1. You must take the final examination at the time specified in the course selection book.
2. If you need course adaptations or accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. My telephone numbers and office hours are given above.
3. In the event of a weather emergency which requires curtailment or cancellation of classes, listen to WTIC (1080 AM) or call (860) 832-3333 for the “general snow message.”
4. The last day to drop a course is October 25. Until Oct. 25 approvals for withdrawal are not required; however, it is strongly recommended that students consult with their academic advisors prior to deciding to withdraw. **Cessation of attendance, notice to the instructor, or telephone calls to the Enrollment Center, are *not* considered official notice of a student’s intention to drop the course.** After October 25, withdrawals are allowed only under extenuating circumstances and with appropriate supporting documentation and require approval of the course instructor, department chair and dean of the School of Arts and Sciences.

Resources Available:

1. If you need help, take advantage of your instructor's office hours. Do not wait until just before the first test to do so.
2. The Learning Center is located in Room 241, Copernicus. Free tutoring is available in Room 241, Copernicus, and at other locations on campus. A schedule for hours the Center is open will be posted soon after the beginning of the semester.
3. Form a study group with other students in your section. Explaining solutions to homework problems to each other is a good way to learn.
4. A list of private tutors for hire is available in the math department office, Room 107 Marcus White, 832-2835.

Evaluation

Minimum averages have been established for each of these grades:

A	93%	B+	87%	C+	77%	D+	67%
A-	90%	B	83%	C	73%	D	63%
		B-	80%	C-	70%	D-	60%

The average for the course will be based on the following weights:

Tests	20%
Final Examination	20%
Portfolio	20%
Homework problems	15%
Classroom participation/attendance	10%
Final Project presentation	15%

About the Assignments

Assignments will be distributed weekly.

Note: A **daily reflection** consists of:

- Key vocabulary words from the lesson and exercises and an explanation of what they mean in your own words
- A summary of the big ideas from the lesson and your understanding of them in your own words
- Questions or observations about concepts that you do not fully understand or find interesting
- Please write these professionally as if you were writing to a student's parent or a supervisor. Watch your spelling, grammar, word usage and so on.
- The most efficient way to prepare these will be to enter each reflection in the portfolio template and copy and paste the entry to email. This will help to insure that you keep up with the portfolio all along the way.

Your **portfolio** will be submitted at the end of the semester. It will be submitted electronically via CD burning. You are encouraged to use Geometer's Sketchpad, scans of appropriate materials, digital photographs of artifacts prepared for class. Scanners, CD burners, Microsoft Office word, and geometer's sketchpad are all available in the computer center. A template for the portfolio will be available on the instructor's web site. Add materials to the portfolio as the course moves along and you will have everything in place at the end of the semester.

Final individual/paired projects will be assigned from this list -

- 2.1 Billiards
- 3.4 pp. 72-77 Knots and stars
- 4.3 Penrose Tilings
- 5.5 Islamic Lattice Patterns (2 people)
- 7.3 Archimedean Solids
- 7.4 Polyhedral Transformations
- 6.2 The fourth dimension
- 7.6 Infinite Polyhedra
- 8.1 Symmetries of polyhedra
- 8.2 Three-Dimensional Kaleidoscopes
- 9.1 Spiral Growth
- 9.2 Fibonacci numbers and phyllotaxis
- 10.1 Perspective (2 people)
- 10.2 Optical illusions
- 11.2 Map Projections
- 11.3 Curvature of curves
- 11.4 Curvature of surfaces
- 11.5 Soap Bubbles
- 13.4 Map coloring problems

Tentative schedule of dates and topics: note that this is subject to change.

Date		Topics
8/31/10	T	Review of the Basic Ideas-Measurement area and perimeter, tangrams Section 1.1

9/2/10	R		Basic Ideas-Pythagorean Theorem, slope, and polygons Section 1.2
9/7/10	T		Grids- Celtic knots Section 2.2
9/9/10	R		Group estimation projects in class. Grids- Celtic knots Section 2.2
9/14/20	T		Constructions- Compass and Straightedge Note: we will use Geometer's Sketchpad for your assignments!
9/18/10	R		Constructions - Golden Ratio Section 3.2 and Estimation Presentations in class
9/21/10	T		Constructions - Theoretical Origami Section 3.3
9/23/10	R		Constructions - Linkages Section 3.5
9/28/10	T		Examination #1 on Sections 1.1,1.2,2.2,3.1,3.2,3.3,not 3.5.
9/30/10	R		Regular and Semi-regular Tilings Section 4.1
10/5/10	T		Irregular Tessellations Section 4.2
10/7/10	R		Kaleidoscopes Section 5.1
10/12/10	T		Two- Dimensional Symmetry- Point Symmetry Section 5.2 Isometry movie and handouts in class.
10/14/10	R		Two- Dimensional Symmetry - Frieze Patterns Section 5.3
10/19/10	T		Two-Dimensional Symmetry - wallpaper patterns Section 5.4
10/21/10	R		Continue with 2D Symmetry
10/26/10	T		Continue with 2D Symmetry
10/28/10	R		Flatlands-Read this before you come to class. We will be viewing excerpts from Flatland the Movie. Section 6.1
11/2/10	T		Polyhedra - Pyramids, Prisms, and Antiprisms Section 7.1
11/4/10	R		Examination #2 Includes sections 3.5, 4.1, 5.1, 5.3, 5.4, 6.1 but not 7.1
11/9/10	T		Polyhedra - The Platonic Solids and the Archimedean Solids Sections 7.2 and 7.3
11/11/10	R		Polyhedral Models 7.5
11/16/10	T		Non-Euclidean Geometry Jeffrey Weeks movie Section 11.1 Non-Euclidean Geometry. We will use materials from Weeks and Lenart
11/18/10	R		Topology We will use materials from Weeks and sections 13.2
11/23/10	T		Graphs and trees Sections 12.1 and 12.2
11/30/10	T		Examination #3 includes sections 7.1,7.2,7.3,7.5, 11.1. 13.2, 12.1, 12.2
12/2/10	R		Student presentations

12/7/10	T		Student presentations
12/9/10	R		Student presentations
12/14/10	T	Exam Day	Final Examination 8-10 AM