

## MATH 307-01: FOUNDATIONS OF GEOMETRY

RAUB 405: TR 10:10-11:00 (3 credits)

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TR: 12:00 – 1:00

### I. CATALOG COURSE DESCRIPTION:

This course is an axiomatic study of various geometries including finite geometry, absolute (neutral) geometry, Euclidean geometry, Lobachevskian geometry, and Riemannian geometry. Historical and cultural frameworks for these geometries are provided.

**Prerequisite:** MATH205. **Fulfills General Education Requirements.**

### II. PREREQUISITE KNOWLEDGE:

This course assumes that you have taken a course in high school geometry. However, the course will be taught in a way that you will not immediately be allowed to use this prerequisite knowledge (strange, I know, but it's just the way it is). In addition to this, you should be proficient at writing basic proofs from MATH205, a skill that you will enhance throughout this course. Finally, it is also hoped, but not necessary, that you have a working knowledge of The Geometer's Sketchpad.

### III. COURSE OBJECTIVES:

In general, the goal of this course is to provide the student with an understanding of the development of a geometry. More specifically, students in this course will:

1. recognize the historical and cultural contexts of various geometries.
2. understand axiomatic systems including the concepts of axiom independence and system completeness.
3. understand the fundamental role of the parallel postulate in Euclidean and non-Euclidean geometry.
4. apply concepts of a particular geometry to the analysis, solution, and coherent presentation of problems within that geometry.
5. use dynamic geometry software as a tool in conjecture formulation and analysis.

### IV. TEXT:

College Geometry: A Discovery Approach

(2001), David C. Kay: Addison Wesley Longman. ISBN: 0-321-04624-2

### V. MATERIALS NEEDED:

Text, laptop with GSP, notebook and paper, pencils (graded work must be done in pencil, or done electronically, to receive full credit), compass, straight edge, protractor, graphing paper, other material mentioned later.

#### MY PHILOSOPHY ON DYNAMIC GEOMETRY SOFTWARE USE FOR THIS COURSE:

You must have a laptop with GSP on it for this course. The power of visualization given by this program is invaluable for any geometry course such as this. We will be using it regularly in class. The intention is to show you a precise diagram of a situation and to be able to dynamically move a diagram around in order to observe what varies and what

remains constant. However, this program DOES NOT substitute for a rigorous proof. While we may sometimes simply observe a phenomenon to make a generalization, we cannot substitute this observation for a proof.

## **VI. MAJOR UNITS AND APPROXIMATE TIME ALLOTTED:**

1. Finite Geometry (6 hours)
2. Absolute (Neutral) Geometry (6 hours)
3. Euclidean Geometry (21 hours)
4. Non-Euclidean Geometry (12 hours)

NOTE: The Geometer's Sketchpad software is integrated throughout all units.

## **VII. TEXT CHAPTER OUTLINE:**

- |   |                                      |
|---|--------------------------------------|
| 1. Exploring Geometry   | Chapter 1                            |
| 2. Foundations of Geometry 1:<br>Points, Lines, Segments, Angles    | Chapter 2                            |
| 3. Foundations of Geometry 2:<br>Triangles, Quadrilaterals, Circles | Chapter 3                            |
| 4. Euclidean Geometry:<br>Trigonometry, Coordinates, Vectors        | Chapter 4                            |
| 5. Transformations in Geometry                                      | Chapter 5                            |
| 6. Alternative Concepts for Parallelism:<br>Non-Euclidean Geometry  | Chapter 6 and Supplementary Material |
| 7. Geometry of Three Dimensions (if time)                           | Chapter 7                            |

## **VIII. EVALUATION**

You will have a variety of assessments to include tests, quizzes, problem sets, and projects. Your grade will be based on the average of the total points received, therefore, there really is no distinction between in-class tests and quizzes. Some assessments will be announced and some will be unannounced. Please do not get caught up in trying to distinguish between a test and a quiz, since your grade is based on the ratio of points earned to points possible. In fact, I have no idea at this point how many total points there will be. As an instructor who usually takes into consideration his students' needs, the exact date and point-value of each assignment is yet to be determined. In addition to this, some tests/quizzes will be in-class and some will be take-home, which then blurs the line between these assessments and a problem set. Finally, you will be asked to work on some assessments on your own, while others you will be able to work on with others. Your goal is to work as hard as you can in this course to learn as much as you can and to not get hung up about thinking about your grade at every turn. The final exam will be cumulative. Your final course grade will be determined by a simple ratio of points earned to points possible, so it should be easy to keep track of your grade throughout the semester. I use rubrics to grade and they will be shared with you as the time arises. The grading scale is as follows: A: 100-91, A-: 90-87, B+: 86-82, B: 81-77, B-: 76-72, C+: 71-67, C: 66-62, C-: 61-57, D+: 56-52, D: 51-47.

## **IX. HOMEWORK:**

Homework will be given daily, with few exceptions. Most of this homework will be given in terms of problems/exercises in your text, but some of it may be a reading assignment or other project. Regardless of what the homework is, it is expected to be completed, whether it is graded or not. Since my lectures are based on your experience with the math, more often than not, the next class meeting will depend on the last homework assignment. This means that you will be behind in class if you do not do the homework outside of class. Most of the daily homework assignments will not be graded; rather, you will have in-class quizzes and tests and out-of-class Problem Sets that will be graded. But if you wait until these graded assignments to actually begin studying the material, you will most likely not do very well in this course.

I will mostly assign odd problems for homework so the answers can be checked in the back. For those problems with which you are having extreme difficulty, you should plan to come see me in my office. We will also be able to go over several problems at various times during class, but please count on spending time in my office going over problems either individually or in small groups. You should always be keeping up with your reading and homework. Near daily activity is strongly advised. Please make good use of my office hours.

You should immediately form a bond with 3 or 4 other people in this course. You should plan to meet a couple of times a week so you can discuss what is going on in class and can help each other out as needed on the daily homework assignments. Unless otherwise stated, you should work on your take-home Problem Sets, Quizzes, and Tests together as well. Please be comfortable talking to myself and each other.

#### **X. READINGS:**

My suggestion is to read the text on a chapter by chapter basis and then go back over it and study the individual sections as we go over the topics in class. I believe that it is important to read the entire chapter first so you can see where it is going. I do not necessarily teach “section by section” throughout a text (although this text makes it easy to do so, and since this is my first time teaching this course, I may very well). If you only read the text “section by section,” you will not be seeing the entire picture that I am presenting in class. Remember that in mathematics, the “whole is much larger than the sum of its parts.”

#### **XI. ATTENDANCE/MAKE-UP WORK:**

I see no way of passing this course without attending most every class session, unless you have been misplaced in the course. While I do not factor attendance into the course grade, LHUP does not require professors to provide makeup work for unexcused absences. Therefore, if you miss an assignment due to an unexcused absence, do not expect me to allow you to make it up. If you are absent on a quiz or test day, you cannot make it up. Also, carefully read the class attendance policy in your student handbook. Course materials will be placed on my LHU website by going to [www.lhup.edu/swillia6](http://www.lhup.edu/swillia6) or following the link in the faculty section of the mathematics department webpage.

#### **XII. ACADEMIC HONESTY:**

Please refer to your student handbook (<http://www.lhup.edu/student-handbook/>) for the detailed policy and procedures for academic honesty.

#### **XIII. SPECIAL SERVICES:**

Any student requiring accommodations for taking notes or tests or anything else should make arrangements to discuss his or her needs with me as soon as possible. You may also see Dr. Rey Junco on campus to document any special needs. LHUP does not discriminate against those students requiring special services.

#### **XIV. DISTRACTIONS AND CLASSROOM BEHAVIOR**

Try to remember that a cellphone ringing in the middle of class is a distraction to all those around you. Therefore, please turn them off before class begins. If you have an emergency situation that warrants having it on, please keep it on vibrating mode and leave the room when a call comes in. Also, do not listen to headphone music once the instructor enters the class. This shows me that you are not a serious student and that you do not deserve to be in this class. One of the biggest temptations while being required to have a laptop in class is wanting to check email or IM friends. However, we all know that this is a major distraction to yourself rather than the others in class, and it definitely stifles your learning process (so let's not pretend that it doesn't). So please try to fight this urge. The university has a detailed classroom behavior policy that can be found on the Provost's website at <http://www.lhup.edu/provost/home.htm>.

## **XV. OFFICE HOURS**

I enjoy helping my students inside and outside of class. My official office hours are on the front of this syllabus and are posted on my office door. However, I am often on campus much more often than these times, so please feel free to call or stop by if you need help. If it is not during my office hours, you may have to wait until I complete another task before I can help you. Email is always a great way to contact me. Please use me and your group as your best resource for passing this course.

## **XVI. FINAL EXAM**

The final exam is scheduled for Wednesday, December 16<sup>th</sup> from 8:00 – 9:50.

**GOOD LUCK AND WORK HARD THIS SEMESTER!**

**NOTE: Sign and return this page of the document**

I, \_\_\_\_\_ (print your name) acknowledge that I have received/retrieved a copy of the syllabus for MATH307 and have had the chance to discuss any matters in the document with the professor. Signing this document does not imply that I agree with everything in the syllabus, just that I have received/retrieved a copy of it from the professor or his website.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date