

MATH 5301: Advanced Geometry

Sul Ross State University ~ Rio Grande College
Fall 2015

Professor: Michael Ortiz, Ph.D.
E-mail: mortiz4@sulross.edu

Office: Uvalde Campus A101
Telephone: (830) 279-3048

Course Description MTH 5301 is intended as an introduction to classical geometry from an advanced viewpoint, including Euclidean geometry, axiomatic systems, constructability, regular polytopes, projective geometry, and non-Euclidean geometry.

Class Time Tuesday, 6:00 – 8:45 p.m.

Class Location Del Rio 107; Eagle Pass B112; Uvalde B114c; Castroville 120

Required Text The required textbook is Robin Hartshorne, *Geometry: Euclid and Beyond*, ISBN 9781441931450.

In addition, you will need access to a version of Euclid's *Elements*. There are inexpensive editions on the market. Electronic versions will also be made available on Blackboard.

Office Hours M/W, 12:00 a.m. – 2:00 p.m.; T/Th, 10:30 a.m. – 12:30 p.m.

Course Policies

Attendance Policy

Attendance is mandatory. You will be held responsible for all material covered in class or in the reading assignments. If you have to miss a class, it is your responsibility to obtain all notes, assignments, and announcements from someone else in the class. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved.

Communication

I will post course documents, reminders, announcements, and assignments on the Blackboard system. You will also submit homework on Blackboard. I may also occasionally send announcements via e-mail. You should make sure you know how to access and use these tools. E-mail is the best way to contact me.

You are welcome to stop by my office if you wish to speak about the content or your progress in the course. I am here to help you. Ask questions in class, call me, e-mail me, or come to my office. If you don't communicate with me, then I can't help you.

Homework

You will turn in homework assignments several times a week. Exercises from the text will be prepared as Microsoft Word documents and turned in via Blackboard. You will need to use a recent version of Word, such as is available on school computers.

It is imperative that you read the textbook and relevant portions of Euclid as we progress through the class. Reading assignments will be made on a weekly basis.

Exams

There will be one midterm exam. Its tentative date is October 27. This is subject to change. You will be notified of a change at least one week in advance. Make-up exams will be given only in the event of an emergency, in which case written justification and/or documentation must be provided and approved.

The final exam is scheduled for December 8. It will be comprehensive.

Grading Policy

Your grades will be weighted as follows:

Homework	30%
Midterm Exam	30%
Final Exam	40%

Subject Outline

- I. Euclid's Geometry: *Euclid's Elements* – ruler and compass constructions – Euclid's axiomatic method – regular pentagons – newer results
- II. Hilbert's Axioms: *axioms of incidence* – *axioms of betweenness* – *axioms of congruence* – *Hilbert planes* – *intersections* – *Euclidean planes*
- III. Geometry over Fields: *the real Cartesian plane* – *fields and incidence* – *ordered fields and betweenness* – *congruence* – *rigid motions and SAS* – *non-Archimedean geometry*
- IV. Segment Arithmetic: *addition and multiplication* – *similar triangles* – *introduction of coordinates*
- V. Area: *area in Euclid's geometry* – *measure of area functions* – *dissection* – *quadratura circuli* – *Euclid's theory of volume* – *Hilbert's third problem*
- VI. Construction Problems and Field Extensions: *three famous problems* – *the regular 17-gon* – *constructions with the compass and marked ruler* – *cubic and quartic extensions*
- VII. Non-Euclidean Geometry: *the parallel postulate* – *neutral geometry* – *non-Euclidean area* – *inversion* – *the Poincare model* – *hyperbolic geometry*
- VIII. Polyhedra: *the five regular solids* – *Euler's and Cauchy's theorems* – *semiregular and face-regular polyhedra* – *symmetry groups of polyhedra*

Schedule

This schedule is tentative only. The unit numbers refer to the above outline.

August 25	Unit I
September 1	Units I – II
September 8	Unit II
September 15	Units II – III
September 22	Unit III
September 29	Units III – IV
October 6	Unit IV
October 13	Units IV – V
October 20	Unit V
October 27	Midterm Exam
November 3	Unit VI
November 10	Units VI – VII
November 17	Unit VII
November 24	Units VII – VIII
December 1	Unit VIII
December 8	Final Exam

Americans With Disabilities Act

Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Kathy Biddick, Student Services Administrative Secretary.