MATH 4327: Readings and Research

Sul Ross State University ~ Rio Grande College
Spring 2016

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Course Description   MTH 4327 is intended as an introduction to individual study and research and to oral and written communication in mathematics.

Course Objectives   Students will independently study a mathematical text and make informal presentations to the class on a regular basis. The course will culminate in the delivery of an oral presentation and research paper in a topic of the student's choice.

Mathematics Program Outcomes   The graduating student will research a mathematical topic and communicate their knowledge orally and in writing.

Class Time   Monday and Wednesday, 2:00 – 3:15 p.m.

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

Required Text   H. S. M. Coxeter, *Introduction to Geometry*, Second Edition, ISBN 9780471504580

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

Course Policies

Reading and Participation

At the beginning of the semester, each student will, under my guidance, select a section of the text. This will typically consist of about two or three connected chapters. possibilities include:

- Euclidean Geometry and Beyond: Chapter 1, Sections 2.1-2, Chapter 6
- Isometry and Symmetry in the Plane: Chapters 2 – 4
- Crystallography: Chapter 4, Sections 10.1 – 10.3 and 10.5, Sections 22.1 – 22.4
- Solids and Polytopes: Chapters 10 – 11, Sections 22.1 – 22.3
- Coordinates and Curves: Chapter 8, Chapter 17

Once we decide which part you would like to work on, this will be your focus for the semester. You should begin by reading the chapters. Plan on working through about two sections per week. You should work most of the exercises you come across.

When we meet as a class, students will take turns telling me and their fellow students what they have been working on. Typically only one student will present during each class period, but

other students are expected to listen carefully and courteously, participate, ask questions, etc. This is intended to be an informal back-and-forth, like office hours, and not a lecture.

Typically, you should plan on summarizing what you've read by writing some things out for everyone to see, working through proofs or computations, etc., and then working an exercise or two. Always make sure to bring plenty of paper! If you want to present a complete or partial solution, it's better to rewrite it and explain each step than to just stick your notebook under the document camera. This helps me and everyone else understand your thought process.

When it's your day to go, it's okay if you mostly have questions about the material, got stuck on exercises, etc. This is a time to learn and to practice communication. Your fellow students may have ideas, and I will get up there to help explain things myself sometimes. If you're needing assistance on an exercise, I will probably try to guide you through it rather than writing something up myself.

The course is self-directed and requires some maturity; my role is that of a guide, not an instructor. It's *crucial* that you adhere to the following two guidelines:

WORK THROUGH ABOUT TWO SECTIONS EVERY WEEK

READING WITHOUT WORKING EXERCISES IS POINTLESS

Your participation grade will depend on whether you seriously grapple with the material, attempt exercises and work on them until you get them right, come to class prepared to discuss your material, and take part in discussions with other students.

Research Paper

In addition to keeping up with the assigned readings, you are required to research a mathematical topic independently. I intend to give you some guidance in this, but if you have other ideas you are free to pursue those as well, so long as you run them by me first.

The paper should be based on a section or sequence of sections from the text. It needs to digest the material, not just summarize what the book says. This is not a textbook review: the focus of the paper is your topic, not the book.

You will need to incorporate some material from at least two additional sources. The footnotes and reference list of the text are an excellent place to begin. Research topics and sources must be approved. Some restrictions apply:

- No online sources whatsoever may be used.
- No encyclopedias may be used.
- No textbooks other than Coxeter may be used.
- No magazine or journal articles may be used.
- Each source must be an actual physical book obtained from the SWTJC library, the SRSU library, or Interlibrary Loan.

You should plan on having a working list of sources by **February 24**. I can give you some good hints on where to start, but you are also free to look for yourself.

The research paper should be mathematically rigorous and involve explicit proofs and computations, but should also exemplify proper grammar, usage, and punctuation. It needs to indicate at least one application of the topic to the humanities, the sciences, or another branch of mathematics. The thesis should be supported or illustrated by interesting examples, not just general theory.

Your paper should be written as to someone who has little knowledge of the material, including an ample introduction and background information. You are to imagine yourself writing an article for undergraduate math majors: you want to make it interesting yet precise and instructive; you want to tell the reader why they should care about the topic.

Your paper should be at least 4000 words long. It should be prepared on Microsoft Word (available on all school computers) in 12 point Cambria font, double spaced, using the Equation Editor to enter mathematical text, with a complete bibliography. You should have a mostly complete rough draft ready for me to look over by **April 7** so that I can provide feedback for your final version.

Oral Presentation

You will also be required to deliver an hour-long oral presentation based on your research paper. This can be thought of as a popular exposition. You can use the document camera or prepare a PowerPoint presentation. Your presentation should also make use of visual aids such as images, models, prepared diagrams, or demonstrations. We will tentatively schedule your presentations to take place in class during the last weeks of class, although we can be somewhat flexible in this regard. You can expect a modestly sized audience of math students and professors, and should be prepared to field questions from the audience after your presentation.

Rubrics

The grading rubrics agreed upon by the mathematics faculty of Rio Grande College will be provided for your convenience. These will be used to score your written paper and oral presentation.

Grading Policy

Your grades will be weighted as follows:

Participation	30%
Research Paper	35%
Oral Presentation	35%

A student who averages at least 90% will receive an A; at least 80% will receive at least a B; at least 70% will receive at least a C; at least 60% will receive at least a D.

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.