MATH 5510, INTRODUCTION TO ALGEBRAIC AND GEOMETRIC TOPOLOGY, I, FALL 2017

Classroom: JWB 333

Time: MWF 10:45 – 11:35

Instructor: Domingo Toledo

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Office Hours: Mon 11:50–12:40,, Wed 9:40 - 10:30 , or by appointment.

Web-page: http://www.math.utah.edu/∼toledo/5510.html

Prerequisites: "C" or better in Math 3220

Textbooks: Notes will be provided for the course, see

http://www.math.utah.edu/∼toledo/5510notesF17V0.pdf

If you would like to consult textbooks, I suggest:

James R. Munkres, *Topology*, Second Edition,

Prentice Hall

and

Manfredo P. do Carmo, *Differential Geometry of Curves and Surfaces*, Prentice-Hall, reprinted by Dover, 2016.

Course Description: This course is the first half of a one year introduction to the methods of algebraic and geometric topology, including some differential geometry. At the end of the year you should have a solid understanding of these methods, and how they apply to the study of surfaces.

This semester will cover basic concepts of topology and and geometry. These concepts will be used in the second semester to develop more advanced methods of algebraic and geometric topology. The basic concepts that we study this semester are also used in many areas of mathematics. In fact, they are part of the common language of mathematics.

The main unifying concept we will discuss is that of a *metric space*. After getting familiar with this concept (which may already be familiar to you) we will proceed in two different directions:

- Generalize it to the concept of a *topological space*.
- Specialize it to the concept of a *Riemannian metric*. Actually, we will look mostly at a special Riemannian metric, the *intrinsic metric* of a surface in $\mathbb{R}^3$.

In more detail, the main topics will be:

- Metric spaces, isometries, Lipschitz mappings.
- Groups of isometries of the plane and sphere.
- Topological spaces and continuous mappings.
- Construction of topological spaces, identification topology.
- Compact spaces, connected spaces.
- Surfaces as identification spaces.
- Surfaces as metric spaces: Riemannian metrics, geodesics, Gaussian curvature.

I have prepared a set of notes that covers all the material for the course, see http://www.math.utah.edu/~toledo/5510notesF17V0.pdf. They will be revised as the course goes on. As I revise them I will change the version number. Please look at this number to be sure that you have the most current version.

My lectures in class will be projected on a screen. At the end of each week I will post pdf files of these projections. Keep in mind that everything you see projected during class will be available to you at the end of the week.

If you would like to also consult a textbook, the one by Munkres has been used in recent years for this course. It would give you a more detailed account of the topics in topology than the presentation in the notes, but it will not have any mention of the topics in differential geometry covered in the course. Similarly, the book by do Carmo will cover the topics in differential geometry in much more detail than in the notes, but would not have any mention of the topics in topology.

The bibliography to the notes contains more textbooks that you can consult.

Homework: I will be assigning homework problems to be collected roughly every other week. When I assign a new homework, I will post two files: a .pdf file and an .tex file. Posting the second is to encourage you to add to it your solutions and hand in your homework in tex. In other words, you are encouraged, but not required, to submit you homework in tex.

Exams: There will be two midterm exams on **September 27** and **November 8**, and a comprehensive final exam on **Thursday, December 14, 10:30–12:30**. Please save these dates!

Grading:
Homework , drop lowest 2:	35 %
Midterm Exams:	40 %
Final Exam:	25 %

Important dates:
- Classes begin: Monday, August 21.

- Last day to add classes without a permission code: Friday, August 25.
- Last day to wait list: Friday, August 25.
- Last day to add, drop (delete), elect CR/NC, or audit classes: Friday, September 1.
- Last day to withdraw from classes: Friday, October 20.
- Last day to reverse CR/NC option: Friday, December 1.
- Classes end: Thursday, December 7.
- Final Exam Period: Monday-Friday December 11–15.

Holidays

- Labor Day: Monday, September 4.
- Fall Break: Sunday - Sunday, October 8 – 15.
- Thanksgiving Break: Thursday-Sunday, November 23–26.

ADA: The Americans with Disabilities Act requires that reasonable accommodations be provided for students with physical, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss any such accommodations you may require for this course.