MATH 5520, INTRODUCTION TO ALGEBRAIC AND GEOMETRIC TOPOLOGY, SPRING 2011

Classroom:	LCB 222 **Time:** T,Th 12:25 – 13:45
Instructor:	Domingo Toledo
e-mail:	`toledo@math.utah.edu`
Office:	JWB 324 **Phone:** (801) 581-7824
Office Hours:	Gladly by appointment. See me after class or send email.
Web-page:	`http://www.math.utah.edu/~toledo/5520.html`
Prerequisites:	Math 4510 and Math 5310.
Textbooks:	W. S. Massey, *Algebraic Topology: An Introduction*, John Stillwell, *Geometry of Surfaces*.

Course Description: This course is the second half of a one year sequence. The purpose of the sequence is to cover some of the basic concepts of topology and geometry, and to apply these concepts to the study of surfaces.

Last semester we covered the following topics:

Metric spaces, Lipschitz maps, isometries.
Groups of isometries.
Classification of isometries of the plane.
Topological spaces and continuous mappings.
Product spaces, subspaces, identification spaces.
Connected spaces, path connected spaces.
Topological surfaces, smooth surfaces.
Intrinsic metric on a surface in $\mathbb{R}^3$, geodesics.

See `http://www.math.utah.edu/~toledo/4510notes.pdf` for notes from last semester, `http://www.math.utah.edu/~toledo/4510F10homework.html` for the homework problems .

This semester we will cover the following topics, not necessarily in the order listed:

Compact topological spaces (not covered last semester for lack of time).
Topological classification of surfaces.
Fundamental group of a topological space, applications.
Covering spaces.
The three geometries of surfaces: Euclidean, Spherical, Hyperbolic.
Curvature, geodesic triangles, Gauss-Bonnet theorem .

The aim of this semester is to study surfaces both from the point of view of topology and of differential geometry. To study the topology of surfaces we will need the concepts of fundamental group and covering spaces. These concepts are very useful in many branches of mathematics. The fundamental group is a topological invariant that we will use to distinguish surfaces. We will relate the group theory, the topological classification, and the geometric classification by means of the Gauss-Bonnet theorem.

Textbooks and Notes: The textbook by Massey has a very good exposition of the fundamental group and covering spaces, and I will follow it to some extent. Another reference for the this material would be the first chapter of the book *Algebraic Topology* by A. Hatcher, which is available at `http://www.math.cornell.edu/~hatcher/AT/ATpage.html`. The textbook by Stillwell has expositions of the three geometries: Euclidean, spherical, hyperbolic, but little differential geometry. I recommend it as an alternative reference for the geometric part of the course. As last semester, I will be writing some notes on the geometry that I hope will give you all the information you need.

Homework: I will be assigning homework problems to be collected roughly every two weeks.

Exams: There will be two midterm exams on February 24 and April 7, and a comprehensive final exam on Monday, May 2, 10:30–12:30.

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

Important dates: Last day to drop (delete) classes: Wednesday, January 19. Last day to add, elect CR/NC, or audit classes: Monday January 24. Last day to withdraw from classes: Friday, March 4.

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.