MTG 5316/4302 Introduction to Topology (3280/3279)
Fall 2014

Instructor: James Keesling, Professor of Mathematics, LIT 424, (352)294-2312, kees@ufl.edu

Meeting Time and Place: MWF 6th Period, LIT 127 **Office Hours:** MW 7th Period

Textbook: James Munkres, *Topology* (2nd Edition) (recommended)

Goal: To understand the concepts of topology and to apply them to mathematical analysis.

Syllabus: This course and its sequel, MTG 5417/4303, will cover the basic concepts and examples in topology. The purpose of the course is to demonstrate the use of topology in analysis and geometry. Important concepts of topology are: open and closed sets, open covers, separation axioms, functions and continuity, homotopy, homeomorphism, compactness, partitions of unity, product spaces, metric spaces, convergence, completion, quotient spaces, inverse limits, and the fundamental group.

Important examples of topological spaces include Euclidean space $\mathbb{R}^n$, the interval $[0,1]$, the Cantor set C, the n–cube $[0,1]^n$, the circle $\mathbb{S}^1$, the n–sphere $\mathbb{S}^n$, the n–torus $\mathbb{T}^n$, 1-dimensional graphs, and 2-dimensional surfaces. We will show how to use these spaces to build other spaces by various constructions including free unions, quotient spaces, mapping tori, nested intersections, and inverse limits. Important theorems to be covered are Urysohn's lemma, the Tietze extension theorem, the Hahn-Mazurkiewicz theorem, the arc-wise connectedness theorem, the Jordan curve theorem, the Banach fixed point theorem, and the Brouwer fixed point theorem. The topics to be covered for this semester are listed below.

Week 1-2	Set theory: sets, functions, index sets, Cartesian products, finite and infinite sets, cardinality, Cantor-Schroeder-Bernstein Theorem, well-ordering, transfinite induction
Week 3-7	Topological spaces: examples, basis, open and closed sets, interior, boundary, closure, continuous maps, homeomorphism. Subspace topology, quotient spaces, product spaces, metric topology, complete metric spaces, the contraction mapping theorem, the Baire category theorem, separation axioms, normal spaces, Tietze Extension Theorem.
Week 8-9	The Tychonoff Theorem and the Stone-Čech compactification
Week 10-11	Metrization and paracompactness
Week 12-13	Function spaces and their topologies
Week 13-14	Connectedness: real line, path-connectedness, components, local Connectivity
Week 15-16	Compactness: covers, finite intersection property, sequential compactness, compactness in the real line and in Euclidean space

Tests and Grading: There will be weekly assignments and a final exam. The grades will be determined by averaging assignments and the final exam. The final exam will count as one-third of the grade. The grading will be on the scale: 95-100 = A, 90-94 = A-, 87-89 = B+, 83-85 = B, 80-82 = B-, 76-79 = C+, 70-75 = C, 65-69 = D+, 60-64 = D, 0-59 = E.

Final Exam Time and Room: Friday, Dec 19, 10:00 am – 12:00 pm, LIT 127

Policy for Make-Up Exams: If a student has a known conflict for an exam, the student has the responsibility to make arrangements for a make-up before the exam is given. If a student misses an exam due to an emergency, arrangements must be made as soon as possible for a make-up.

Students with Disabilities: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.