MTG 5316/4302 Introduction to Topology (3280/79)
Fall 2018

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

Meeting Time and Place: MWF 6th Period, LIT 217 **Office Hours:** MW 7th Period

Textbook: James Munkres, *Topology* (2nd Edition) (not required, most material will be posted online)

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. The course will gradually introduce these concepts in a logical manner starting with the real line and the interval.

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. An outline for this semester is below. The order may vary.

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 3-6	We will start with metric spaces beginning with the real line and the interval. This will lead to general metric topology, complete metric spaces, the contraction mapping theorem, and the Baire category theorem. As the course proceeds we will cover the more general topics mentioned above.
Week 7-8	The Tychonoff Theorem and the Stone-Čech compactification
Week 9-10	Lindelöf spaces, normal spaces, and paracompactness. Metrization.
Week 11-12	Connectedness: path-connectedness, components, local connectivity
Week 13-14	Compactness: covers, finite intersection property.
Week 15-16	Function spaces and their topologies

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: Thursday, Dec 13, 3:00-5:00 pm, LIT 217

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.