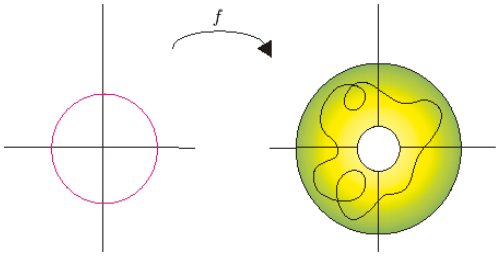
Course: **MATH 530 Section Q1** **Course Title:** **Algebraic Topology**	**Core Course:** ☒ **Yes** ❑ **No** **Term:** ❑ **Fall** ☒ **Winter**
***Instructor*:** **George Peschke** ***Office*:** CAB 543	

While early ad hoc constructions on a topological space, such as Euler's characteristic, go back centuries, the systematic study of algebraic topology only took off from around the beginning of the 20th century onward. Since then the subject has experienced explosive growth. Let us highlight two central themes: one is “homotopy”, that is varying a map of spaces continuously; the other is the investigation of “(co-)cycles” in a space. Both lead to algebraic invariants (e.g. groups) of spaces and of mappings between them.

The result is a vast body of mathematics with a sometimes ubiquitous seeming reach into substantial parts of algebra, algebraic- geometric- and differential topology, differential geometry, complex variables, non-linear analysis, differential equations, mathematical physics, transformation groups, various flavors of K-theory, …

In this course, we will develop material which opens up entrance points to many of these subjects. Here are the main topics:

***Topics*:**
Introduction to homotopy theory: The idea of varying a map of spaces continuously. Mapping degree, homotopy groups and homology groups.
Covering space theory and its relationship to the fundamental group and to combinatorial group theory.
Fiber bundles and fibrations with an explicit discussion of Stiefel manifolds and Grassmann manifolds, together with their relationship to homotopy theory.
CW-complexes and their homotopy theory
Singular homology definition and basic properties.

Background: basic notions from point set topology, algebra and complex variables

Recommended Literature:

G. Bredon	Topology and Geometry
B. Gray	Algebraic Topology, an Introduction
A. Hatcher	Algebraic Topology
P. May	A Concise Course in Algebraic Topology
E. Spanier	Algebraic Topology

Grading Policy:
There will be 10 take home packages, with a combined weight of 50%, and a final examination whose weight is 50%.