18.901 Instructor: Prof. James Munkres

18.901 INTRODUCTION TO TOPOLOGY

We discuss the following:

(1) Objectives of the course

(2) Expectations

OBJECTIVES OF THE COURSE

The objectives of this course are four:

(i) To explore the foundations of mathematics (logic and set theory) at a level and depth appropriate for someone aspiring to study higher-level mathematics and/or to become a professional mathematician.

(ii) To present an introduction to the field of topology, with emphasis on those aspects of the subject that are basic to higher mathematics.

(iii) To introduce the student to what it means to do mathematics, as opposed to learning about mathematics or to learning to do computational exercises.

(iv) To help the student learn how to write mathematical text according to the standards of the profession.

The prerequisite for the course is a first course in Analysis, at the level of Rudin's "Principles of Mathematical Analysis"(18.100B here at MIT.) This background is essential both for the knowledge of the subject matter and for the experience in formulating proofs.

The text for the course is "Topology, Second Edition," by James R. Munkres, published by Prentice-Hall. An errata sheet is appended.

EXPECTATIONS

You are expected of course to read the text and to listen to the lectures. But one does not learn mathematics by reading or listening or taking notes or memorizing proofs. One learns mathematics by doing mathematics. In your case, that means working on the exercises that will be assigned to accompany each lecture. Once a week, we will discuss in class those exercises that anyone wishes to ask about. This session is actually more important than the formal lectures, since it will deal with material that cannot be found in the text.

Your goal should be to construct a notebook containing written-out solutions to all the assigned exercises. Whether you found the solution yourself, or worked it out in collaboration with others, or wrote it up after the class discussion, does not matter. What matters is that you went through the process of writing it out and understanding it. This process is essential, for that is how one finds his or her errors or gaps in reasoning (as any graduate student writing a thesis can testify).

These exercises are not to be handed in for grading. Instead, your knowledge of the exercises will be determined by the exams, which will be based almost entirely on the exercises. I guarantee that the exams will do a good job of determining to what extent you have mastered the exercises.

Besides the exercises, there will be four formal problem sets during the term. The solutions are to be written out, in good mathemaical style, to be handed in and graded. (We make some comments about mathematical style later.) The work on the problem sets is to be strictly your own--think of them as take-home exams. They are intended to challenge you to think about problems that are a bit less routine than the regular ones, and to give you some practice in writing mathematics acceptably.

There will also be two informal, optional problem sets, one at the beginning and one at the end of the term, whose purpose is explained later.

ERRATA FOR TOPOLOGY, SECOND EDITION

(second and subsequent printings)

xii; 13	of connectedness and compactness in Chapter 3.
107; 2	$f : [0,1) \rightarrow S^1$
111; 15	The wording is confusing. Try this: Let X and X' be spaces having the same underlying set; let their topologies be...
118; Exercise 9, line 2	$J \neq \emptyset$.
143; 1	composite g is
151; 2*	$(a_1,\ldots,a_N,0,0,\ldots)$
187; 4*	Let $A\subset X$.
203; 12	$b<a$. Neither U nor V contains a_0.
205; 9*	if and only if X is T_1 and for every...
224; 13	open in X_i for each i.
235; 13*	Show that if X is Hausdorff,
237; 8	Assume is a covering of X by basis elements such that
251; 7	$\leq 1/n$
261; 7	Replace "paracompact" by "metrizable."
262; 8	(x, ε_i)
263; 1*	Throughout, we assume §28.
266; 8*	$\bar{\rho}$ is a metric;
356; 7	Find a ball centered at the origin...
417; 11	element of $P(W)$,
421; 8	length (at least 3), then
425; 10*	$G_1 * G_2$
445; 10	*2.
466; 4	$= w_0[y_1]a[y_2]b\ldots$
481; 1	with $k\circ h(e_0) = e_0$.
488; 4	$F = p^{-1}(b_0)$.
488; 11	of the subset
503; 14*	either empty or a one- or two-point set!