MATH 104A: INTRODUCTION TO TOPOLOGY
SPRING 2015

Instructor: Arunima Ray
Email: `aruray@brandeis.edu`
Course website: LATTE
Lecture time: MWTh 10a–1050a (Block C)
Office: Goldsmith 205
Office hours: M 5-7p, W 11a-1p, and by appointment.

Textbook:
Topology, second edition by Munkres

Additional (optional) references:
Introduction to Topology, pure and applied, by Adams and Franzosa
Introduction to Topology, by Mendelson
Topology Now!, by Messer and Straffin
Counterexamples in Topology, Steen and Seebach

Topics:
Our main goal will be to cover the basics of point-set topology, which correspond to Chapters 2–3 in our textbook. We will cover some topics from Chapter 1 as needed. In the last month or so of the semester, we will explore several topics which the class will choose by vote – this could include metric spaces, algebraic topology, dynamical systems and chaos, game theory (including a proof of Nash's theorem on the existence of Nash equilibria), manifolds and cosmology, etc. We will end the semester with several guest lectures about topics of current topological research, including knot theory, geometric group theory, etc. some of which are studied right here at Brandeis.

Learning goals:
Upon successful completion of this course, students will be able to:

(1) define and illustrate the concepts of topological spaces and continuous functions,
(2) define and illustrate the concepts of subspace, product and quotient topologies,
(3) define and illustrate the concepts of connectedness and compactness,
(4) state and prove several theorems about topological spaces, continuous functions, and subspace, product, and quotient topologies, and connectedness and compactness,
(5) define the fundamental group of a space and give examples,
(6) describe the relationship between topology and various branches of mathematics, and
(7) distinguish between several subfields of topology, including general, geometric, and algebraic topology.

Feedback:
Occasionally during the semester I will pass out notecards asking for (anonymous) feedback. Please use them to share any thoughts or concerns regarding the course. Remember, the

sooner you tell me your concerns, the more I can do about them. In addition, you can send me anonymous feedback through the google form available at `http://goo.gl/forms/HUhQaWRDXk` (this link can also be found on the course website).

Grading: Your grade will be calculated as follows.

Problem sets	50%
Midterm	25%
Course summary	10%
Final paper	15%

If there are any concerns about grading, please see me within one week of getting the assignment/exam back, and before the last day of class (Dec 9). There might be a curve at the end of the semester based on student performance.

Late work policy:
Life tends to get in the way of classes sometimes. To help with this, you have five late days that you may use for problem sets or paper/summary-related deadlines (not the midterm since it is in-class). This means you can apply a late day to submit your work late (by at most one day) without penalty. (I might ask you to submit your work via email in that case if I will be out of town.) You are welcome to use multiple late days for the same assignment.

To apply a late day, you must talk to me in person, or send me an email clearly stating that you want to use a late day. You may not use a late day if I have already posted any corresponding solutions online, so it is to your advantage to let me know your plan to use the late day before the submission deadline.

If you have chosen not to apply a late day, or have run out of them, I will deduct $\frac{1}{7}$ of the assignment grade per day it is late. E.g. if you submit a 70-pt assignment two days late, I will compute your score, and then subtract 20 points from it to obtain your actual score. This means submitting more than a week late is 'pointless' in terms of grades, but I will still be happy to give feedback on your work. Unless otherwise stated, problem sets, topics, summaries, etc. are due at 11a (slightly after the end of our scheduled class period).

Expectations:
This is a higher-level pure mathematics course. As a result, you should expect to do a fair amount of independent reading, and much of our work will consist of reading and writing proofs. I expect you to do readings and homeworks in time. I expect you to ask questions in class or in office hours if you have them. Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).

In return you should expect me to be on time for lectures, be available in my office for scheduled office hours, and respond to emails in a timely manner. You should also expect me to answer your questions to the best of my ability, and to direct you towards appropriate resources when necessary. You should expect my goal to be for everyone in this class to do well.

Problem sets:
There will be seven problem sets (see below for due-dates). If you are unable to submit a problem set for some reason, I recommend looking over the problems regardless since we might use them later in the semester.

Problem sets will consist primarily of writing proofs. As in any higher-level mathematics course, these should be written in complete sentences and with an eye towards exposition. Depending on our class size and whether we have a Teaching Assistant, only a selection of problems might be graded. Solutions will be posted on LATTE in this case. Due to the late day policy, solutions might not be posted immediately after the deadline.

If a problem is graded, it will be graded as follows.

0	left blank
3	question copied, nothing else written
4	something written apart from the question, but it appears to be written only to take up space
6	substantially incomplete; does not really answer the main question; major errors; poor writing
8	mostly complete; maybe a few minor errors
9	complete; no errors; some personal insight; well-written
10	wonderful

You are welcome to work with your classmates on problem sets, but your final writeup must be your own!! In particular, you are not permitted to look up solutions to the problems in any written form, including on the internet. If in doubt about what sources you can use, ask me.

You are welcome to email me your problem sets in case you are typing your solutions, or will not be in class, or if you feel like it.

Midterm:
The midterm will be in-class during our usual class time on Oct 19. There will be no make-up exams without prior approval and an appropriate reason. The exam will be closed-book, closed-notes, closed-friends, and open-brain.

Course summary:
This will consist of a stream-lined typed summary of our course, not including the guest lectures during the last week or so of the semester. This should include important definitions and theorems. It need not include proofs unless you think the proof was important to your learning in this course. You are welcome and encouraged to work with others. It might be useful to type up your summary in LaTeX, but you are welcome to use any other typesetting software, such as Word, OpenOffice, GoogleDocs, etc. (On the other hand, LaTeX is designed to make typing mathematics painless and intuitive and is a generally useful thing to know of in academia.)

The goal of this assignment is for you to recap the semester – as long as your summary is relatively complete you will get full credit for this component of your grade.

You are welcome to email me your course summary - a hard copy is not needed.

Final paper:
The final paper will be based on a topic of your choice; it could, for instance, be something we have discussed (briefly) in class, but you are welcome to find your own topics based on your own personal interests, as long as they are topological in some reasonable sense (if in doubt, run your topic by me before the topic submission deadline). I will happily give suggestions to help with topic selection. Your goal is to just summarize the topic and give some details as if you are explaining the topic to your fellow classmates. I will post example papers on LATTE. I will also post a list of books that might help with choosing paper topics.

You can work on your final paper on your own, or in pairs – the choice is yours. If working with a partner, the two of you will submit a single jointly written paper (see below for the different length requirement). If two of you (mutually) want to work on the paper together, let me know when submitting your paper topic. If you would like to work with a partner but do not have a specific person in mind, let me know early in the semester, and I will try to find a partner for you within our class. There will be plenty of announcements about deadlines for these things in class.

If you are working alone on a paper, it should be 1000–1500 words. If you are working with a partner, it should be 2000–2500 words.

There are several paper-related deadlines. Paper topics are due to me by Nov 4, although I encourage you to speak to me about topics before then. An annotated bibliography is due on Nov 18—this should consist of a list of length ≥ 2 of sources for your topic, and a (brief) description of what you are using the sources for. Sources may be textbooks, (respectable) online sources, articles, etc. I will be happy to look at drafts of your work and provide comments—these will not be graded. You are also welcome to talk to anyone you like about the paper, but the final written work should be yours (or your partner's). You are also welcome to take advantage of the Writing Center for feedback on your exposition. The final version of your paper is due on Dec 9.

The final paper will be graded out of 100 points as follows.

If you are working alone:

Submitted paper topic on time	10 points
Submitted AB on time	15 points
Paper content	50 points
Paper exposition	25 points

If you are working with a partner, I will calculate a raw score out of 100 as above. This will be adjusted by a 'partner evaluation coefficient', which we will determine together. The goal of this to ensure that both partners contribute equally to the final paper.

You are welcome to email me your paper - a hard copy is not needed.

Extra credit:
You can earn up to 5 points on your final grade in the following ways. Each item counts

for at most 2 points, and you can use the same item at most twice (e.g. only two seminar reports can count as extra credit).

(1) Attend an EveryTopic seminar and write a short report (at most one typed page containing the title of the talk, the name of the speaker, and a few things you learned from the talk). See `http://people.brandeis.edu/~aruray/everytopic` for schedule. (If there is a different seminar you would like to attend instead, run it by me.)
(2) Enter the AWM Essay contest (choose a contemporary female mathematician—not including myself—and write an essay about her life based on an interview with her). See `https://sites.google.com/site/awmmath/programs/essay-contest` for more details. (If you need help finding/contacting local female mathematicians, ask me!)
(3) Create or substantially edit a wikipedia page about a math topic/individual. (If editing an article, run it by me to make sure the edits are substantial enough.)
(4) Write a publicly available blogpost about a math topic of your choice.

The above will be graded primarily on completion – i.e. if you complete the assignment in good faith, you will get all the 2 points.

Discussion forum:
I have created a discussion forum on the LATTE page for our class. Please feel free to use it to discuss the class, including problem sets, papers, summaries, etc. I hope that this will help you communicate with one another despite varying schedules.

Disability support:
If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately.

Academic Integrity: You are expected to be familiar with, and to follow, the University?s policies on academic integrity. Please consult Brandeis University Rights and Responsibilities for all policies and procedures. All policies related to academic integrity apply to in-class and take home projects, assignments, exams, and quizzes. Students may only collaborate on assignments with permission from the instructor. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university.

Course Schedule:

PS #1	Sep 16
PS #2	Sep 30
PS #3	Oct 14
In-class midterm	Oct 19
PS #4	Oct 28
Paper topics due	Nov 4
PS #5	Nov 11
Annotated bibliography due	Nov 18
PS #6	Nov 23
PS #7	Dec 2
Course summary and paper due	Dec 9