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M 531.B01: Introduction to Topology

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M531 Introduction to Topology

NAC 011 at 2P

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COURSE OVERVIEW

"Topology is an important and interesting area of mathematics, the study of which will not only introduce you to new concepts and theorems but also put into context old ones like continuous functions. However, to say just this is to understate the significance of topology. It is so fundamental that its influence is evident in almost every other branch of mathematics. This makes the study of topology relevant to all who aspire to be mathematicians whether their first love is (or will be) algebra, analysis, category theory, chaos, continuum mechanics, dynamics, geometry, industrial mathematics, mathematical biology, mathematical economics, mathematical finance, mathematical modelling, mathematical physics, mathematics of communication, number theory, numerical mathematics, operations research or statistics. Topological notions like compactness, connectedness and denseness are as basic to mathematicians of today as sets and functions were to those of last century." -Topology without tears, Sidney Morris

You may have learned that, in addition to its geometric structure, the unit circle has algebraic properties. In fact, it also has structure as a topological space. Topology is not concerned with the exact shape of objects, but rather how they look in a softer sense. As usual, we need to be precise about what we mean by softer and from this we define topology.

As is somewhat traditional for an introductory course in topology, this class will be taught without formal lectures and without a textbook. Instead, I will guide the class by giving definitions, pointing out examples, and stating theorems. You, the students, will work out the essential details of the examples and prove the theorems. We will cover the definitions as some important properties, including continuity, connectedness, and compactness. Along the way, we will see many examples.

There are no formal prerequisites for the material in this course. On the other hand, I will assume that you have some experience in writing, reading, and critiquing mathematical proofs. (Some basic analysis or advanced calculus may help provide motivation for the subject.)

RULES

- Participation is a critical part of this course and your attendance is required.
- Intra-class collaboration is encouraged.
- No outside resources are allowed. This includes the internet, other texts or notes, and people who are not in this room.
- You are expected to be polite to me and your classmates. This includes coming to class on time, acting interested and engaged, and not using electronic devices and computers for social reasons during class.

NOTABLE CHALLENGES

- You will be routinely asked to think deeply about new ideas.
- You will constantly be asked to work on problems which you have not been shown how to solve.
- You will be challenged directly about the details in your reasoning.
- You will be criticized in your writing.
- You may experience frustration and failure before success. Becoming comfortable with this process is one of the most empowering skills you can develop to become an independent lifelong learner.
- Solving new problems and mastering new concepts is both difficult and time consuming. It may take time, experimentation, and deep thinking before you develop a plan for how to even begin a task.

Moodle

This site will contain all information on this sheet plus more. Homework assignments and other information pertinent to this course will be posted at this web site.

Graded work

All graded work will be submitted electronically as **pdf** files. Generally, work will be uploaded to Moodle and graded work will be placed in your UMbox folder.

Daily homework

In each class period, you will be assigned some tasks which need to be completed before the next class meeting. These assignments should be carefully, clearly, and cleanly written in order to receive credit. You should work in drafts and hand in a copy of your final draft. You will also need to

have a copy of your final draft handy to refer to during class.

You will be graded on the work you have completed before the class meeting begins. I will use a quick ‘check system’ to grade these assignments.

Presentations

Presentations will occur each class period and might be assigned to groups or individuals. I will select presenters based on (computer) random choices, quantity of presentations for each student, existence of volunteers.

Presentations are usually based on daily homework tasks. The main purpose of the presentations is to make the ideas of your solution clear to your peers.

- Completely correct and clear proof/solution. 4 points.
- Minor technical errors or lacking minor details. 3 points.
- Partial explaination/proof is given but significant gap remains. 2 points.
- Minimal progress. 1 point.
- No preparation is evident. 0 points.

You can and should annotate your daily homework during presentations in order to prepare for weekly homework.

Weekly homework

Choose 2 problems from the a list of Daily Homework problems to write up beautifully. Use the LaTex template posted on Moodle.

- Correct and well-written. 4 points.
- Good work but some mathematical errors or writing errors that need addressing. 3 points.
- Some good intuition, but this is at least one serious flaw. 2 points.
- I don't understand this, but I see that you did work on it. 1 point.
- No work is evident. 0 points.

Grades

Exam problems will be graded according to the Weekly homework rubric listed above. Your exam score will be the average of your scores on the individual problems. Letter grades are assigned as follows:

- A: At least 3.6.
- B: Less than 3.6 but at least 3.
- C: Less than 3 but at least 2.3.
- D: Less than 2.3 but at least 1.7.
- F: Less than 1.7.

COVID-19

- Mask use is required within the classroom. View UM’s face covering policy.
- Each student is provided with a Healthy Griz kit. We expect students to clean their personal work space when they arrive for class, and before they leave the classroom. Refill stations for cleaning supplies/hand sanitizer will be set up around campus - please learn where they are and use them.
- Classrooms may have one-way entrances and exits to minimize crowding. Students are discouraged from congregating outside the classroom before and after class.
- Drinking liquids and eating food (which requires mask removal) is strongly discouraged within the classroom.
- Stay home and contact the Curry Health Center at (406) 243-4330 if you feel sick and/or if exhibiting COVID-19 symptoms. If you are diagnosed with COVID-19, follow instructions for quarantine and contact your advisor so they can help you stay on track academically.
- Students, please remain vigilant outside the classroom and help mitigate the spread of COVID-19.

Guidelines and policies

University dates and deadlines

You should be aware of the important dates and deadlines posted by the Registrar's Office.

Academic honesty

I take academic honesty very seriously and I will act on any transgressions that I notice. Misconduct is subject to an academic penalty in this course and/or a disciplinary sanction by the university. We all know that a record of academic misconduct is a very bad thing to have documented in your academic history. All students should be familiar with the Student Conduct Code.

Disability modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.