University at Buffalo

MTH 428/528 Introduction to Topology II
Syllabus - Spring 2022

Course Website: www.mth528.site.
Please refer to the course website for an up-to-date version of this syllabus and all course materials.

Lectures: Mon, Wed 3:30 - 4:50 PM Math Building 122.

Instructor: Bernard Badzioch
E-mail: badzioch@buffalo.edu
Office Hours: Mon 5:00-6:00 PM and by appointment.

Prerequisites:
- General topology (topological spaces, continuous functions, subspaces, product spaces, quotient spaces, compactness and path connectedness).
- Some group theory (groups, subgroups, quotient groups, homomorphisms and isomorphisms).

Learning outcomes: After completing this course student should be able to:
- Understand the notions of a category and a functor between categories.
- Understand the notions of homotopy of functions and homotopy equivalence of topological spaces.
- Understand the construction of the fundamental group functor and its properties.
- Be able to compute the fundamental group of a variety spaces using such properties as homotopy invariance, the product formula, van Kampen's Theorem.
- Understand some applications of the fundamental group (Brouwer fixed point theorem, Borsuk-Ulam theorem, the fundamental theorem of algebra etc.).
- Understand the notion of a CW complex and know how to compute the fundamental group of a CW complex using its cell structure.
- Understand and apply some basic results of homotopy theory: the cellular approximation theorem, the homotopy extension property of CW complexes etc.
- Understand the notion of a covering space.
- Understand and be able to apply the results on classification theorem of covering spaces using the fundamental group.
- Understand the notion of a deck transformation and how the group of deck transformations of a covering can be expressed in terms of the fundamental group.

Textbook: The course will follow lecture notes posted on this website. If you would like to use a published text as a supplement, there are many books to choose from. Algebraic Topology by Edwin Spanier is a classic. Algebraic Topology by Allen Hatcher is another good option and it can be downloaded for free from Allen Hatcher's website. The content of the course will roughly correspond to chapters 1-2 of Spanier's book and chapters 0-1 of Hatcher's text.

Grading:
Homework: 35%
Midtem Exam: 20%
Class participation: 10%
Final Exam 35%

Homework: Homework problems will be assigned weekly. Students registered for MTH 528 are required to submit homework solutions typeset in LaTeX. MTH 428 students will receive one bonus point for each homework problem solution prepared in LaTeX (solutions that show no mathematical effort do not count).

You can collaborate on homework problems, but you must write solutions entirely on your own. Copying solutions from other students or any other sources is a violation of the UB academic integrity policy.

Homework assignments will be collected and returned through Gradescope.

Class participation: Class participation credit will be based on two components**.**

- **Class attendance.** You can earn up to 5% of the total course credit for being present and on time during class meetings. You can miss two class meetings without a justified reason. Each subsequent unexcused absence will lower your participation credit by 1% (i.e. from 5% to 4% etc.).

- **Weekly digest.** As a part of each homework you will be asked to submit a short (2-3 sentences) writeup on your study from the previous week. For example, you can write:

  - what topics you have found interesting (or boring)
  - what topics you have found difficult (or easy)
  - how you feel about the course
  - anything else you want to share.

You will be also asked to submit questions that you would like to see discussed during a class meeting.

You can receive up to 5% credit for these writeups. You can miss one such assignment without loosing any credit, but your weekly digest credit will be lowered by 1% for each subsequent missed assignment.

I may award extra credit to students who are especially active in the course. I may also offer some extra credit opportunities for giving short presentations on some topic etc.

Exams:
- **Midterm Exam:** Wednesday, March 30, 3:30 - 4:50 PM, Math Building 122.
- **Final Exam:** Tuesday, May 17, 11:45 - 2:45 PM Fronczak Hall 422.

Incomplete Grades: See the UB Catalog for the UB Incomplete Grades Policy.

Academic Integrity: See the UB Catalog for the UB Academic Integrity Policy.

Accessibility Resources: If you need accommodations due to a physical or learning disability please contact the UB Accessibility Resources Office to get help with making appropriate arrangements.