

	<h2>Math 829: Algebraic Topology</h2>
	Credits: 3, Section(s): 011
	Semester: Spring, Year: 2018
	Meeting Days, Times, Location and Room: MW 8:40-9:55, Gore 219

1. Instructor Information

Instructor name	Prof. Chad Giusti
E-mail address	cgiusti@udel.edu (e-mail hours: 9AM - 6PM M-F)
Website	http://www.chadgiusti.com/math829.html
Office location	532 Ewing Hall
Office hours	Monday 10;11, 2-4 or by appointment
Phone number	(302) 831-0592

2. Course Description

Pre-requisites

First courses in algebra (e.g. MATH 451 or 650) and analysis (e.g. MATH 401 or 600). In particular, exposure to basic definitions regarding and properties of topological spaces and algebraic objects including groups and rings.

Description

This course is an introduction to algebraic invariants of topological spaces. We will cover the construction of the fundamental group, higher homotopy groups, homology groups and cohomology rings of topological spaces. We will develop the languages of categories and homological algebra as a framework for these invariants, and apply a range of various geometric, algebraic and combinatorial techniques to compute topological invariants for spheres, Grassman manifolds, configuration spaces, and matrix Lie groups. We will prove classical topological results including cellular approximation, Poincare duality, fixed point theorems, the generalized Jordan curve theorem, and the Borsuk-Ulam theorem.

3. Learning Resources

The principal reference for the course will be the classic geometrically-flavored text for a first course in algebraic topology.

- *Algebraic Topology*, by Allen Hatcher
ISBN 978-0-521-79540-1

This book is available both in print at the bookstore and electronically at Prof. Hatcher's web page:

<https://www.math.cornell.edu/~hatcher/AT/ATpage.html>

I strongly recommend buying a copy, as it is inexpensive enough that you won't save money printing your own, and there is growing evidence that learning from printed material is more effective than from electronic copies.

In addition, there is a course web page:

<http://www.chadgiusti.com/math829.html>

The page contains all course documents and a schedule (topics may move around or change as the course progresses, but exam dates are fixed). Throughout the term, I will post homework and resources to the web page.

4. Course Structure and Assessment

Final Grade Breakdown

The final course grade will be calculated using the following categories:

Course Component	Percentage of Total
Reading questions and preliminary exercises	20%
Weekly homework	30%
Take-home midterm	20%
Take-home final	30%

After class on Wednesdays, written problems for the preceding week's material and required reading and preliminary exercises (primarily from the textbook) for the following week will be made available on the course web page.

Reading questions and preliminary exercises

By Sunday at noon, you must send me an **e-mail** containing both a collection of questions about the assigned reading and your answers to the preliminary exercises as a **PDF attachment**. Due to the large number of pictures you will need to draw in this course, you can choose to **either typeset in LaTeX** -- I'm happy to help you learn to typeset figures or import figures made by hand or in other software -- **or scan a neat, hand-written document**. For each reading, full marks will be given for submitting at least **three high-quality questions** and for making a **reasonable attempt at completing each exercise**. I will address a subset of the reading questions I receive during the class meetings, and if you are particularly interested in hearing an answer to one of the questions you have, please indicate this in the body of your e-mail.

Appropriate reading questions include, among many others, specific points of confusion regarding terms, examples or reasoning, specific sticking points where you had problems with the preliminary exercises, or well-motivated questions about how things relate to other ideas either inside or outside the course. An example of an excellent question might be, "The statement of <theorem> requires <property X>, but it appears that the proof only uses <weaker property Y>. I was unable to find a counterexample if for something satisfying <Y> but not <X>; for example, I tried <my example>. Is the theorem true under this weaker assumption?", while poor questions include non-specific or unmotivated questions like, "What does <term> mean?" or, "How do homotopy groups relate to differential geometry?"

Weekly homework

Homework exercises assigned the previous week are **due on Wednesday at the beginning of class as an e-mail attachment**, again **either typeset in LaTeX or nearly hand-written**. I highly encourage you to work with others on the weekly homework, in which case you must state at the top of the first page with whom you worked. **Homework will be graded for correct completion**: when grading I will indicate the place where a proof or computation begins to go awry and give partial credit proportional to how close to a completely correct answer you submitted, but **written comments will be brief**. If you have specific questions about a problem you did not complete or which was marked incorrect, **I am happy to meet with you in person to work through any difficulties, or to answer specific questions over e-mail**.

Midterm/Final Exams

There will be take-home midterm and final exam. The midterm will be posted to the web page on Wednesday, March 21st and due before class on Wednesday, April 4th. The final will be posted to the web page on Wednesday, May 9th and due by midnight on Wednesday, April 23rd. Both exams must be submitted electronically in the same manner as the homework. You may use only the course textbook and your notes on the exam, and may discuss the problems with no one other than the professor.

Grading Scale

Students will be assigned the following letter grade, based on the calculation coming from the course assessment section.

Grade	Interval		Grade	Interval		Grade	Interval
A	94.50 and over		B-	79.50 to 82.49		D+	66.50 to 69.49
A-	89.50 to 94.49		C+	76.50 to 79.49		D	62.50 to 66.49
B+	86.50 to 89.49		C	72.50 to 76.49		D-	59.50 to 62.49
B	82.50 to 86.49		C-	69.50 to 72.49		F	Below 59.49

Course Policy Document

Attendance

The Faculty Handbook contains the following language regarding excused absences:

“Absences on religious holidays listed in University calendars is recognized as an excused absence. Nevertheless, students are urged to remind the instructor of their intention to be absent on a particular upcoming holiday. Absences on religious holidays not listed in University calendars, as well as absences due to athletic participation or other extracurricular activities in which students are official representatives of the University, shall be recognized as excused absences when the student informs the instructor in writing during the first two weeks of the semester of these planned absences for the semester. “

While this course has no formal attendance requirement, it is unlikely that students who fail to attend the scheduled lectures will succeed with the course assignments, and I will not provide a review of material that is missed due to unexcused absences. I am always happy to work with you in the case of excused absences.

Homework and Exam Submission Policy

All homework and exams must be submitted as PDF e-mail attachments, either typeset through LaTeX or neatly hand-written. It is the responsibility of the student to ensure that PDF attachments can be opened in either Adobe Reader or Evince. Documents which I cannot open in either of these programs will not be considered properly submitted, and I will not grant extensions to submission deadlines in such cases. Properly submitted homework for which the associated e-mail's "Received" header timestamp is after the submission is due will be considered late and subject to the late work policy specified below.

Late Work

Work which is late due to an excused absence will always be accepted without penalty and does not count toward grace weeks. Late reading questions, preliminary work and exams which are not the result of an excused absence will not be accepted. In the case of late homework, each student has two weeks of "homework grace period" to be used at their discretion. Thus, you may choose to hand in two homework assignments one week late, or one assignment two weeks

late, with no expected explanation and at no change in grade. Once these grace weeks are used, no further late homework will be accepted.

Make-up Exams

In the case of extended excused absence during the course of one of the take-home exams, I will work with you to schedule an alternate exam period as soon as possible after the standard exam period. Except in the case of an emergency, such arrangements must be made before the official exam date. At my discretion, a make-up exam may contain different questions than the exam given to the rest of the class, though all reasonable attempts to make the difficulty equitable will be made.

Communication

Primary out-of-class contact will occur through office hours (532 Ewing, times TBD, or by appointment) and by e-mail (cgiusti@udel.edu). I will be available to answer e-mail between 9 AM and 6 PM Monday through Friday, and will usually respond to an e-mail within 24 hours of receiving it during this period. While I may respond to e-mail outside of these hours, this should not be expected; my dog gets grumpy when I answer e-mail in the evenings or weekends.

Academic Integrity

Please familiarize yourself with UD policies regarding academic dishonesty. To falsify the results of one's research, to steal the words or ideas of another, to cheat on an assignment, to re-submit the same assignment for different classes, or to allow or assist another to commit these acts corrupts the educational process. Students are expected to do their own work and neither give nor receive unauthorized assistance. Complete details of the university's academic integrity policies and procedures can be found at <http://www1.udel.edu/studentconduct/policyref.html> Office of Student Conduct, 218 Hullahen Hall, (302) 831-2117. E-mail: student-conduct@udel.edu

Harassment and Discrimination

The University of Delaware works to promote an academic and work environment that is free from all forms of discrimination, including harassment. As a member of the community, your rights, resource and responsibilities are reflected in the non-discrimination and sexual misconduct policies. Please familiarize yourself with these policies at www.udel.edu/oei. You can report any concerns to the University's Office of Equity & Inclusion, at 305 Hullahen Hall, (302) 831-8063 or you can report anonymously through UD Police (302) 831-2222 or the EthicsPoint Compliance Hotline at www1.udel.edu/compliance. You can also report any violation of UD policy on harassment, discrimination, or abuse of any person at this site: <http://sites.udel.edu/sexualmisconduct/how-to-report/>.

Faculty Statement on Disclosures of Instances of Sexual Misconduct

If, at any time during this course, I happen to be made aware that a student may have been the victim of sexual misconduct (including sexual harassment, sexual violence, domestic/dating violence, or stalking), I am obligated to inform the university's Title IX Coordinator. The university needs to know information about such incidents in order to offer resources to victims and to ensure a safe campus environment for everyone. The Title IX Coordinator will decide if the incident should be examined further. If such a situation is disclosed to me in class, in a paper assignment, or in office hours, I promise to protect your privacy--I will not disclose the incident to anyone but the Title IX Coordinator. For more information on Sexual Misconduct policies, where to get help, and how to reporting information, please refer to www.udel.edu/sexualmisconduct. At UD, we provide 24-hour crisis assistance and victim advocacy and counseling. Contact 302-831-1001, UD Helpline 24/7/365, to get in touch with a sexual offense support advocate.

For information on various places you can turn for help, [click here](#). For more information on Sexual Misconduct policies, where to get help, and reporting information please refer to www.udel.edu/sexualmisconduct.

Inclusion of Diverse Learning Needs

Any student who thinks he/she may need an accommodation based on a disability should contact the Office of Disability Support Services (DSS) office as soon as possible. The DSS office is located at 240 Academy Street, Alison Hall Suite

130, Phone: 302-831-4643, fax: 302-831-3261, DSS Website (<http://www.udel.edu/DSS/www.udel.edu/DSS>). You may contact DSS at dsoffice@udel.edu

Non-Discrimination

The University of Delaware does not discriminate against any person on the basis of race, color, national origin, sex, gender identity or expression, sexual orientation, genetic information, marital status, disability, religion, age, veteran status or any other characteristic protected by applicable law in its employment, educational programs and activities, admissions policies, and scholarship and loan programs as required by Title IX of the Educational Amendments of 1972, the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, Title VII of the Civil Rights Act of 1964, and other applicable statutes and University policies. The University of Delaware also prohibits unlawful harassment including sexual harassment and sexual violence.

For inquiries or complaints related to non-discrimination policies, please contact:

Director, Institutional Equity & Title IX Coordinator- Susan L. Groff, Ed.D. groff@udel.edu, 305 HULLIHEN HALL NEWARK, DE 19716 (302) 831-8063

For complaints related to Section 504 of the Rehabilitation Act of 1973 and/or the Americans with Disabilities Act, please contact: Director, Office of Disability Support Services, Anne L. Jannarone, M.Ed., Ed.S. - ajannaro@udel.edu
Alison Hall, Suite 130, Newark, DE 19716 (302) 831-4643 OR contact the U.S. Department of Education - Office for Civil Rights (<https://wdcrobcop01.ed.gov/CFAPPS/OCR/contactus.cfm>)