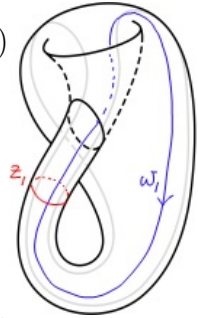


# Math 524: Algebraic Topology (Fall 2021)

Credits	3
Time	Tue,Thu 1:30–2:45 pm
Locations	<b>TERR 24 (PI)</b> , VECS 120 (Vn), Zoom (ID: 965 3685 7826, Pw: 13070)
Instructor	Bala Krishnamoorthy
Office	VUB 347 (Vancouver), Zoom (ID: 360 546 9167, Pwd: Bala)
Office Hours	<b>Tue, Wed 3–4 pm</b> , or by appt
Email	kbala@wsu.edu
Web page	<a href="http://www.math.wsu.edu/faculty/bkrishna/Math524.html">www.math.wsu.edu/faculty/bkrishna/Math524.html</a>
Text	James R. Munkres: Elements of Algebraic Topology Westview Press, ISBN: 0201-62728-0.
	Allen Hatcher: Algebraic Topology Full book at <a href="http://pi.math.cornell.edu/~hatcher/AT/ATpage.html">pi.math.cornell.edu/~hatcher/AT/ATpage.html</a>



## Description of the Course

Algebraic topology uses techniques from abstract algebra to study how (topological) spaces are *connected*. Most often, the algebraic structures used are groups, but more elaborate structures such as rings or modules also arise. A typical approach projects continuous maps between topological spaces onto homomorphisms between the corresponding groups. This course will introduce basic concepts of algebraic topology at the first-year graduate level.

We will follow mostly the book *Elements of Algebraic Topology* by James R. Munkres, and cover in a fair bit of detail the topics on homology of simplicial complexes, relative homology, cohomology, and, if time permits, the basics of duality in manifolds (selected Sections from Chapters 1–5 and 8). We will also refer to the book *Algebraic Topology* by Allen Hatcher for some of the topics. But unless there is strong interest, we will not cover topics related to the fundamental group. We will stress geometric motivations as well as applications (where relevant) throughout the course.

**Prerequisites:** Some background in general topology as well as abstract algebra, both at the undergraduate level, will be assumed. In particular, familiarity with the concepts of continuous functions, connectedness, and compactness, as well as with the concepts of groups, homomorphisms, fields, and vector spaces will be helpful to follow the course. But no particularly deep theorems from these topics will be needed. Some flexibility could be afforded as far as this background is concerned—please contact the instructor if you are interested in the class, but have doubts about the background required.

## Organization and Grading

The course will have around **seven** homework assignments, which include mostly theoretical, i.e., “pen-and-paper” problems. Each student will also be required to make one long, or a few short, blog post(s). These posts could be made on a topic chosen from the textbooks (but not covered in the lectures), or from 1–2 research papers. The overall grade will be assigned using the following weights: **homework– 75%, blog posts–25%**. There will be no exams.

# **WSU Systemwide Policies and Statements**

## **Reasonable Accommodation**

**Students with Disabilities:** Reasonable accommodations are available for students with documented disabilities or chronic medical or psychological conditions. If you have such a condition and need accommodations to fully participate in this class, please visit your campus' Access Center/Services website to follow published procedures to request accommodations. Students may also contact their campus offices to schedule an appointment with a Disability Specialist. All disability related accommodations are to be approved through the Access Center/Services on your campus. It is a university expectation that students connect with instructors (via email, Zoom, or in person) to discuss logistics within two weeks after they have officially requested their accommodations.

For more information, contact a Disability Specialist on your home campus:

- Pullman, WSU Global Campus, Everett, Bremerton, and Puyallup: 509-335-3417 Access Center (<https://www.accesscenter.wsu.edu>) or email at [access.center@wsu.edu](mailto:access.center@wsu.edu)
- Vancouver: 360-546-9739 Access Center (<https://studentaffairs.vancouver.wsu.edu/access-center>) or email [van.access.center@wsu.edu](mailto:van.access.center@wsu.edu).

## **Academic Integrity**

All members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Students are responsible for understanding the full Academic Integrity Statement. Students who violate WSU's Academic Integrity Policy (identified in [WAC 504-26-010\(3\) and -404](#)) will receive a failing grade for the assignment or for the whole course, will not have the option to withdraw from the course pending an appeal, and will be reported to the Center for Community Standards. If you have any questions about what is and is not allowed in this course, ask your course instructor.

## **COVID-19**

Per the proclamation of Governor Inslee on August 18, 2021, masks that cover both the nose and mouth must be worn by all people over the age of five while indoors in public spaces. This includes all WSU owned and operated facilities. The state-wide mask mandate goes into effect on Monday, August 23, 2021, and will be effective until further notice.

Public health directives may be adjusted throughout the year to respond to the evolving COVID-19 pandemic. Directives may include, but are not limited to, compliance with WSU's COVID-19 vaccination policy, wearing a cloth face covering, physically distancing, and sanitizing common-use spaces. All current COVID-19 related university policies and public health directives are located at <https://wsu.edu/covid-19/>. Students who choose not to comply with these directives may be required to leave the classroom; in egregious or repetitive cases, student non-compliance may be referred to the Center for Community Standards for action under the Standards of Conduct for Students.

## **Discrimination and Harrassment**

Discrimination, including discriminatory harassment, sexual harassment, and sexual misconduct (including stalking, intimate partner violence, and sexual violence) is prohibited at WSU (See [WSU Policy Prohibiting Discrimination and Harassment](#) (Executive Policy 15) and [WSU Standards of Conduct for Students](#)). If you feel you have experienced or have witnessed discriminatory conduct, you can contact the WSU Compliance & Civil Rights (CCR) and/or the [WSU Title IX Coordinator](#) at 509-335-8288 to discuss resources, including confidential resources, and reporting options. (Visit [ccr.wsu.edu](http://ccr.wsu.edu) for more information). Most WSU employees, including faculty, who have information regarding sexual harassment or sexual misconduct are required to report the information to CCR or a designated Title IX Coordinator or Liaison. (Visit [ccr.wsu.edu/reporting-requirements](http://ccr.wsu.edu/reporting-requirements) for more info).

## **Accommodation for Religious Observances or Activities**

Washington State University reasonably accommodates absences allowing for students to take holidays for reasons of faith or conscience or organized activities conducted under the auspices of a religious denomination, church, or religious organization. Reasonable accommodation requires the student to coordinate with the instructor on scheduling examinations or other activities necessary for course completion. Students requesting accommodation must provide written notification within the first two weeks of the beginning of the course and include specific dates for absences. Approved accommodations for absences will not adversely impact student grades. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who feel they have been treated unfairly in terms of this accommodation may refer to Academic Regulation 104 – Academic Complaint Procedures.

## **Classroom Safety**

Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the “Alert, Assess, Act,” protocol for all types of emergencies and the “[Run, Hide, Fight](#)” response for an active shooter incident. Remain ALERT (through direct observation or emergency notification), ASSESS your specific situation, and ACT in the most appropriate way to assure your own safety (and the safety of others if you are able).

Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI’s [Run, Hide, Fight video](#) and visit the [WSU safety portal](#).

Full details can be found at <https://provost.wsu.edu/classroom-safety/>.

## **Severe Weather**

For severe weather alerts, see <http://alert.wsu.edu/> and <https://oem.wsu.edu/emergency-procedures/severe-weather/>. In the event of severe weather affecting university operations, guidance will be issued through the alert system.

**WSU Vancouver Statement:** In the event that an adverse weather event (e.g., snow or ice) or natural hazard that poses a safety risk occurs, you should take personal safety into account when deciding whether you can travel safely to and from campus, taking local conditions into account. If campus remains open and your instructor decides to cancel the face-to-face meeting and substitute an alternative learning activity, you will be notified by your instructor via email within a reasonable time after the decision to open or close campus has been made. Instructions regarding any alternative learning options or assignments will be communicated in a timely manner. If travel to campus is not possible due to adverse regional conditions, allowances to course attendance policy and scheduled assignments, including exams and quizzes, will be made. Students who attempt to gain advantage through abuse of this policy (e.g., by providing an instructor with false information) may be referred to the Office of Student Conduct for disciplinary action. If a student encounters an issue with an instructor, the student should first talk with the instructor. If the issue cannot be resolved, the student should follow the reporting violations of policies outlined on the student affairs website. Finally, in case of class cancellation campus-wide, please check local media, the WSU Vancouver web page (<https://www.vancouver.wsu.edu>) and/or <https://www.flashalert.net/>. Individual class cancellations may be made at the discretion of the instructor.

# Resources for Students

## In Pullman

- Student Care Network: [studentcare.wsu.edu](http://studentcare.wsu.edu)
- Cougar Transit: 978 267-7233
- WSU Counseling and Psychological Services (CAPS): 509 335-2159
- Suicide Prevention Hotline: 800 273-8255
- Crisis Text Line: Text HOME to 741741
- WSU Pullman Police: 509 335-8548
- Pullman Police (Non-Emergency): 509 332-2521
- WSU Office of Civil Rights Compliance & Investigation: 509 335-8288
- Alternatives to Violence on the Palouse: 877 334-2887
- Pullman 24-Hour Crisis Line: 509 334-1133

## In Vancouver

- Students may apply for grant assistance to cover technology or COVID-19 related educational costs through the Student Emergency Funding request form: <https://studentaffairs.vancouver.wsu.edu/financial-aid>
- The Chromebook loaner program will continue in Fall 2021. To apply, students should visit: <https://www.vancouver.wsu.edu/information-technology/new-student-tech-guide>
- Tech Help for Students: <http://wsuvtech4students.org/>
- Access Campus Software Remotely with AppStream: <https://www.vancouver.wsu.edu/information-technology/access-campus-software-remotely-appstream>
- Cougar Food Pantry: We know that it can be hard for students to make ends meet when paying for college and living on a tight budget. The Cougar Food Pantry can help. The pantry provides free, nonperishable food items for WSU Vancouver students in need. The process is simple, anonymous and judgement-free. Learn more and request food at <https://studentaffairs.vancouver.wsu.edu/cougar-food-pantry>.