

MTH 516/616: Topology II

Semester 2, 2021-22

General information

Instructor: Dr. Kashyap Rajeevsarathy

Office: AB1 (Infinity building) - 314

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Venue:

- Offline classes: AB1 (Infinity building) - 316
- Online classes: Google Classroom - [3pckrit](#)

Schedule: SLOT I (in [Time Table](#))

Day	Timing
Monday	12 pm - 1 pm
Thursday	2 pm - 3 pm
Friday	12 pm - 1 pm

Course webpage: Click [here](#).

Course structure

Topics

- **Simplicial Homology.** Simplicial Complexes, Barycentric Subdivision, and Simplicial Homology with examples.

- **Singular and Cellular Homology.** Definition with examples, Homotopy Invariance, Exact Sequence of Relative Homology, Excision, Mayer-Vietoris Sequence, Degree of Maps, and Cellular Homology, Jordan-Brouwer Separation Theorem, Invariance of domain and dimension, Borsuk-Ulam Theorem, Lefschetz-Hopf Fixed Point Theorem, Axioms for homology, Fundamental group and homology, and Simplicial Approximation Theorem.
- **Cohomology.** Universal Coefficient Theorem, Künneth Formula, Cup Product and the Cohomology Ring, Cap Product, Orientations on Manifolds, and Poincaré Duality.
- **Higher Homotopy Groups.** Definition with examples, Aspherical Spaces, Relative Homotopy Groups, Long Exact Sequence of a triple, n -connected spaces, and Whitehead's Theorem.

Suggested references

1. A. Hatcher, *Algebraic Topology*, Cambridge University Press, 2002.
2. E. H. Spanier, *Algebraic Topology*, Springer, 1994.
3. J. R. Munkres, *Elements of Algebraic Topology*, Westview Press, 1996.
4. J. J. Rotman, *An Introduction to Algebraic Topology*, Springer, 1988.
5. M. J. Greenberg & J. R. Harper, *Algebraic Topology: A First Course*, Perseus Books Publishing, 1981.
6. W. S. Massey, *A Basic Course in Algebraic Topology*, Springer International Edition, 2007.
7. G. Bredon, *Topology and Geometry*, Springer International Edition, 2006.

Course policies

Classes

- As this is an advanced course, it would be in the best interest of the students to have offline lectures during scheduled class hours.

- However, if the need arises to have online lectures for an extended period of time, please make note of the following points:
 - Reading material and prerecorded video lectures will be posted at the Google Classroom portal every week. It is your responsibility to check the portal for any updates (from my end) and come prepared for the interactive sessions.
 - There will be live interaction sessions every week during the scheduled lecture hours. These sessions will be primarily aimed at enhancing your conceptual understanding of the reading material and video lectures posted during the week. Therefore, you are advised to effectively use these sessions to clarify your doubts on the topics being covered.
 - If you face any difficulties in participating in the live interaction sessions due to limitations in internet connectivity, data availability (or coverage) or technology, please contact me immediately. I will try my best to provide additional help or make alternative arrangements for you. Note that all live sessions will be recorded and posted in the Google Classroom for the benefit of the students with poor internet/data connectivity.

Continuous assessments

- **Continuous assessment will carry 40% weightage in your final grade as per the current academic policy (available [here](#)).**
- This component of your grade will be computed based on two continuous assessment components.

Assignments

- Practice problem sets will be posted every other week. **It is highly imperative that you try solving these problems on your own, as your homework assignments will constitute select problems from these sets.**
- **Up to four homework assignments will be given during the course of the semester that you would have to turn in. Your**

top two performances in these assignments will together count towards one continuous assessment component.

- The problems to be turned in and the due dates will be posted on the Google Classroom. So it is your responsibility to regularly check the Google Classroom for any updates.
- If you must miss the due date (for genuine reasons), try turning in your assignment in advance, or write to me seeking an extension.
- If physical submission is not possible, your solutions should be turned in via email either as a typed document or as a scanned softcopy of handwritten solutions.
- Problems written should be legible and must clearly indicate the steps used to arrive at the solution.
- While you are encouraged to share and discuss ideas with your classmates, I would strongly caution you against copying solutions verbatim from your classmate/friend. **Please be warned that:**
 - (a) **Assignments with nearly identical solutions will not be graded.**
 - (b) **If there is evidence that even a part of an assignment is copied (or plagiarized), the entire assignment will be given a score of zero.**

Quizzes

- **Up to two quizzes may be administered during the course of the semester and your best performance in these quizzes will count towards one continuous assessment component.**
- These quizzes will be given in the regular classrooms. However, if the need arises, quizzes and exams may be hosted on any online proctoring platform endorsed by the Institute. In such situations, students may be required to take the quiz while sitting in front of their computer webcams/mobile phone cameras during the entire duration of the examination.

- The schedules and syllabuses for the quizzes will be announced in the Google Classroom.

Mid-semester and end-semester exams

- **As per the current academic policy (available [here](#)), each one of these exams will contribute 30% weightage towards your final grade.**
- These exams will be administered in the officially assigned classrooms. However, if the need arise, the exams may be hosted on any online proctoring platform endorsed by the Institute. In such situations, students may be required to take the quiz while sitting in front of their computer webcams/mobile phone cameras during the entire duration of the examination.
- The final exam will be comprehensive with possibly more emphasis on the topics that are covered after the mid-semester exam.
- When graded exams are returned, please check them carefully for any grading errors. All grading issues should be brought to my attention as soon as possible. Note that test scores are not renegotiable after final grades are submitted.
- Do not make travel plans that might prevent you from taking any scheduled exam. If you have a verifiable reason why you cannot be present at an exam, you must contact me in advance to make an alternative arrangement.

General policies concerning assessment

- Books, notes, or electronic devices of any kind are strictly prohibited while taking tests (exams and quizzes). It is your ethical (and moral) responsibility to exercise honesty and integrity while taking them.
- When graded tests are returned, please check them carefully for any grading errors. All grading issues should be brought to my attention

as soon as possible. Note that your scores are not renegotiable after the final grades are submitted.

- Do not make plans that might prevent you from taking any scheduled exam or quiz. If you have a justifiable reason for missing a scheduled test, you must contact me in advance to make an alternative arrangement.
- Strong disciplinary action will be initiated against students indulging in academic malpractices (or misconduct) during quizzes (or exams) which include any form of cheating, impersonation, copying, plagiarism, etc., as per the prevailing academic norms of the Institute available at: [Circular - Disciplinary actions for various acts of academic malpractices](#).

Grading scheme

A total of 100 percentage points will be distributed as follows:

Component	Weightage
Continuous assessment	40%
Mid-semester examination	30%
Final examination	30%