# MTH 516/616 - Topology II

## Semester 2, 2015-16

**Classroom:** AB1-108

**Schedule:** Mon, Wed, & Thu : 4:00 - 4:55 PM

**Course Webpage:** `http://home.iiserb.ac.in/~kashyap/MTH 616/mth616.html`

**Prerequisites:**

- MTH 507 or MTH 605, and
- MTH 302 or MTH 601.

**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.

**Recommended Books:**

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.

**Homework:** Homework assignments will be due every other week. The problems to be turned in will be shown on the course webpage. If you must miss the class, try turning in your assignment in advance or have some one else turn it in for you. Problems written should be should be legible and must clearly indicate the steps used to arrive at the solution.

**Mid Sem and End Sem Exams:** The exams will be given in the regular classrooms. The exact dates for the exams will be ocially announced later in the semester. Many of the problems on the exams will be similar to the homework and quiz problems. The Final Exam will be comprehensive with emphasis on topics that are discussed after the Mid Sem exam.No books, notes, or electronic devices of any kind may be used during exams.

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. Test scores are notrenegotiable 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.

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

- Homework: 20%.

- Midterm: 30%
- Final Exam: 50%.