THE CHINESE UNIVERSITY OF HONG KONG
Department of Mathematics
MATH3070 (Second Term, 2017–2018)
Introduction to Topology
Course Description

The Course

This course is to introduce the basic notions of topology. Emphasis will be placed on providing a general foundation for learning analysis (real and functional) and geometry (algebraic and differential). The former is customarily called *point set topology* while the latter *algebraic topology*. Roughly, 80% of the course deals with entrance concepts and foundational materials for analysis; the remaining 20% leads to topological recognition of geometric space. There will be examples from Euclidean spaces, function spaces, and geometric spaces.

Background Knowledge and Skills

Students are expected to have a good command of the geometric and analytical structures of $\mathbb{R}$ and $\mathbb{R}^n$; deep understanding of calculus of several variables; and reasonable exposure to analysis of functions in one real variables. Essential competence is listed below.

- Write abstract proof fluently with **mathematics rigor**, especially on ε-δ argument (at least a grade of B in MATH2050 or 2060).

- Handle abstract algebraic groups and use isomorphism results (as studied in MATH2070).

- Understand metric spaces and properties of sequences of functions (as taught in MATH3060).

Expected Outcome

In this course, students will demonstrate their knowledge by **proving** statements about:

- the criteria and various constructions of topological spaces; important properties such as compactness, connectedness, and how continuity interacts with them;

- algebraic invariants under homotopy and applications of them.

Teachers

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| Tutorials | Ka Ho WONG | LSB 228 | khwong@math.cuhk.edu.hk | 3943 7956 |

Assessment

The final course grade is determined by the following factors: Tutorial participation ($P \leq 10\%$), Test 1 and 2 ($T_j \leq 20\%, j = 1, 2$) and an examination ($E \leq 50\%$) according to criterion-referencing (see department information about it).

Points in P can be obtained by satisfactory participation in weekly tutorial lessons (largely decided by handling in your class exercises) or by gaining "tutorial credits" due to satisfactory performances in tests. The period for counting tutorial is from Jan 24 to April 18 (totally 10 tutorial lessons).

Class Exercises will be given out during tutorial lessons and your work will be counted towards participation. More exercises may be suggested for out-of-class practice also. All exercises will NOT be graded. We encourage students to communicate in learning how to solve the problems. Methods used in doing the exercises are well known in the mathematics community so plagiarism is not a serious issue. On the other hand, we discourage students to read any sorts of "model answers", therefore such resources will not be provided. The teaching assistant may prepare simple ideas for some exercises but it is not an obligation.

Schedule

The two *Tests* are scheduled on two Wednesdays (tentatively Feb 7 and March 28) using a regular tutorial plus a regular lecture of 90 minutes (see the calendar in CUHK Blackboard System). The content of the tests will be largely homework level with perhaps a small portion of harder problems. The *examination* will be centrally administered by the university at the end of the semester.

The absence of a test or examination will result in a zero score, unless in the case of sickness (with written proof by a physician) or other serious incidents (with the approval of the Department). In such cases, the assessment method will be determined according to the situation. Make-up examination will only be arranged after proper endorsement of CUHK.

Textbook, References, and Course Information

The course materials will be selected from several sources.

`Basic Text` Any one of the following:
- Sheldon W. Davis. *Topology.* International edition. McGraw Hill.
  This book focusses more on point set topology and analysis.
- James R. Munkres. *Topology.* Ch. 1 to 9. Second edition. Prentice Hall.
  This book is more extensive and contains more advanced topics for future studies.
- Thomas Au. *An Introduction to Topology.* Preprint manuscript.
  This is an old manuscript, which only reflects the style of teaching.

`References of similar level but the coverage may be different`
  M. A. Armstrong. *Basic Topology.* Springer Verlag.
  W. F. Basener. *Topology and its applications.* Wiley.
  G. F. Simmons. *Introduction to Topology and Modern Analysis.* McGraw-Hill.
  J. L. Kelley. *General Topology.* Springer Verlag.

Particular information about this course will usually be announced in lectures and sent to your campus email account. We do not send email to other accounts, so please set up your own email forwarding. Information and course materials may be obtained at CUHK Blackboard System or website of Mathematics Department (http://www.math.cuhk.edu.hk/course/math3070/).