

Instructor: Professor Ki Hyoung Ko (Office: E6-1-4408, Office Hour: 10 - 12 am on Tuesday or by appointment, Phone: Ext. 2719, Email: khko@kaist.ac.kr)

Course Description: This course consists of two parts. In the first half, we cover a classical part of topology, usually called point-set topology or general topology. The part is explicitly developed in the nineteenth century in order to clarify many ideas in analysis. In the second half, we cover various topics in differential manifolds that are important and useful but are not systematically taught in any other courses in the department. We will try to cover most of materials of Chapters 1 and 2 in the main textbook. The rest of the book is taught in the graduate courses MAS 531 and MAS 532.

Textbook:

- **Main Text:** Glen E. Bredon, *Topology and Goemetry*, Springer-Verlag New York, Inc, 1993.
- **Supplementary:** James R. Munkres, *Topology, 2nd Edition*, Prentice-Hall, 2000.
John W. Milnor, *Topology from the Differentiable Viewpoint*, Princeton University Press; Revised edition (November 24, 1997).

Syllabus:

- Week 1.* Metric spaces, Topological spaces
- Week 2.* Subspaces, Connectivity, Components, Separation Axioms
- Week 3.* Compactness, Products, Urysohn Lemma, Urysohn Metrization Theorem
- Week 4.* Lebesgue Lemma, Tietze Exetension Theorem, Local compactness
- Week 5.* Paracompactness, Quotient spaces
- Week 6.* Homotopy, Topological groups
- Week 7.* Baire Category Theorem, Nowhere differentiable function
- Week 8.* Midterm Exam
- Week 9.* Implicit function theorem, Differential manifolds, Local coordinate
- Week 10.* Induced differential manifolds, Tangent vectors, Differentials
- Week 11.* Sard's Theorem, Immersions, Submersions
- Week 12.* Vector fields, Flows, Tangent bundles, Embedding into Euclidean spaces
- Week 13.* Tubular neighborhoods, Approximation
- Week 14.* Classical Lie groups
- Week 15.* Transversality, Thom-Pontryagin Theory

Homework: Homework problems will be assigned every week. You do not have to hand in your homework and instead you practice with them to prepare for quizzes and exams. In recitation sessions, some of homework problems will be explained by teaching assistants or you may ask questions.

Recitation and Quiz: There will be a hour-and-half recitation class on each week except the first week. I will announce the detail about when and where. Quizzes will be given in recitation classes to check whether you are doing homework. Each quiz consists of 3 to 5 problems that are usually little or not modified from homework problems.

Course Grade: There will be 12 quizzes and a 3-hour final exam. Neither makeup quizzes nor a makeup final will be given under any circumstance. Instead you may drop two worst quiz scores. If you have to miss final exam, you should apply for an incomplete grade. Your course grade consists of quizzes 50%, final exam 40%, and attendance 10%.