

TOPICS IN TOPOLOGY, FALL 2000

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This will be a general course on algebraic topology; to take it you should know the material in the standard first-year topology course. The course has two purposes:

- to provide you with a certain amount of basic information (fibre bundles, spectral sequences, homotopy groups, Eilenberg-MacLane spaces, Postnikov systems, cohomology operations, ...), and
- (more importantly) to get you used to the idea of grappling with the existing chaotic mass of advanced material in an inquiring but sceptical way.

The course will involve seminar talks given by the people that sign up; these seminar talks will be presentations that deal with selected research papers, some classical and some modern. Grading will follow the usual convention, but *passive attendance is not allowed*. It is important to have a willingness to read papers, think about them with an open mind, and prepare talks on them yourself. It is possible to have too much prior knowledge of topology to be qualified for the course.

Taking this course does not in any sense represent a commitment to work on a dissertation in topology, and in fact the course might be useful to students in a number of different areas. There will be an upper limit on the enrollment. People who are interested in enrolling should come to talk to me. A general background reference for the course will be

A sort of general background reference for the course is the following book.

J. F. Adams, *Algebraic topology—a student's guide*, London Mathematical Society Lecture Note Series, No. 4. Cambridge University Press, London-New York, 1972.

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Here is an initial list of papers which might serve as starting points for seminar talks. We certainly will not cover all of these papers in the course, and we may cover other papers. The choice of papers covered will be determined to a large extent by the interests of the people enrolled.

SELECTED PAPERS

1. J. F. Adams, *On the structure and applications of the Steenrod algebra*, Comment. Math. Helv. **32** (1958), 180–214.
2. M. F. Atiyah, R. Bott, and A. Shapiro, *Clifford modules*, Topology **3** (1964), no. suppl. 1, 3–38.
3. M. F. Atiyah and F. Hirzebruch, *Vector bundles and homogeneous spaces*, Proc. Sympos. Pure Math., Vol. III, American Mathematical Society, Providence, R.I., 1961, pp. 7–38.
4. E. H. Brown, Jr., *Cohomology theories*, Ann. of Math. (2) **75** (1962), 467–484.
5. S. Eilenberg and N. E. Steenrod, *Axiomatic approach to homology theory*, Proc. Nat. Acad. Sci. U. S. A. **31** (1945), 117–120.
6. A. Grothendieck, *Sur quelques points d'algèbre homologique*, Tôhoku Math. J. (2) **9** (1957), 119–221.
7. D. M. Kan, *A combinatorial definition of homotopy groups*, Ann. of Math. (2) **67** (1958), 282–312.
8. M. A. Kervaire, *A manifold which does not admit any differentiable structure*, Comment. Math. Helv. **34** (1960), 257–270.
9. M. A. Kervaire and J. W. Milnor, *Groups of homotopy spheres. I*, Ann. of Math. (2) **77** (1963), 504–537.
10. J. Milnor, *Microbundles. I*, Topology **3** (1964), no. suppl. 1, 53–80.
11. ———, *Whitehead torsion*, Bull. Amer. Math. Soc. **72** (1966), 358–426.
12. J. Milnor, *Construction of universal bundles. I*, Ann. of Math. (2) **63** (1956), 272–284.
13. ———, *Construction of universal bundles. II*, Ann. of Math. (2) **63** (1956), 430–436.
14. ———, *On manifolds homeomorphic to the 7-sphere*, Ann. of Math. (2) **64** (1956), 399–405.
15. ———, *The Steenrod algebra and its dual*, Ann. of Math. (2) **67** (1958), 150–171.
16. J. W. Milnor, *Topology from the differentiable viewpoint*, Princeton University Press, Princeton, NJ, 1997, Based on notes by David W. Weaver, Revised reprint of the 1965 original.
17. D. Quillen, *Rational homotopy theory*, Ann. of Math. (2) **90** (1969), 205–295.
18. ———, *Higher algebraic K-theory*, (1975), 171–176.
19. G. Segal, *Classifying spaces and spectral sequences*, Inst. Hautes Études Sci. Publ. Math. (1968), no. 34, 105–112.
20. J.-P. Serre, *Homologie singulière des espaces fibrés. Applications*, Ann. of Math. (2) **54** (1951), 425–505.
21. ———, *Cohomologie modulo 2 des complexes d'Eilenberg-MacLane*, Comment. Math. Helv. **27** (1953), 198–232.

22. ———, *Groupes d'homotopie et classes de groupes abéliens*, Ann. of Math. (2) **58** (1953), 258–294.
23. N. E. Steenrod, *A convenient category of topological spaces*, Michigan Math. J. **14** (1967), 133–152.
24. R. Thom, *Quelques propriétés globales des variétés différentiables*, Comment. Math. Helv. **28** (1954), 17–86.
25. F. Waldhausen, *Algebraic K-theory of spaces*, Algebraic and geometric topology (New Brunswick, N.J., 1983), Springer, Berlin, 1985, pp. 318–419.
26. C. T. C. Wall, *Finiteness conditions for cw-complexes*, Ann. of Math. (2) **81** (1965), 56–69.
27. G. W. Whitehead, *Generalized homology theories*, Trans. Amer. Math. Soc. **102** (1962), 227–283.
28. J. H. C. Whitehead, *Combinatorial homotopy. I*, Bull. Amer. Math. Soc. **55** (1949), 213–245.

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