

Cohomology operations and applications

- Topics
 - Properties of the Steenrod squares.
 - Spectral sequences.
 - Serre spectral sequence.
 - Chomology of Eilenberg-MacLane spaces.
 - Serre's method for the computation of homotopy groups of spheres.
- Reference
 - Mosher, Robert E.; Tangora, Martin C. Cohomology operations and applications in homotopy theory. Harper and Row, Publishers, New York-London 1968 214 pp. Chapters 1,3,7,8,9,10,11 and 12.

Model Categories and Simplicial Homotopy Theory

- Topics
 - Model categories, Quillen functors and Quillen equivalences.
 - Cofibrantly generated model categories.
 - Quillen model structure on Simplicial sets.
 - Homotopy colimits.
 - Reedy model structures.
 - Two sided cobar construction.
 - Bousfield localization.
- References
 - Hovey, M. Model categories. Mathematical Surveys and Monographs, 63. American Mathematical Society, Providence, RI, 1999. 209 pp. Chapters 1,2 and 3.
 - Hirschhorn, Philip S. Model categories and their localizations. (English summary) Mathematical Surveys and Monographs, 99. American Mathematical Society, Providence, RI, 2003. 457 pp. Chapters 2 and 3.
 - Dugger, D. A primer in homotopy Colimits. Online notes. <https://pages.uoregon.edu/ddugger/hocolim.pdf> Parts 1,2 and 3.
 - Joyal A. and Tierney M. An introduction to Simplicial Homotopy Theory. Online notes. <https://mat.uab.cat/~kock/crm/hocat/advanced-course/Quadern47.pdf>

Homotopy theory of ∞ -Categories

- Topics
 - Simplicial spaces.
 - Simplicial categories.
 - Complete Segal spaces.
 - Joyal model structure on Simplicial sets.
 - Quasi-categories.
 - Rigidification of quasi-categories.
 - Mapping spaces in quasi-categories.
- References
 - Bergner, Julia E. The homotopy theory of $(\infty, 1)$ -categories. London Mathematical Society Student Texts, 90. Cambridge University Press, Cambridge, 2018. 273 pp. Chapters 1,2,3,4,5 and 7.
 - Dugger, Daniel; Spivak, David I. Rigidification of quasi-categories. *Algebr. Geom. Topol.* 11 (2011), no. 1, 225–261.
 - Dugger, Daniel; Spivak, David I. Mapping spaces in quasi-categories. *Algebr. Geom. Topol.* 11 (2011), no. 1, 263–325.
 - Rezk, Charles. A model for the homotopy theory of homotopy theory. *Trans. Amer. Math. Soc.* 353 (2001), no. 3, 973–1007.