

LTCC Advanced Pure Mathematics Course

Homological Algebra

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Course description. From its historical roots in algebraic topology, homological algebra has evolved during the last six decades into an indispensable algebraic tool in virtually any area of pure mathematics.

The first half of this course will be a systematic introduction to the basic concepts and methods in homological algebra, such as chain complexes, cohomology, Ext and Tor, homotopy, long exact cohomology sequences, derived functors and categories.

The second half of the course will focus on applications in group cohomology, Hochschild cohomology of algebras, deformation theory, algebraic topology, and time permitting some basics on functor cohomology.

Prerequisites: basic notions of modules over rings and algebras. Some category theoretic background is useful, but the concepts from category theory that will show up - such as adjoint functors - will be introduced during the course.

Reference:

C. Weibel, *An introduction to homological algebra*, Cambridge studies in advanced mathematics **38**, Cambridge University Press.