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Cyclic cohomology within the differential envelope. An introduction to Alain Connes' non-commutative differential geometry. (English) [Zbl 0662.55001](#)

Travaux en Cours, 30. Paris: Hermann. viii, 183 p. FF 180.00 (1988).

“Alain Connes' cyclic cohomology is an essential step in developing a new branch of mathematics, liable to play a basic role in the future progress of physics: noncommutative differential geometry and topology. The general attitude consists in following the trend of passing from commutative to noncommutative algebras. This is, in physics, the transition from classical to quantum theories.”

This monograph contains a detailed presentation of the Alain Connes' cyclic cohomology. All the calculations are performed in detail “within the differential envelope” in the generalized case of $\mathbb{Z}/2$ -graded algebras and this allows to encompass, among other things, the fermionic integral calculus of Berezin.

The monograph is divided into six chapters and nine appendices. Chapter 1 presents a construction of the differential envelope $\Omega(A)$ of a $\mathbb{Z}/2$ -graded complex algebra A . The next chapter is purely technical and develops a calculus in $\Omega(A)$, the given formulae being necessary in the sequel. In chapter 3 cyclic and Hochschild cohomology are defined. The cup product of linear forms on $\Omega(A)$ is studied in chapter 4. In chapter 5 the author analyzes the passage from cyclic to de Rham cohomology of C , while the last chapter describes the relations between Hochschild and cyclic cohomology, with the relevant long exact sequence and corresponding bicomplex.

Many appendices make the book selfcontained and hence it can be used as an excellent introduction to Alain Connes' cyclic cohomology.

Reviewer: [Gh.Pitiş](#)

MSC:

- [55N35](#) Other homology theories in algebraic topology
- [55-02](#) Research exposition (monographs, survey articles) pertaining to algebraic topology
- [46L80](#) K -theory and operator algebras (including cyclic theory)

Cited in 1 Review
Cited in 12 Documents

Keywords:

noncommutative differential geometry; cyclic cohomology; $\mathbb{Z}/2$ - graded algebras; fermionic integral calculus; differential envelope; Hochschild cohomology; cup product; de Rham cohomology