

# COMMUTATIVE ALGEBRA

## CONTACT

### Contact data:

- Josep Alvarez Montaner
- Departament de Matemàtiques (ETSEIB 3rd floor)
- Josep.Alvarez@upc.edu

**Schedule:** Mondays and Wednesdays from 14:00 to 16:00.

**Room:** 101 (FME).

## CONTENTS

### 0: Categories and functors.

- 0.1.- Categories.
- 0.2.- Functors.
- 0.3.- Products.
- 0.4.- Limits.
- 0.5.- Abelian Categories.

### 1: Rings and Ideals.

- 1.1.- Review on rings.
- 1.2.- Ideals.
- 1.3.- Quotient rings.
- 1.4.- Prime and maximal ideals.
- 1.5.- Rings of fractions.
- 1.6.- Chain conditions.
- 1.7.- Primary decomposition.

### 2: Modules

- 2.1.- Modules
- 2.2.- Some operations on modules.
- 2.3.- Generators of modules.
- 2.4.- Chain conditions.
- 2.5.- Sequences of modules.
- 2.6.- The Hom functor.
- 2.7.- The tensor product functor.
- 2.8.- The localization functor.
- 2.9.- Algebras.

**3: Affine algebraic varieties.**

- 3.1.- Algebraic equations and affine algebraic sets.
- 3.2.- Finitely generated algebras and algebraic varieties.
- 3.3.- Zariski topology.
- 3.4.- Spectrum of a ring.

**4: Derived Functors .**

- 4.1.- Chain complexes. Homology and cohomology.
- 4.2.- Resolutions.
- 4.3.- Derived functors.
- 4.4.- Examples .

**5: Grade Theory .**

- 5.1.- Regular sequences. Depth..
- 5.2.- Cohen-Macaulay rings .
- 5.3.- Gorenstein rings.
- 5.4.- Regular rings.

## BIBLIOGRAPHY

**Basic references**

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