

# Projective modules

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**Timetable:** 20 hrs. Lectures start on January 28, 2013, 11:00 (dates already fixed, see the calendar), Torre Archimede, Room 2BC/30.

**Course requirements:** The content of the course of “Introduction to ring theory” (course of the first year of the master Algant).

**Examination and grading:** Oral examination.

**SSD:** MAT/02 Algebra

**Aim:** Projective modules are fundamental in several settings: rings and modules, group theory, algebraic geometry, number theory, homological algebra, . . . The aim of this course is to provide a better understanding of the structure of these modules.

**Course contents:** Semisimple rings and modules. Free rings and free algebras. Free modules. Projective modules and radical. Projective covers, injective envelopes. The monoid  $V(R)$ . Some universal constructions in ring theory. The Grothendieck group  $K_0(R)$ . Direct limits of projectives, inverse limits of injectives. Some classical results, due to Bass, Kaplansky and Lazard, and some more recent results, due to Bergman (and Dicks) and Prihoda (and Herbera).