SEMINAR ÜBER KOMMUTATIVE ALGEBRA: GRÖBNERBASEN UND REGULARITÄT

PROF. DR. MORITZ KERZ, DR. FLORIAN STRUNK
WEDNESDAY 10–12, M 101

In the first part of the seminar we discuss constructive methods in Commutative Algebra using Gröbner bases. Beside finding concrete algorithms which allow a computer to solve basic questions from the theory of algebraic varieties, we also use Gröbner bases to prove some classical theorems from "local" Algebraic Geometry, like generic flatness. As basic reference we will use [1] part III.

In the second part of the seminar we study different local measures for the singularity of commutative rings, such as normal rings, regular local rings and the Jacobian criterion. As basic reference we will use [1] part IV.

In a third part we will have additional talks on both subjects Gröbner bases and regularity depending on the interests of participants. As reference we will use chapters 15, 17 and 19 from [2].

As prerequisites we assume basic Commutative Algebra, as presented in one of the Commutative Algebra lectures at Regensburg. As a preparation it might be useful to look at part I and part II of [1].

Preliminary meeting 12.7.16, 14:00 in M 201. In case you cannot come and would like to participate please write an email to one of the organizers.

(1) Gröbner bases and Buchberger algorithm **(19.10, Slavinskaya)**
    [1, III.9.1]

(2) Gröbner bases and elimination ideal **(26.10, Feil)**
    [1, III.9.2]

(3) "Generic freeness" **(02.11, Seidl)**
    [1, III.10.1]

(4) Fibre dimension and constructible sets, application to invariant theory **(09.11, NN)**
    [1, III.10.2], [1, III.10.3]

(5) Theorem of Hilbert-Serre, Hilbert polynomial and dimension **(16.11, Auburger)**
    [1, III.11.1], [1, III.11.2]

(6) Length of a module, local rings and corresponding graded ring **(23.11, Bachfisch)**
    [1, IV.12.1], [1, IV.12.2]

(7 and 8) Regular local rings I+II: Basics on regular local rings, Jacobian criterion, dimension one (two talks!) **(30.11,kein Seminar), (07.12, Schenk)**
    [1, IV.13.1], [1, IV.13.2], [1, IV.14.1]

(9) Fractional ideals **(14.12, Strathmeyer)**
    [1, IV.14.2]

(10) Dedekind rings and ideal class group **(21.12, Mousa)**
    [1, IV.14.3]

(11+) Homological dimension of rings and application to regular local rings **(11.01-8.2., Pangerl, Kufner)**

LITERATUR

[1] Gregor Kemper. *A course in commutative algebra*, volume 256 of *Graduate Texts in Mathematics*. Springer, Heidelberg, 2011.

[2] David Eisenbud *Commutative Algebra*, volume 150 of *Graduate Texts in Mathematics*. Springer, Heidelberg, 2004.

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