I.Course description

RS "Problems in commutative algebra"
C. Brav.

1. Prerequisites include familiarity with the basic notions of rings and ideals.
2. The course is electory.
3. This course will be devoted to the theory of Groebner bases of ideals in polynomials rings and will focus on applications of this theory to computing invariants of algebraic varieties.

II.The objectives and goals of the RS "Problems in commutative algebra" are as follows:
1. introducing the audience to the theory of Groebner bases
2. prove the basic theorems of commutative algebra in the spirit of Groebner bases
3. apply the theory to compute the image of a morphism between algebraic varieties (elimination theory)

III.After mastering the course, the student is expected to:
1. understand such fundamental notions as monomial orders and Groebner bases,
2. Buchberger's algorithm and elimination ideals

IV.Plan:
1. Monomial orders and finite generation of monomial ideals
2. Division with remainder in many variables
3. Basissatz (finite generation of ideals in polynomial rings)
4. Groebner bases
5. Buchberger's algorithm
6. Image of a morphism of algebraic varieties (elimination theory)
7. Extension of the theory to modules over polynomial rings

V.Reading lists:
1. Required
    1) Cox, Little, O'Shea. Ideals, Varieties, and Algorithms.

VI. Grading. The grade is based on solving problems in the required book. Problems will be divided into two assignments, the first with 40% of the final mark, the second worth 60%. For the first set of problems, solutions should be written. For the second, they should be written and then presented orally.