Groebner bases and beyond-An introduction to the CAS Singular

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Groebner bases are the main theoretical tool available for the symbolic manipulation of non-linear systems of equations. These appear in a wide variety of applications. In first place, however, Groebner bases have become an indispensable supporting tool in the study of algebraic geometry. This course will introduce the students to the basics of the theory, with a view towards its applications. The course will also give an introduction to the computer algebra system SINGU-LAR. We will discuss fundamental algorithms (Groebner bases, Groebner bases for non-commutative rings, for free modules, syzygies and free resolutions, etc.), their implementation in SINGULAR, and a number of applications to problems of theoretical and practical interest.