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Commutative algebra : constructive methods finite projective modules

[Lombardi H.](#), [Quitt C.](#), Springer Publishing Company, Incorporated, New York, NY, 2015. 996 pp. Type: Book (978-9-401799-43-0)

Date Reviewed: Feb 24 2016

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According to the book's webpage, "This book offers a detailed introduction to various basic concepts, methods, principles, and results of commutative algebra. It takes a constructive viewpoint in commutative algebra and studies algorithmic approaches alongside several abstract classical theories." There are 18 chapters, and detailed notations are given in the beginning. This is one of the most theoretical branches of computer science. The algorithmic proofs are not optimized for faster execution, but show proofs in an elegant fashion. The constructive algebraic methods were developed long ago by Gauss and other mathematicians. The algorithmic aspects of such naturally abstract topics as Galois theory, Dedekind rings, Prüfer rings, finitely generated projective modules, and dimension theory of commutative rings are all analyzed in great detail.

The book has over 350 well-arranged exercises, together with helpful hints for solution. There are lots of exercises--really a lot of exercises--and fantastic solutions. Many methods, like lazy evaluation and dynamic evaluation, are discussed in great detail. There is even a chapter on 19th century basic algebra methods of providing generalities about polynomials and partial factorization. There is a detailed flow chart on chapter dependencies and the order in which chapters should be read. There are lemmas and theorems that go into great detail. Boolean algebra, lattice methods, and modern concepts are discussed in great detail as well. A basic knowledge of linear algebra, group theory, and elementary number theory, as well as the fundamentals of ring and module theory, is required to understand this graduate-level book. The book will be useful for graduate students, as well as researchers, instructors, and theoretical computer scientists. This is a sound book on the subject, if indeed a rigorous treatise on a specialized mathematical branch.

Reviewer: [Naga Narayanaswamy](#)

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