

Volume 249

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Abelian Groups, Rings, Modules, and Homological Algebra

Edited by

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Overtoun M. G. Jenda



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A CHAPMAN & HALL BOOK

Rings Modules And Algebra

**Michiel Hazewinkel, Nadiya M.
Gubareni**



Rings Modules And Algebra:

Lectures on Rings and Modules Joachim Lambek, 2009 This book is an introduction to the theory of associative rings and their modules designed primarily for graduate students The standard topics on the structure of rings are covered with a particular emphasis on the concept of the complete ring of quotients A survey of the fundamental concepts of algebras in the first chapter helps to make the treatment self contained The topics covered include selected results on Boolean and other commutative rings the classical structure theory of associative rings injective modules and rings of quotients The final chapter provides an introduction to homological algebra Besides three appendices on further results there is a six page section of historical comments Table of Contents Fundamental Concepts of Algebra 1 1 Rings and related algebraic systems 1 2 Subrings homomorphisms ideals 1 3 Modules direct products and direct sums 1 4 Classical isomorphism theorems Selected Topics on Commutative Rings 2 1 Prime ideals in commutative rings 2 2 Prime ideals in special commutative rings 2 3 The complete ring of quotients of a commutative ring 2 4 Rings of quotients of commutative semiprime rings 2 5 Prime ideal spaces Classical Theory of Associative Rings 3 1 Primitive rings 3 2 Radicals 3 3 Completely reducible modules 3 4 Completely reducible rings 3 5 Artinian and Noetherian rings 3 6 On lifting idempotents 3 7 Local and semiperfect rings Injectivity and Related Concepts 4 1 Projective modules 4 2 Injective modules 4 3 The complete ring of quotients 4 4 Rings of endomorphisms of injective modules 4 5 Regular rings of quotients 4 6 Classical rings of quotients 4 7 The Faith Utumi theorem Introduction to Homological Algebra 5 1 Tensor products of modules 5 2 Hom and otimes as functors 5 3 Exact sequences 5 4 Flat modules 5 5 Torsion and extension products Appendixes Comments Bibliography Index Review from Zentralblatt Math Due to their clarity and intelligible presentation these lectures on rings and modules are a particularly successful introduction to the surrounding circle of ideas Review from American Mathematical Monthly An introduction to associative rings and modules which requires of the reader only the mathematical maturity which one would attain in a first year graduate algebra course in order to make the contents of the book as accessible as possible the author develops all the fundamentals he will need In addition to covering the basic topics the author covers some topics not so readily available to the nonspecialist the chapters are written to be as independent as possible which will be appreciated by students making their first acquaintance with the subject one of the most successful features of the book is that it can be read by graduate students with little or no help from a specialist CHEL 283 H Algebras, Rings and Modules Michiel Hazewinkel, Nadiya M. Gubareni, 2016-04-05 The theory of algebras rings and modules is one of the fundamental domains of modern mathematics General algebra more specifically non commutative algebra is poised for major advances in the twenty first century together with and in interaction with combinatorics just as topology analysis and probability experienced in the twentieth century

Rings, Modules and Radicals Andor Kertész, 1973 **Foundations of Module and Ring Theory** Robert Wisbauer, 2018-05-11 This volume provides a comprehensive introduction to module theory and the related part of ring

theory including original results as well as the most recent work It is a useful and stimulating study for those new to the subject as well as for researchers and serves as a reference volume Starting from a basic understanding of linear algebra the theory is presented and accompanied by complete proofs For a module M the smallest Grothendieck category containing it is denoted by $\mathcal{O} M$ and module theory is developed in this category Developing the techniques in $\mathcal{O} M$ is no more complicated than in full module categories and the higher generality yields significant advantages for example module theory may be developed for rings without units and also for non associative rings Numerous exercises are included in this volume to give further insight into the topics covered and to draw attention to related results in the literature

Modules and the Structure of Rings Golan, 1991-04-24 This book offers vital background information on methods for solving hard classification problems of algebraic structures It explains how algebraists deal with the problem of the structure of modules over rings and how they make use of these structures to classify rings

Rings, Modules, and the Total Friedrich Kasch, Adolf Mader, 2004-06-25 Accessible to anyone with a basic knowledge of ring and module theory A short introduction to torsion free Abelian groups is included

Exercises in Modules and Rings T.Y. Lam, 2009-12-08 The idea of writing this book came roughly at the time of publication of my graduate text *Lectures on Modules and Rings* Springer GTM Vol 189 1999 Since that time teaching obligations and intermittent intervention of other projects caused prolonged delays in the work on this volume Only a lucky break in my schedule in 2006 enabled me to put the finishing touches on the completion of this long overdue book This book is intended to serve a dual purpose First it is designed as a problem book for *Lectures* As such it contains the statements and full solutions of the many exercises that appeared in *Lectures* Second this book is also offered as a reference and repository for general information in the theory of modules and rings that may be hard to find in the standard textbooks in the field As a companion volume to *Lectures* this work covers the same mathematical material as its parent work namely the part of ring theory that makes substantial use of the notion of modules The two books thus share the same table of contents with the first half treating projective injective and flat modules homological and uniform dimensions and the second half dealing with noncommutative localizations and Goldie's theorems maximal rings of quotients Frobenius and quasi Frobenius rings concluding with Morita's theory of category equivalences and dualities

Lectures on Modules and Rings Tsit-Yuen Lam, 1999 This new book can be read independently from the first volume and may be used for lecturing seminar and self study or for general reference It focuses more on specific topics in order to introduce readers to a wealth of basic and useful ideas without the hindrance of heavy machinery or undue abstractions User friendly with its abundance of examples illustrating the theory at virtually every step the volume contains a large number of carefully chosen exercises to provide newcomers with practice while offering a rich additional source of information to experts A direct approach is used in order to present the material in an efficient and economic way thereby introducing readers to a considerable amount of interesting ring theory without being dragged through endless preparatory material

Rings and Categories of Modules

Frank W. Anderson, Kent R. Fuller, 2012-12-06 This book is intended to provide a reasonably self contained account of a major portion of the general theory of rings and modules suitable as a text for introductory and more advanced graduate courses We assume the familiarity with rings usually acquired in standard undergraduate algebra courses Our general approach is categorical rather than arithmetical The continuing theme of the text is the study of the relationship between the one sided ideal structure that a ring may possess and the behavior of its categories of modules Following a brief outline of set theoretic and categorical foundations the text begins with the basic definitions and properties of rings modules and homomorphisms and ranges through comprehensive treatments of direct sums finiteness conditions the Wedderburn Artin Theorem the Jacobson radical the hom and tensor functors Morita equivalence and duality decomposition theory of injective and projective modules and semi perfect and perfect rings In this second edition we have included a chapter containing many of the classical results on artinian rings that have helped to form the foundation for much of the contemporary research on the representation theory of artinian rings and finite dimensional algebras Both to illustrate the text and to extend it we have included a substantial number of exercises covering a wide spectrum of difficulty There are of course many important areas of ring and module theory that the text does not touch upon

Rings and Their Modules Paul E. Bland, 2011-02-01 This book is an introduction to the theory of rings and modules that goes beyond what one normally obtains in a graduate course in abstract algebra The theme of the text is the interplay between rings and modules At times rings are investigated by considering given sets of conditions on the modules they admit and at other times rings of a certain type are considered to see what structure is forced on their modules Standard topics in ring and module theory such as chain conditions on rings and modules injective and projective modules and semisimple rings are included as well as subjects like category theory and homological algebra The text also contains presentations on topics such as flat modules and coherent rings injective envelopes projective covers and perfect rings reflexive modules and quasi Frobenius rings and graded rings and modules The book is a self contained volume written in a very systematic style all proofs are clear and easy for the reader to understand and all arguments are based on materials contained in the book A problem sets follow each section It is assumed that the reader is familiar with concepts such as Zorn's lemma commutative diagrams and ordinal and cardinal numbers It is also assumed that the reader has a basic knowledge of rings and their homomorphisms The text is suitable for graduate and PhD students who have chosen ring theory for their research subject

Algebra Carl Faith, 2012-12-06 VI of Oregon lectures in 1962 Bass gave simplified proofs of a number of Morita Theorems incorporating ideas of Chase and Schanuel One of the Morita theorems characterizes when there is an equivalence of categories $\text{mod } A \cong \text{mod } B$ for two rings A and B Morita's solution organizes ideas so efficiently that the classical Wedderburn Artin theorem is a simple consequence and moreover a similarity class A_J in the Brauer group $\text{Br } k$ of Azumaya algebras over a commutative ring k consists of all algebras B such that the corresponding categories $\text{mod } A$ and $\text{mod } B$ consisting of k linear morphisms are equivalent by a k linear functor For

fields $B_r(k)$ consists of similarity classes of simple central algebras and for arbitrary commutative k this is subsumed under the Azumaya 51 1 and Auslander Goldman 60J Brauer group Numerous other instances of a wedding of ring theory and category albeit a shot gun wedding are contained in the text Furthermore in my attempt to further simplify proofs notably to eliminate the need for tensor products in Bass's exposition I uncovered a vein of ideas and new theorems lying wholly within ring theory This constitutes much of Chapter 4 the Morita theorem is Theorem 4 29 and the basis for it is a correspondence theorem for projective modules Theorem 4 7 suggested by the Morita context As a by product this provides foundation for a rather complete theory of simple Noetherian rings but more about this in the introduction

Abelian Groups, Rings, Modules, and Homological Algebra Pat Goeters, Overtoun M.G. Jenda, 2016-04-19 About the book In honor of Edgar Enochs and his venerable contributions to a broad range of topics in Algebra top researchers from around the world gathered at Auburn University to report on their latest work and exchange ideas on some of today's foremost research topics This carefully edited volume presents the refereed papers of the par

Modules and the Structure of Rings Golan, 2017-10-19 This textbook is designed for students with at least one solid semester of abstract algebra some linear algebra background and no previous knowledge of module theory Modules and the Structure of Rings details the use of modules over a ring as a means of considering the structure of the ring itself explaining the mathematics and inductive reasoning used in working on ring theory challenges and emphasizing modules instead of rings Stressing the inductive aspect of mathematical research underlying the formal deductive style of the literature this volume offers vital background on current methods for solving hard classification problems of algebraic structures Written in an informal but completely rigorous style Modules and the Structure of Rings clarifies sophisticated proofs avoids the formalism of category theory aids independent study or seminar work and supplies end of chapter problems This book serves as an excellent primary text for upper level undergraduate and graduate students in one semester courses on ring or module theory laying a foundation for more advanced study of homological algebra or module theory

Ring Theory Kenneth Goodearl, 1976-03-01

Abelian Groups, Rings, Modules, and Homological Algebra Pat Goeters, Overtoun M.G. Jenda, 2006-01-27 About the book In honor of Edgar Enochs and his venerable contributions to a broad range of topics in Algebra top researchers from around the world gathered at Auburn University to report on their latest work and exchange ideas on some of today's foremost research topics This carefully edited volume presents the refereed papers of the participants of these talks along with contributions from other veteran researchers who were unable to attend These papers reflect many of the current topics in Abelian Groups Commutative Algebra Commutative Rings Group Theory Homological Algebra Lie Algebras and Module Theory Accessible even to beginning mathematicians many of these articles suggest problems and programs for future study This volume is an outstanding addition to the literature and a valuable handbook for beginning as well as seasoned researchers in Algebra about the editors H PAT GOETERS completed his undergraduate studies in mathematics and computer science at Southern

Connecticut State University and received his Ph D in 1984 from the University of Connecticut under the supervision of William J Wickless After spending one year in a post doctoral position in Wesleyan University under the tutelage of James D Reid Goeters was invited for a tenure track position in Auburn University by Ulrich F Albrecht Soon afterwards William Ullery and Overtoun Jenda were hired and so began a lively Algebra group OVERTOUN M G JENDA received his bachelor s degree in Mathematics from Chancellor College the University of Malawi He moved to the U S 1977 to pursue graduate studies at University of Kentucky earning his Ph D in 1981 under the supervision of Professor Edgar Enochs He then returned to Chancellor College where he was a lecturer assistant professor for three years He moved to the University of Botswana for another three year stint as a lecturer before moving back to the University of Kentucky as a visiting assistant professor in 1987 In 1988 he joined the Algebra research group at Auburn University

Algebra: Rings, modules, and categories Carl Faith, 1973 **Groups, Rings, Modules** Maurice Auslander, David Buchsbaum, 2014-06-18 This classic monograph is geared toward advanced undergraduates and graduate students The treatment presupposes some familiarity with sets groups rings and vector spaces The four part approach begins with examinations of sets and maps monoids and groups categories and rings The second part explores unique factorization domains general module theory semisimple rings and modules and Artinian rings Part three s topics include localization and tensor products principal ideal domains and applications of fundamental theorem The fourth and final part covers algebraic field extensions and Dedekind domains Exercises are provided at the end of each chapter Dover 2014 republication of the edition originally published by Harper Row Publishers New York 1974 See every Dover book in print at www.doverpublications.com

Algebras, Rings and Modules Michiel Hazewinkel, Nadezhda Mikhailovna Gubareni, Vladimir V. Kirichenko, 2010 Presenting an introduction to the theory of Hopf algebras the authors also discuss some important aspects of the theory of Lie algebras This book includes a chapters on the Hopf algebra of symmetric functions the Hopf algebra of representations of the symmetric groups the Hopf algebras of the nonsymmetric and quasisymmetric functions and the Hopf algebra of permutations

Rings, Modules and Representations Viet Dung Nguyen, 2009 The papers in this volume contain results in active research areas in the theory of rings and modules including non commutative and commutative ring theory module theory representation theory and coding theory

Introduction to Rings and Modules C. Musili, 1994 This book is a self contained elementary introduction to rings and modules and should be useful for courses on Algebra The emphasis is on concept development with adequate examples and counter examples drawn from topics such as analysis topology etc The entire material including exercises is fully class tested

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