

# Graduate Texts in Mathematics

**T. Y. Lam**

## **Lectures on Modules and Rings**



**Springer**

# Lectures On Modules And Rings

**John A. Beachy**



## Lectures On Modules And Rings:

**Lectures on Modules and Rings** Tsit-Yuen Lam, 2012-12-06 Textbook writing must be one of the cruelest of self inflicted tortures Carl Faith Math Reviews 54 5281 So why didn't I heed the warning of a wise colleague especially one who is a great expert in the subject of modules and rings The answer is simple I did not learn about it until it was too late My writing project in ring theory started in 1983 after I taught a year long course in the subject at Berkeley My original plan was to write up my lectures and publish them as a graduate text in a couple of years My hopes of carrying out this plan on schedule were however quickly dashed as I began to realize how much material was at hand and how little time I had at my disposal As the years went by I added further material to my notes and used them to teach different versions of the course Eventually I came to the realization that writing a single volume would not fully accomplish my original goal of giving a comprehensive treatment of basic ring theory At the suggestion of Ulrike Schmickler Hirzebruch then Mathematics Editor of Springer Verlag I completed the first part of my project and published the write up in 1991 as *A First Course in Noncommutative Rings* GTM 131 hereafter referred to as First Course or simply FC *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, 1998-10-01 *Exercises in Modules and Rings* T.Y. Lam, 2011-11-02 This volume offers a compendium of exercises of varying degree of difficulty in the theory of modules and rings It is the companion volume to GTM 189 All exercises are solved in full detail Each section begins with an introduction giving the general background and the theoretical basis for the problems that follow **Introductory Lectures on Rings and Modules** John A. Beachy, 1999-04-22 A first year graduate text or reference for advanced undergraduates on noncommutative aspects of rings and modules **Lectures on Modules and Rings**, 1999 Ring and Module Theory Toma Albu, Gary F. Birkenmeier, Ali Erdogan, Adnan Tercan, 2011-02-04 This book is a collection of invited

papers and articles many presented at the 2008 International Conference on Ring and Module Theory The papers explore the latest in various areas of algebra including ring theory module theory and commutative algebra **Tulane University Ring and Operator Theory Year, 1970-1971** Karl H. Hofmann, 2006-11-15 *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 *Rings, Modules and Codes* André Leroy, Christian Lomp, Sergio López-Permouth, Frédérique Oggier, 2019-04-12 This book contains the proceedings of the Fifth International Conference on Noncommutative Rings and their Applications held from June 12 15 2017 at the University of Artois Lens France The papers are related to noncommutative rings covering topics such as ring theory with both the elementwise and more structural approaches developed module theory with popular

topics such as automorphism invariance almost injectivity ADS and extending modules and coding theory both the theoretical aspects such as the extension theorem and the more applied ones such as Construction A or Reed Muller codes Classical topics like enveloping skewfields weak Hopf algebras and tropical algebras are also presented

**Foundations of Commutative Rings and Their Modules** Fanggui Wang,Hwankoo Kim,2017-01-06 This book provides an introduction to the basics and recent developments of commutative algebra A glance at the contents of the first five chapters shows that the topics covered are ones that usually are included in any commutative algebra text However the contents of this book differ significantly from most commutative algebra texts namely its treatment of the Dedekind Mertens formula the small finitistic dimension of a ring Gorenstein rings valuation overrings and the valuative dimension and Nagata rings Going further Chapter 6 presents modules over commutative rings as they can be most commonly used by torsion theory and multiplicative ideal theory Chapter 7 deals with multiplicative ideal theory over integral domains Chapter 8 collects various results of the pullbacks especially Milnor squares and D M constructions which are probably the most important example generating machines In Chapter 9 coherent rings with finite weak global dimensions are probed and the local ring of weak global dimension two is elaborated on by combining homological tricks and methods of star operation theory Chapter 10 is devoted to the Grothendieck group of a commutative ring In particular the Bass Quillen problem is discussed Finally Chapter 11 aims to introduce relative homological algebra especially where the related concepts of integral domains which appear in classical ideal theory are defined and investigated by using the class of Gorenstein projective modules Each section of the book is followed by a selection of exercises of varying degrees of difficulty This book will appeal to a wide readership from graduate students to academic researchers who are interested in studying commutative algebra

**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

**Lectures on Injective Modules and Quotient Rings** Carl Faith,2014-01-15 *Topics in the Homological Theory of Modules Over Commutative Rings* Melvin Hochster,1975-12-31 This volume contains expository lectures by Melvin Hochster from the CBMS Regional Conference in Mathematics held at the University of Nebraska June 1974 The lectures deal mainly with recent developments and still open questions in the homological theory of modules over commutative usually Noetherian rings A good deal of attention is given to the role big Cohen Macaulay modules play in clearing up some of the open questions A modest knowledge of commutative rings and familiarity with the long exact sequences for Tor and Ext should suffice as a background for the reader

*Cyclic Modules and the Structure of Rings* S.K. Jain,Ashish K. Srivastava,Askar A. Tuganbaev,2012-09-27 This unique monograph brings together important material in the field of noncommutative rings and modules It provides an up to date account of the topic

of cyclic modules and the structure of rings which will be of particular interest to those working in abstract algebra and to graduate students who are exploring potential research topics

**Groups, Rings and Algebras** Donald S. Passman, William Chin, James Osterburg, Declan Patrick Francis Quinn, 2006 This is a companion volume to the conference in honor of Donald S. Passman held in Madison Wisconsin in June 2005 It contains research papers on Algebras Group Rings Hopf Algebras Invariant Theory Lie Algebras and their Enveloping Algebras Noncommutative Algebraic Geometry Noncommutative Rings and other topics The papers represent an important part of the latest research in these areas

*Advances in Rings and Modules* Sergio R. López-Permouth, Jae Keol Park, S. Tariq Rizvi, Cosmin S. Roman, 2018-09-06 This volume dedicated to Bruno J. Müller a renowned algebraist is a collection of papers that provide a snapshot of the diversity of themes and applications that interest algebraists today The papers highlight the latest progress in ring and module research and present work done on the frontiers of the topics discussed In addition selected expository articles are included to give algebraists and other mathematicians including graduate students an accessible introduction to areas that may be outside their own expertise

Lecture Notes On Algebraic Structure Of Lattice-ordered Rings Jingjing Ma, 2014-03-14 Algebraic Structure of Lattice Ordered Rings presents an introduction to the theory of lattice ordered rings and some new developments in this area in the last 10-15 years It aims to provide the reader with a good foundation in the subject as well as some new research ideas and topic in the field This book may be used as a textbook for graduate and advanced undergraduate students who have completed an abstract algebra course including general topics on group ring module and field It is also suitable for readers with some background in abstract algebra and are interested in lattice ordered rings to use as a self study book The book is largely self contained except in a few places and contains about 200 exercises to assist the reader to better understand the text and practice some ideas

**Injective Modules and Injective Quotient Rings** Faith, 2019-08-21 First published in 1982 These lectures are in two parts Part I entitled injective Modules Over Levitzki Rings studies an injective module  $E$  and chain conditions on the set  $A(E, R)$  of right ideals annihilated by subsets of  $E$  Part II is on the subject of FPF or finitely pseudo Frobenius rings i.e. all finitely generated faithful modules generate the category  $\text{mod } R$  of all  $R$  modules The FPF rings had been introduced by Azumaya as a generalization of quasi Frobenius rings but FPF includes infinite products of Prüfer domains  $e.g. \mathbb{Z}_w$

**Abelian Groups, Rings and Modules** Andrei V. Kelarev, 2001 This volume presents the proceedings from the conference on Abelian Groups Rings and Modules AGRAM held at the University of Western Australia Perth Included are articles based on talks given at the conference as well as a few specially invited papers The proceedings were dedicated to Professor Lszl Fuchs The book includes a tribute and a review of his work by his long time collaborator Professor Luigi Salce Four surveys from leading experts follow Professor Salce's article They present recent results from active research areas

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