# Jordan University of Science and Technology

## Faculty of Science & Arts

## Mathematics Department

MATH741 Abstract Algebra (1)

First Semester 2017-2018

| Course Catalog |
|---|
| 3 Credit Hours. In this course we study the following subjects : Rings, zero-divisors and units, Polynomial Rings, Matrix Rings, integral domain and fields, Ring Homomorphism., Ideals. (right ideals and left ideals ). Factor Rings, Isomorphism Theorems for rings. Maximal ideals, Prime ideals, Radicals of ideals, Primary ideals .The Chinese Remainder Theorem for rings. Euclidean Domains. Principle Ideal Domains. Unique Factorization Domains, Irreducibility Criteria., Module, submodules, Module Homomorphism. Isomorphism Theorems for modules. Prime submodules , maximal submodules, primary submodules . Generation of modules direct sume and free modules. The Chinese Remainder Theorem for module Noetherian R-modules. Finitely generated R-modules. |

| Text Book | |
|---|---|
| **Title** | Abstract Algebra |
| **Author(s)** | David S. Dummit and Richard M. Foote |
| **Edition** | 3rd Edition |
| **Short Name** | TextBook |
| **Other Information** | 2003 |

**Course References**

| Short name | Book name | Author(s) | Edition | Other Information |
|---|---|---|---|---|
| Ref 1 | Algebra; an Approach via Module Theory | William A. Adkins and Steven H. Weintraub | 1st Edition | Graduate Texts in Mathematics, Vol. 136. Springer-Verlag, 1992. |
| Ref 2 | Algebra | Hungerford, Thomas W. | 1st Edition | Graduate Texts in Mathematics, Vol. 73. Springer-Verlag, 2003. |
| Ref 3 | Algebra. | Lang, S. | 1st Edition | Graduate Texts in Mathematics, Vol. 211. Springer-Verlag, 2002. |

| Instructor | |
|---|---|
| Name | **Dr. Khaldoun Al-Zoubi** |

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|---|---|
| Office Location | 23451 |
| Office Hours | Sun : 10:30 - 11:30<br>Mon : 10:00 - 11:30<br>Tue : 11:30 - 13:00<br>Wed : 11:30 - 12:30<br>Thu : 09:30 - 10:30 |
| Email | kfzoubi@just.edu.jo |

| **Class Schedule & Room** |
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| Section 1:<br>Lecture Time: Thu : 14:30 - 17:30<br>Room: SF05 |

**Tentative List of Topics Covered**

| Weeks | Topic | References |
|---|---|---|
| Weeks 1, 2 | Chapter 7 Introduction to Rings: Basic Definitions and Examples. Examples: Polynomial Rings, Matrix Rings. zero-divisors and units (left zero-divisor, right zero-divisor, left inverse , right inverse) , integral domain and fields, division ring, Subrings | From **TextBook** |
| Week 3 | Chapter 7: Polynomial Rings, Ring Homomorphism, Properties of Ideals. (right ideals and left ideals ) | From **TextBook** |
| Weeks 4, 5, 6 | Chapter 7: Factor Rings, Isomorphism Theorems for rings (First Ring Isomorphism Theorem, Second Ring Isomorphism Theorem, Third Ring Isomorphism Theorem, Fourth Ring Isomorphism Theorem) Maximal ideals, Prime ideals, Radicals of ideals, Primary ideals, The Chinese Remainder Theorem. | From **TextBook** |
| Week 7 | Chapter 8: Euclidean Domains. Principle Ideal Domains. Unique Factorization Domains. | From **TextBook** |
| Week 8 | Chapter 9: Definitions and Basic Properties. Polynomial Rings Over Fields I. Polynomial Rings that are U.F.D.s. | From **TextBook** |
| Week 9 | Chapter 9: Irreducibility Criteria. Polynomial Rings Over Fields II. | From **TextBook** |
| Week 10 | Chapter 10: Basic Definitions and Examples, Submodules , Module Homomorphism. | From **TextBook** |
| Weeks 11, 12 | Chapter 10: Quotient Modules, Isomorphism Theorems for modules (First module Isomorphism Theorem, Second module Isomorphism Theorem, Third module Isomorphism Theorem, Fourth module Isomorphism Theorem | From **TextBook** |
| Weeks 13, 14 | Chapter 10: Prime submodules , maximal submodules, primary submodules | From **TextBook** |
| Week 15 | Chapter 10: Generation of modules direct sume and free modules, The Chinese Remainder Theorem for modules, Noetherian R-modules , Finitely generated R-modules | From **TextBook** |
| Week 16 | Final Exam Week | |

| Mapping of Course Objectives to Program Student Outcomes[1] | Assessment method |
|---|---|
| Define, illustrate, and apply the concepts of rings, division ring integral domain, fields. [3a, 1e] | 1st Exam |
| Define, illustrate, and apply the concepts of, left (right ) zero-divisor, left (right ) inverse, Ideals, factor rings and ring homomorphism. [2a, 1e] | 1st Exam |
| Define, illustrate, and apply the concepts of Maximal ideals, prime ideals, primary ideals, Radicals of ideals. [1a, 1e] | |
| Learn the rings of polynomials and factorization of polynomials over a field. [1a, 1e] | |
| Define, illustrate, and apply the concepts of Euclidean Domains (ED), Unique Factorization Domains and Principle Ideal Domains. [1a] | |
| Define, illustrate, and apply the concepts of modules, submodules , module homomorphism and isomorphism theorems for modules [2a, 1e] | |
| Define, illustrate, and apply the concepts of prime submodules, primary submodules, maximal submodules. [2a, 1e] | |
| Define, illustrate, and apply the concepts of Noetherian modules and Finitely generated modules [1a] | |

| Relationship to Program Student Outcomes (Out of 100%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a | b | c | d | e | f | g | h | i | j | k |
| 70 | | | | 30 | | | | | | |

| Evaluation | |
|---|---|
| **Assessment Tool** | **Weight** |
| 1st Exam | 25% |
| 2nd Exam | 25% |
| final Exam | 50% |

Date Printed: 2017-11-28

Abstract algebra is a broad field of mathematics, concerned with algebraic structures such as groups, rings, vector spaces, and algebras. Roughly speaking, abstract algebraÂ  It is possible to abstract away practically all of the properties found in the "usual" number systems, the tradeoff being that the resulting object--known as a magma (which consists of a set and a binary operation, that need not satisfy any properties other than closure)--is simply too general to be interesting. Abstract Algebra. Practice. With Albert, schools save 50-80% on their digital curriculum spending.Learn more.Â  Abstract algebra assumes a working prerequisite knowledge of necessary mathematical fundamentals. This theme covers the basics of working with sets and relations, and applying knowledge of logic and proofs. Set Theory.