

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics and Statistics**  
**SYLLABUS**

Semester II, 2019-2020 (192)  
(Dr. Abdeslam MIMOUNI)

Office: 5-303; e-mail: amimouni@kfupm.edu.sa; Ph. #: 4036

Course #: Math 323 (Formerly named Math 345)

Title: Modern Algebra I

Prerequisite: Math 232

Textbook: Contemporary Abstract Algebra by J. A. Gallian, eighth edition (2013)

Objectives: This course is intended to introduce students to fundamental concepts and techniques in abstract algebra and to provide students with appropriate background for more advanced courses in mathematics.

Week #	Date	Chapter	Topics
1	Jan. 19-23	2 3	Groups, Definitions, Examples, Elementary Properties Finite Groups, Subgroups: Terminology and notation, Subgroup Tests
2	Jan. 26-30	3 4	Examples of Subgroups Cyclic groups : Properties of Cyclic Groups
3	Feb 02-06	4 5	Classification of Subgroups of Cyclic Groups Permutation groups: Notation&Definition, Cycle notation
4	Feb. 09-13	5 6	Properties of Permutations Isomorphisms: Examples& Definition, Cayley's Theorem
5	Feb.16-20	6 7	Properties of Isomorphisms, Automorphisms Cosets and Lagrange's theorem: Properties of Cosets, Lagrange's Theorem & Consequences
6	Feb. 23-27	8 9	External Direct Product: Definition, Examples, Properties of Ex. Dir. Prod. Normal subgroups and Factor groups: Normal Subgroups, Factor groups
7	Mar. 01-05	9 10	Internal Direct Products Group Homomorphisms: Definition, Examples, Properties
8	Mar. 08-12	10 11	The First Isomorphism Theorem Fundamental Theorem of Finite Abelian Groups: The Fundamental Theorem, The Isomorphism Classes of Abelian Groups
9	Mar. 15-19	12	Introduction to rings: Definition, Examples, Properties of Rings, Subrings
10	Mar. 22-26	13	Integral Domains: Definition, Examples, Fields, Characteristic of a Ring.
11	Mar. 29- Apr. 02	14	Ideals and Factor Rings: Ideals, Factor Rings, Prime and Maximal Ideals.
12	Apr. 05-09	15	Ring Homomorphism: Definition, Examples, Properties of Ring Homomorphisms , The Field of Quotients
13	Apr. 12- 16	16	Polynomial Rings: Notation and Terminology, The Division Algorithm and Consequences.
14	Apr. 19-23	17	Factorization of Polynomials: Reducibility Tests, Irreducibility Tests, Unique Factorization in $Z[x]$
15	Apr. 26-30	18	Divisibility in Integral Domains: Irreducibles, Primes, Unique Factorization Domains.

### Learning Outcomes

Upon completion of this course, students should be able to  
Understand normal subgroups, factor groups, homomorphisms  
Understand the fundamental theorem of finite Abelian groups  
Understand integral domains and fields  
Understand ideals, factor rings and ring homomorphisms  
Understand factorization of polynomials over a field, factor rings of polynomials over a field  
Understand irreducible elements and unique factorization  
Understand principal ideal domains

### Homework

<i>Chapter 2</i>	<i>Exercises: 22-34-52</i>
<i>Chapter 3</i>	<i>Exercises: 4-12-32</i>
<i>Chapter 4</i>	<i>Exercises: 14-20-42</i>
<i>Chapter 5</i>	<i>Exercises: 22-26-38</i>
<i>Chapter 6</i>	<i>Exercises: 2-10-42</i>
<i>Chapter 7</i>	<i>Exercises: 6-12-48</i>
<i>Chapter 8</i>	<i>Exercises: 6-22-38</i>
<i>Chapter 9</i>	<i>Exercises: 10-38-48</i>
<i>Chapter 10</i>	<i>Exercises: 6-14-20</i>
<i>Chapter 11</i>	<i>Exercises: 2-8-22</i>
<i>Chapter 12</i>	<i>Exercises: 4-8-12</i>
<i>Chapter 13</i>	<i>Exercises: 14-30-46</i>
<i>Chapter 14</i>	<i>Exercises: 14-16-26</i>
<i>Chapter 15</i>	<i>Exercises: 12-24-52</i>
<i>Chapter 16</i>	<i>Exercises: 4-10-20</i>
<i>Chapter 17</i>	<i>Exercises: 10-20-30</i>
<i>Chapter 18</i>	<i>Exercises: 4-12-28</i>

### Grading Policy.

Homework: Out of: 60.  
Major Exam 1: February 25, 2020, Chapters 2-6. Out of: 100.  
Major Exam 2: March 25, 2010, Chapters 7-11. Out of: 100.  
Final Exam: Announced by the Registrar. Out of: 140.  
Total: Out of: 400.