

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

Semester II, 2013-2014 (132)

(Prepared by: Dr. Abdeslam MIMOUNI)

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Course #: Math 345

Title: Modern Algebra I

Prerequisite: Math 232

Textbook: Contemporary Abstract Algebra by J. A. Gallian, sixth edition (2006)

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. 26-30	2 3	Groups, Definitions, Examples, Elementary Properties Finite Groups, Subgroups: Terminology and notation, Subgroup Tests
2	Feb. 02-06	3 4	Examples of Subgroups Cyclic groups : Properties of Cyclic Groups
3	Feb. 09-13	4 5	Classification of Subgroups of Cyclic Groups Permutation groups: Notation&Definition, Cycle notation
4	Feb. 16-20	5 6	Properties of Permutations Isomorphisms: Examples& Definition, Cayley's Theorem
5	Feb.23-27	6 7	Properties of Isomorphisms, Automorphisms Cosets and Lagrange's theorem: Properties of Cosets, Lagrange's Theorem & Consequences
6	Mar. 02-06	8 9	External Direct Product: Definition, Examples, Properties of Ex. Dir. Prod. Normal subgroups and Factor groups: Normal Subgroups, Factor groups
7	Mar. 09-13	9 10	Internal Direct Products Group Homomorphisms: Definition, Examples, Properties
8	Mar. 16-20	10 11	The First Isomorphism Theorem Fundamental Theorem of Finite Abelian Groups: The Fundamental Theorem, The Isomorphism Classes of Abelian Groups
<b>March 21-29: Med-Term Vacation</b>			
9	Mar. 30- Apr. 03	12	Introduction to rings: Definition, Examples, Properties of Rings, Subrings
10	Apr. 06-10	13	Integral Domains: Definition, Examples, Fields, Characteristic of a Ring.
11	Apr. 13-17	14	Ideals and Factor Rings: Ideals, Factor Rings, Prime and Maximal Ideals.
12	Apr. 20-24	15	Ring Homomorphism: Definition, Examples, Properties of Ring Homomorphisms , The Field of Quotients
13	Apr. 27- May 01	16	Polynomial Rings: Notation and Terminology, The Division Algorithm and Consequences.
14	May 04-08	17	Factorization of Polynomials: Reducibility Tests, Irreducibility Tests, Unique Factorization in $\mathbb{Z}[x]$
15	May 11-15	18	Divisibility in Integral Domains: Irreducibles, Primes, Unique Factorization Domains.

## Homework

<i>Chapter 2</i>	<i>Exercises: 6-14-30</i>
<i>Chapter 3</i>	<i>Exercises: 4-10-32</i>
<i>Chapter 4</i>	<i>Exercises: 14-20-42</i>
<i>Chapter 5</i>	<i>Exercises: 12-22-38</i>
<i>Chapter 6</i>	<i>Exercises: 2-10-24</i>
<i>Chapter 7</i>	<i>Exercises: 6-12-16</i>
<i>Chapter 8</i>	<i>Exercises: 6-22-38</i>
<i>Chapter 9</i>	<i>Exercises: 10-38-44</i>
<i>Chapter 10</i>	<i>Exercises: 6-10-20</i>
<i>Chapter 11</i>	<i>Exercises: 2-8-20</i>
<i>Chapter 12</i>	<i>Exercises: 4-8-12</i>
<i>Chapter 13</i>	<i>Exercises: 12-22-26</i>
<i>Chapter 14</i>	<i>Exercises: 14-16-42</i>
<i>Chapter 15</i>	<i>Exercises: 12-24-40</i>
<i>Chapter 16</i>	<i>Exercises: 4-10-18</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 26, 2014, Chapters 2-6, Out of: 80.  
Major Exam 2: March 31, 2014, Chapters 7-11, Out of: 80.  
Major Exam 3: April 30, 2014, Chapters 12-15, Out of: 80.  
Final Exam: Announced by the Registrar, Out of 100.  
Total: Out of 400.