**King Fahd University of Petroleum and Minerals**
**Department of Mathematics and Statistics**
**SYLLABUS**
**Semester II, 2012-2013 (122)**

**(Prepared by: Dr. Abdeslam MIMOUNI)**
**(Office: 5-303); e-mail: amimouni@kfupm.edu.sa; Ph. #: 4036)**

**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<br>3 | Groups, Definitions, Examples, Elementary Properties<br>Finite Groups, Subgroups: Terminology and notation, Subgroup Tests |
| 2 | Feb. 02-06 | 3<br>4 | Examples of Subgroups<br>Cyclic groups : Properties of Cyclic Groups |
| 3 | Feb. 09-13 | 4<br>5 | Classification of Subgroups of Cyclic Groups<br>Permutation groups: Notation&Definition, Cycle notation |
| 4 | Feb. 16-20 | 5<br>6 | Properties of Permutations<br>Isomorphisms: Examples& Definition, Cayley's Theorem |
| 5 | Feb.23-27 | 6<br>7 | Properties of Isomorphisms, Automorphisms<br>Cosets and Lagrange's theorem: Properties of Cosets, Lagrange's Theorem & Consequences |
| 6 | Mar. 02-06 | 8<br>9 | External Direct Product: Definition, Examples, Properties of Ex. Dir. Prod.<br>Normal subgroups and Factor groups: Normal Subgroups, Factor groups |
| 7 | Mar. 09-13 | 9<br>10 | Internal Direct Products<br>Group Homomorphisms: Definition, Examples, Properties |
| 8 | Mar. 16-20 | 10<br>11 | The First Isomorphism Theorem<br>Fundamental Theorem of Finite Abelian Groups: The Fundamental Theorem, The Isomorphism Classes of Abelian Groups |
| *March 21-29: Med-Term Vacation* | | | |
| 9 | Mar. 30-<br>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-<br>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 Z[x] |
| 15 | May 11-15 | 18 | Divisibility in Integral Domains: Irreducibles, Primes, Unique Factorization Domains. |

**Homework**

| | |
|---|---|
| ***Chapter 2*** | ***Exercises: 6-14-30*** |
| ***Chapter 3*** | ***Exercises: 4-10-32*** |
| ***Chapter 4*** | ***Exercises: 14-20-42*** |
| ***Chapter 5*** | ***Exercises: 12-22-38*** |
| ***Chapter 6*** | ***Exercises: 2-10-24*** |
| ***Chapter 7*** | ***Exercises: 6-12-16*** |
| ***Chapter 8*** | ***Exercises: 6-22-38*** |
| ***Chapter 9*** | ***Exercises: 10-38-44*** |
| ***Chapter 10*** | ***Exercises: 6-10-20*** |
| ***Chapter 11*** | ***Exercises: 2-8-20*** |
| ***Chapter 12*** | ***Exercises: 4-8-12*** |
| ***Chapter 13*** | ***Exercises: 12-22-26*** |
| ***Chapter 14*** | ***Exercises: 14-16-42*** |
| ***Chapter 15*** | ***Exercises: 12-24-40*** |
| ***Chapter 16*** | ***Exercises: 4-10-18*** |
| ***Chapter 17*** | ***Exercises: 10-20-30*** |
| ***Chapter 18*** | ***Exercises: 4-12-28*** |

**Grading Policy.**

**Homework: Out of 60.**
**Major Exam 1: February 26, 2013, Chapters 2-6, Out of: 80.**
**Major Exam 2: March 31, 2013, Chapters 7-11, Out of: 80.**
**Major Exam 3: April 30, 2013, Chapters 12-15, Out of: 80.**
**Final Exam: Announced by the Registrar, Out of 100.**
**Total: Out of 400.**