Math 242 — Spring 2012
Topics in Algebra
`http://people.aub.edu.lb/~kmakdisi/`

Classes: MWF 11:00–11:50, in Bliss 205.

Instructor: Kamal Khuri-Makdisi (`kmakdisi@aub.edu.lb`), Bliss 311, phone 4234. E-mail is usually the easiest way to contact me.

Office hours: Will be announced soon. Also, you should always feel free to contact me by e-mail at other times, if you have any questions.

Required textbook: Fraleigh, *A First Course in Abstract Algebra*, 7th edition (available at the University Bookstore).

Optional, but useful, supplementary textbooks: These will be placed on reserve at Jafet Library.

1) N. Jacobson, Basic Algebra I (especially chapters 2 and 4)
2) M. Artin, Algebra (especially chapters 11, 13, and 14)
3) E. Artin, Galois Theory
4) L. Gaal, Classical Galois Theory, with Examples

Course requirements: I will assign weekly graded problem sets throughout the term, and have one midterm quiz after we finish Section 33; the grading will be 20% problem sets, 30% midterm, and 50% final. If needed, I may give brief quizzes at other points in the semester.

It is **very important** to keep up with the homework in this course, otherwise you can easily fall behind with the material and do poorly on the midterm and final exam. You may collaborate with your classmates in finding out how to solve the homework problems, but **you MUST write your problem set in your own words, based on your own understanding of the solution.**

Prerequisites for this course: Math 241 or the equivalent. Specifically, you should be comfortable with groups and rings including subgroups, quotient groups, ideals, quotient rings, and prime and maximal ideals. I will quickly review (and expand on) the material we saw in Math 241 on factorization of polynomials over a field.

Topics to be covered: Each section will take one to two hours of lecture.

- Some background material:
  - Lecture, Unique factorization of integers; the Euclidean algorithm
  - Section 22, Rings of Polynomials
  - Section 23, Factorization of Polynomials over a Field
- More on polynomial rings and unique factorization:
  - Section 45, Unique Factorization Domains
  - Section 46, Euclidean Domains
  - Section 47, Gaussian Integers and Norms
- Field extensions:
  - Section 29, Introduction to Extension Fields
  - Section 30, Vector Spaces
  - Section 31, Algebraic Extensions
  - Section 32, Geometric Constructions
  - Section 33, Finite Fields

Midterm quiz

- Galois theory:
  - Section 48, Automorphisms of Fields
  - Section 49, The Isomorphism Extension Theorem
  - Section 50, Splitting Fields
  - Section 51, Separable Extensions
  - Section 52, Totally Inseparable Extensions
  - Section 53, Galois Theory
  - Section 54, Illustrations of Galois Theory
  - Section 55, Cyclotomic Extensions
  - Section 56, Insolvability of the Quintic
- Group theory as needed while we do Galois theory:
  - Section 16, Group Action on a Set (review)
  - Section 35, Series of Groups
  - Section 38, Free Abelian Groups

Final exam
