SD '00

RM

SYLLABUS

MA402 ABSTRACT ALGEBRA

Spring 2000

TR 9:30 – 10:50pm HH39

INSTRUCTOR: DR. CHOCK WONG

Office: Henry Hall 018 (Phone: 739-4682)

Office Hours: TBA M 2:00–3:00am, W 1:00–2:30, TH 12:30-1:50pm.

Course Description: This writing intensive course is one of the major requirements for a bachelor degree in Mathematics (or Secondary Mathematics Education). By taking this course, students will learn the concepts, terminology, and axiomatic structure of abstract algebra in introductory level. The course covers the study of groups, rings, and fields.

Prerequisites: MA401 Linear Algebra (and desirable MA301 Number Theory), or consent of instructor.

Textbook: Modern Algebra: A Conceptual Approach (1993) by Franklin D. Pedersen. *Wm. C Brown Publishers.*

Plan of the Course: Chapters and topics to be covered are listed below, subject to changes if necessary:

(1) Chapter 2: Operations. Operation tables, identity element, asociativity and commutativity, inverses.
(2) Chapter 3 & 4: Groups. Semigroups and groups, Abelian groups, Dihedral groups D_n, properties of groups, order of a group.
(3) Chapter 5: Homomorphisms. Homomorphisms, isomorphisms, and automorphisms of groups.
(4) Chapter 6 & 7: More structures of groups. Subgroups, generating sets, Cyclic groups, products of groups.
(5) Chapter 8 & 9: Permutation groups, Cayley's Theorem, and the Fundamental Theorem of Finite Abelian Groups.
(6) Chapter 10 & 11: Cosets and LaGrange's Theorem. Equivalence relation and classes, left cosets, index of a subgroup, Sylow p-subgroups.
(7) Chapter 12: Normal subgroups and quotient groups.
(8) Chapter 13 & 14: Rings. Properties of rings, integral domains and fields, subrings and ideals, ring homomorphisms.
(9) Chapter 15 & 16: More on rings. Polynomial rings, irreducible polynomials, maximal ideals in $F[x]$, quotient rings and field extensions.

Requirements: Students taking this course are required to do:

(1) Reading assignments — especially the proofs of the main theorems;
(2) Board presentations of theorem proving and problem solving;
(3) Writing assignments — Exercise problems and section/chapter summaries;

(4) Group projects;
(5) Tests: There will be 3 unit tests —
Test 1: Chapter 2 to 4, on Week 5
Test 2: Chapter 5 to 7, on Week 9
Test 3: Chapter 8 to 12, on Week 13
(6) Final Examination.

Grading: Basd on the performance in the requirements. In detail, Board presentations, Writing assisnments and Projects, Tests, and Final Examination, each worth 25% of the total.

General Remarks: From the weights of board presentation and writing assignments (homework) given above, you should see their importance for the course. Most of the learning will occur while doing board presentation and writing assignments. There are two main things you should learn each time a new concept is introduced. First of all, you must learn the **definitions** of the words used in presenting the new concept; for, if you don't know the definition, you won't be able to use the **language** and concepts of abstract algebra to solve problems you'll encounter. Secondly, you need to see and understand an enough amount of examples so that you can get a feeling for what the definitions actually mean. Only in this way will the words really make sense to you.

As in a writing intensive course, you should try hard to learn "writing" — of course, in mathematics. It is important that you write your homework, your board presentation **in sentences**, since only in this way can you organize your own thoughts and clearly express them to others. The emphasis will be on writing clearly enough that your classmates can understand what you have written. **Write in sentences, write clearly, write logically.**