Course Syllabus
MA553 Abstract Algebra
Rivier College Summer 1, 2004

Mondays & Wednesdays 4.30 – 7.00 pm

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Brief Course Description

This course is an introduction to axiomatic treatment of mathematics.
The focus is on the concepts of groups, rings, and fields as generalizations of familiar mathematical models. The concept of groups will be covered in more depth, including such topics as subgroups, cyclic groups, cosets, direct products, homomorphisms and isomorphisms, and factor groups.
The main goal of the course is to create a deeper understanding of the nature of mathematical thinking and the principles of forming mathematical knowledge.

Required Course Textbook

John B. Fraleigh. *A First Course In Abstract Algebra*.
Addison Wesley, 2003, Seventh Edition.

Course Objectives

- To develop understanding of algebraic structures as abstractions of more familiar number systems.
- To acquire ability to work with concepts of groups, rings, and fields.
- To develop the deeper understanding of algebra needed to teach high school algebra.
- To develop awareness and appreciation of formal axiomatic systems and their applications.
- To lay foundations for further axiomatic study of mathematics.

Course Schedule

May: 24(Mon), 26(Wed);
June: 2(Wed), **4(Fri),** 7(Mon), 9(Wed), 14(Mon), 16(Wed), 21(Mon), 23(Wed), 28(Mon);
30(Wed) – Final exam

Learning Strategies

All new material will be introduced in class first. We will discuss it and work through a few examples. Your active involvement is crucial: you are encouraged to participate in the discussion and contribute ideas.

The next stage will be your work at home with your class notes and the textbook. Please read both your notes and the assigned textbook material making sure you understand everything, study all the examples, and then do the assigned problems. If something is unclear, formulate it as a question for the next class. Group work is a wonderful tool to use at this stage.

At the beginning of each class, we will discuss the assignment from the previous class meeting and address all concerns and uncertainties. Please do not leave anything unclear: we can only move forward successfully if we have no hazy areas left behind. All questions are always welcome: before, during, or after the class.

Course Requirements

- You are expected to attend all classes, to be on time for classes, and to come prepared. Please do the assigned reading, study the examples, solve the assigned problems, and formulate questions to raise in class. Never leave anything unclear.
- In each class, we will have a short written quiz, and you will submit your written home assignment.
- We will have our final exam on Wednesday, June 30. It will be a two-hour written test.

Grading Method

Quizzes and written home assignments	40%
Final exam	60%

The result will be converted to a letter grade in accordance with the grading policy of the college.

Classroom Policies

- In case of an illness or an emergency that will require missing a class, please contact me – if at all possible, before the class. Let me know of any anticipated absences as early as possible. Even if you have to miss a class, please make sure you complete the home assignment and submit it.
- You can make an appointment with me, individually or in groups, by phone or by e-mail, to address any unclear topics. Please do not hesitate to contact me whenever you need some help.
- If, at any point, you have concerns about the course or your personal progress – please talk with me immediately, after the class or via e-mail. We can certainly deal successfully with all such problems – if we do it promptly, before they have a chance to become "chronic". If you don't say anything – I will assume you are happy with the course and your progress.

Tentative Course Outline (please expect adjustments)

Groups and Subgroups
Binary operations
Isomorphic binary structures
Groups
Subgroups
Cyclic groups
Generating sets and Cayley diagrams

Permutations, Cosets, and Direct Products
Groups of permutations
Orbits, cycles, and the alternating groups
Cosets and the Theorem of Lagrange
Direct products and finitely generated Abelian groups

Homomorphisms and Factor Groups
Concept of homomorphism
Factor groups
Factor-group computations and simple groups

Rings and Fields
Concepts of rings and fields
Integral domains
Fermat's and Euler's Theorems
The field of quotients of an integral domain
Rings of polynomials