MA 312 ABSTRACT ALGEBRA I

Course Syllabus

Prerequisite: MA 211 and MA 163 with grades of C– or better, or consent of instructor

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Office Hours: Specific office hours for the semester will be announced. I am in and out of the office throughout the day and am willing to meet with students who drop in at other times if whatever I am doing can be set aside. To be sure I will be there when you can come, make an appointment.

Text: The text to be used will be announced at the first class session.

General Statement of Content and Objectives:

This course will introduce the student to the concepts and methodology of abstract algebra. Topics covered will include operations on sets, groups, permutation groups, with applications, homomorphisms and isomorphisms, cosets, quotient groups, Lagrange's theorem, and the fundamental homomorphism theorem. If time permits, there will be some coverage of rings, integral domains, and fields. In addition, attention will be given to the formal logic necessary for a rigorous treatment of mathematics. Applications to other disciplines such as computing will be indicated where appropriate.

The student will be expected to demonstrate an understanding of concepts and methods through written assignments, on tests, by participation in class discussions, by work on some computerized puzzles, and by work on certain "challenge problems".

Written Assignments:

Homework assignments to be turned in for grading will be given every few weeks. Students may work together on these, and they may use outside reference materials. However, any ideas obtained from other persons or sources must be acknowledged using a standard form which will be provided. In addition, students will be expected to work on many other exercises for discussion in class.

Writing Quality:

The quality of students' writing will be taken into account in the grading of problem assignments. Students should strive to learn to write clearly and concisely and with good grammar and style. A sample set of solutions will be distributed after each problem set is turned in. These will give models of the sort of writing that is expected. A "Guidelines for Written Assignments" paper will be distributed to help students with their writing.

Computer-Based Explorations:

There will be several assigned activities in which the students will be asked to use existing permutation puzzle software on a computer to explore some serious applications of the theory, form conclusions and write up their results.

Tests:

One mid–term exam and a final exam will be given. For these, the student will have to be able to reproduce proofs of theorems which will be identified in advance, state definitions of important concepts, and solve problems and produce proofs and examples like ones which have been done in homework assignments. The tests will also include essay questions.

Class Attendance, Participation, and Extra Credit:

Regular attendance at class is expected. Participation in discussion in class will be taken into account in grading. Challenge problems will be introduced from time to time, and students are strongly urged to work on these to strengthen their participation grade.

Although this is a three–credit course, there is a fourth meeting built into the weekly schedule. This extra session will be used for further explanation of topics being studied, and occasionally to make up a missed session. While attendance at this extra session isn't mandatory, it is highly recommended for those for whom abstract mathematics is difficult.

Grading:

Grades in an advanced mathematics class are determined more subjectively than in earlier classes. This is because the skills expected of the student are more complex. It is not possible, nor desirable, to break broad objectives into narrow test items, attach point values to each and then base grades on cumulative totals. Instead, the instructor assigns a task, such as giving a proof of some proposition, or perhaps even asking an open–ended question which requires the student to formulate the proposition before proving it. In evaluating the results, the following issues are considered:

- Did the student understand the problem?
- Is the solution correct?
- Does the solution have any clever features or reflect special insights?
- How well is the solution presented?

Based on answers to these questions, a grade must be determined.

For this course, the written assignments, computer assignments, tests, and class participation will have approximately the following weights: **Written assignments**: 35%; **Tests**: 35%; **Computer assignments**: 15%; and **Participation**: 15%.

The following are some qualitative interpretations which will be associated with letter grades:

A.
1. Clear understanding of definitions and theorems demonstrated, and the ability to reproduce basic theorems.
2. Ability to give proofs, including ones which do not just parallel ones presented in class but require combining known ideas in new ways.
3. A demonstrated understanding of how to formulate a strategy for solving a problem, even if a solution is not found.
4. The ability to write clear proofs with good use of logic.
5. Little or no nonsense in written discourse.
6. Perhaps occasional really elegant insights.
7. Insightful and accurate work on several challenge problems.
8. Insightful comments, questions, and answers in class discussion.

B.
1. Same as A.1.
2. The ability to give proofs and solve problems on new types after some help in formulating the strategy.
3. Skills as in A.4. through A.8., but not so fully developed.

C.
1. A clear understanding of topics presented demonstrated most of the time, but misunderstanding apparent sometimes.
2. Ability to solve the easier problems but not the more difficult ones.
3. A need for considerable guidance in developing strategies for solving problems or giving proofs.
4. Nonsense occurs with some frequency in written work.
5. Good attendance.
6. Asking clear questions about materials not understood.

D.
1. A clear understanding only occasionally demonstrated.
2. Can solve problems or give proofs only rarely.
3. Nonsense and misunderstanding occurs frequently in written work.
4. Should not go on to s subsequent course which requires this one.

F.
1. Qualitatively like the D, but the F would probably also indicate a failure to even try on a significant proportion of the assigned work.