Abstract Algebra Spring Semester 2002

MATH 434-A	Abstract Algebra	9:00 A.M.	M,T, Θ, F
Bryan Smith	Thompson 321-E	879-3562	bryans@ups.edu

ROOM Thompson Hall 127

OFFICE HOURS

11:00 A.M. - Noon	Monday, Tuesday, Thursday, and Friday
9:30 A.M. - 11:00 A.M.	Wednesday

I am also happy to meet at any other time we can arrange. Feel free to stop me after class or call to find a mutually acceptable time. I also encourage you to contact me by electronic mail.

TEXTBOOK *Contemporary Abstract Algebra*, Joseph A. Gallian, ©1998, Houghton Mifflin Company.

Since most of you are majoring in either mathematics or science, you should consider buying *Scientific Notebook* or some other technical word processor.

COURSE CONTENT The formal prerequisites for this course are Linear Algebra 232 and Abstract Algebra 433. This means you should be familiar not only with the standard methods and techniques for thinking about and solving mathematical problems but also with the basics of developing and writing proofs.

Although there are few prerequisites, Abstract Algebra 433 and 434 are senior level courses and are considered to be a capstone for those of you considering graduate school in mathematics or a career teaching at the secondary (or higher) level.

In this course, you will continue to acquire a deeper knowledge of linear algebra, investigate a bit more of group theory and learn the basics of a the algebraic structures called rings, modules and fields.

As you did last semester, please think of our text, not as the course bible, but rather as your primary resource for filling in details of the material covered in class. I also recommend that you take the time to find and use additional references. In particular, there are an abundance of useful books in the library and mathematics reading room.

HOMEWORK / WRITING Homework will be assigned and collected as it was last semester except I might designate due dates. I expect a total of 20 problems to be accepted by the end of the semester. However, this semester you do not need to designate any of them as writing problems. Instead, write all problems for an audience consisting of the rest of the class. I will occasionally check your level of exposition by having a classmate read your proof and then asking pertinent questions of that reader. Feel free to use (or not) any technology that you like (e.g., calculators, *Mathematica*, MATLAB, etc.). You may also work with others in solving these problems but there is to be no collaboration on the written exposition of the solutions. In addition, you must include a reference page citing each resource you use: technological tools, reference texts employed, names of participants in discussions, and anything else other than your own thoughts. Failure to include references is plagiarism! It is intellectual theft and, as such, is extremely unacceptable. Please see the "Academic Honesty" section of the *Logger* to see how seriously we take this issue.

Talk/Paper The last 4-5 weeks of class will be devoted to talks given by the class members. You may investigate any topic that involves higher algebra. Those of you with interests in physics or chemistry will have no trouble finding many possibilities. There are also a number of choices mentioned in part 5 of our text. For example, you could go into more depth on the Sylow theorems, discuss the classification of finite simple groups, indicate how generators and relations are used to investigate groups (this is a fundamental tool in knot theory), get hard core with symmetry (other than discrete planar symmetries), show how to use more sophisticated counting arguments like Burnside's Theorem, look at how algebra is used in the study of graphs (one example is the Cayley Digraphs), expound on algebraic coding theory, or introduce the class to Galois theory (the interaction between groups and fields). Or if none of those seem like fun, how about: looking at why it is impossible to trisect all angles using only a straightedge and a compass or other constructibility questions like why it is impossible to square the circle, investigating boolean algebras (for those of you with a leaning toward computer science), or talking about lattice theory (we dealt a bit with lattices in our classification of planar symmetries but wouldn't it be fun to research the Leach lattice in 24 dimensional space and how it applies to the best way to pack spheres into a Euclidean box – not to mention the way it links to the theory of codes.) And, of course, there is always the way that algebra is used in the study of topological spaces. You saw a bit of this last semester after we developed the fundamental group of a topological space but there is much more that is accessible for a presentation to the class.

The main thrust of this assignment is the oral presentation of your investigations but you are also to present the material in a paper that you submit to me electronically (I prefer TeX format but will accept it in Microsoft Word format as well). I will publish your paper in the *Journal of Undergraduate Mathematics at Puget Sound* that I maintain on my web page. This might prove useful to mention when you are interviewing for a job.

In any event, you should talk with me no later than midterm or slightly thereafter about your choice of topic.

SEMESTER EXAMS There will be one examination during the semester of the form used in the fall. It will occur approximately at midterm.

FINAL EXAM The Final will be cumulative but will be weighted more heavily (about 2/3) on the material covered since the third in-class examination. It is scheduled for Wednesday May 15, 2002; Noon - 2:00 P.M. Please note this schedule and do not plan to leave town until after the final.

TOTAL POINTS

Homework	60 %
Class presentation and paper	20 %
In-Class Examination	10 %
Final Examination	10 %