MTH 419H Honors Algebra II, Section 001
Spring 2016 Course Syllabus

Instructor:	Robert Bell (rbell@math.msu.edu)
Lectures:	MWF 12:40 p.m. - 1:30 p.m. in A-108 Wells Hall
Instructor's Office:	C305 Wells Hall
Instructor's Office Hours:	Tu, Th 1:00 p.m.–2:00 p.m. and by appointment

Required Course Materials & Resources

Textbook. *Algebra*, 2nd Edition, by Michael Artin. ISBN-13: 978-0-13-241377-0, Pearson, 2011.

Piazza. You will receive an e-mail invitation to join our class discussion forum hosted by Piazza:

`https://piazza.com/`

Course Web Page. All course materials are posted on our course web page:

`http://users.math.msu.edu/users/robertbe/mth419Hss16.html`

Course Description. The official course description is as follows:

Course:	MTH 419H Honors Algebra II
Prerequisite:	MTH 418H
Topics:	Algebraic field extensions, Galois theory, classification of finite fields, Fundamental Theorem of Algebra.

The list of topics over simplifies the task before us. We will pick up where you left off last semester by continuing to study groups. This time, however, we will focus our attention on the so-called classical groups. To study these groups, we will first study topics from linear algebra: bilinear forms and the spectral theorem. Next, we will learn about rings, restricting our attention to commutative rings with identity, The prototypical example is the set of integers together with the operations of addition & multiplication and the distributive property which connects the two operations. Working over commutative rings with identity, we study polynomials, fractions, factoring, and problems related to number theory. If time permits, we will consider modules over a ring; these are analogous to vector spaces over a field. The remainder of the course concerns the topics listed in the official course description.

Learning Objectives. The learning objectives of this course are as follows:

1. Gain a working familiarity with groups, rings, and fields. You should be able to give many examples of each by the end of the course. By the end

of the course, you will be able to give some simple examples, some instructive examples, and some important examples, whether these are important because of their role in mathematics or because of their application to fields which use mathematics.

2. Learn how to read and write mathematical proofs by working directly from the definitions. The objects of study are primarily defined axiomatically. Correct mathematical proofs in this context should use these axioms in a clear and precise manner.

3. Develop intuition and mathematical sophistication. This course is targeted at students who are planning to continue their mathematical studies at the graduate level with, perhaps, the goal of contributing to current research in the mathematical sciences. The pre-requisite for many a graduate course is so-called "mathematical sophistication". In this course, you will acquire this sophistication by learning to study examples, to construct your own examples, and to test your own understanding. You will learn to formulate precise mathematical questions, and you will learn to formulate imprecise mathematical statements which can nonetheless lead to a precise question or statement of a problem when carefully critiqued by and shared with a group of your mathematical peers.

Exams, Homework, and Important Dates.

Midterm Exam I	Thursday, February 18, 5:30 p.m.–7:30 p.m.
Midterm Exam II	Thursday, April 7, 5:30 p.m.–7:30 p.m.
Final Exam	Thursday, May 5, 12:45 - 2:45 p.m.
Homework	assigned on a weekly basis

Exams are written and completed in class without the aid of the textbook, notes, calculators, or similar materials. The final exam is NOT comprehensive.

If you will be absent for official university business on the date of a midterm exam or quiz, you need to arrange an alternate exam or quiz date with me in advance.

Homework assignments are due at the start of class. Late homework is assessed a 10% penalty per day of lateness. Late homework will not be accepted more than 5 days after the due date.

Grading Criteria. In general, all of your work in the course will be graded according to three criteria: Does your work **clearly communicate** your reasoning and methods? Does your work **completely address** the question posed? Does your work **correctly answer** the question posed? Solutions which ineffectively communicate your ideas, which omit or incompletely

address the questions posed, or which include inaccuracies or errors will be penalized.

Use the following formula to determine x and use the grading scale to determine your grade for the course:

$$H \times 0.30 + P \times 0.10 + (E1 + E2) \times 0.20 + F \times 0.20 = x,$$

where H, P, $E1, E2$, and F are defined below. Each component is a percentage score (i.e. out of 100).

Graded Components	
(H) Homework	30%
(P) Participation	10%
(E1, E2) Midterm Exams (2)	20% each
(F) Final Exam	20%

	Grading Scale
4.0	$90 \leq x$
3.5	$84 \leq x < 90$
3.0	$78 \leq x < 84$
2.5	$72 \leq x < 78$
2.0	$66 \leq x < 72$
1.5	$60 \leq x < 66$
1.0	$55 \leq x < 60$
0.0	$x < 55$

Homework. Homework will be assigned on a weekly basis. By grading your written work I have the opportunity to assess your overall understanding of the course material as well as your progress towards developing strong analytical problem solving skills. Writing solutions to homework problems gives you the opportunity to receive direct feedback on how you are progressing in the course. Please take the homework assignments very seriously. Put in effort, take pride in your work, and check your solutions very carefully before deciding that you are done with the assignment.

How to prepare your homework for grading. You must completely and clearly state each problem by either copying the problem statement word-for-word or by restating the problem in your own words. This should be followed by a clear solution to the problem. If you cannot completely solve the problem, you should write several complete sentences which express your ideas on how to solve the problem, questions you have about the problem, and/or attempts you made but which did not lead to a complete solution.

If your homework is illegible, it will be returned and you will be asked to re-write your solutions. I encourage you to learn how to type your solutions and format them using LaTeX. I would be glad to help you acquire this skill.

How homework assignments are graded. A score from 0-10 will be assigned to each graded problem. You should interpret this score as a measure of how correct your solution is, e.g. 8 means 80% correct. A correct solution will enjoy all of the following properties:

completeness	(a measure of whether or not all parts were attempted)
correctness	(a measure of the accuracy of the solution)
clarity	(a measure of the quality of writing and explanation)

You should earn at least 5 points on each problem for which you have made an honest attempt and are able to communicate what you tried to do but which, perhaps, did not lead to a complete solution.

At the end of the semester, I will total your homework scores and then linearly rescale them to determine your homework grade so that a 5/10 average translates to 70 percent and 9/10 to 95 percent. Note: Some homework assignments will be worth more points than others because of the number of problems will vary from one assignment to the next.

Solutions to most of the problems will be made available. You should read these solutions even if you received full-credit. We can (and should) discuss solutions to the homework problems on Piazza and outside of class (e.g. during office hours or during a weekly problem solving session).

Ungraded Work. Success in mathematics requires that you spend a significant amount of time reading the textbook, testing your understanding by solving textbook exercises, and reviewing previously covered topics when they are not familiar. This is time in addition to the time you already plan to spend outside of class working on graded assignments. It is expected that you will attend all lectures and take appropriate notes on ideas and examples which seem worth revisiting outside of class. As this is a 400 level course, you should consider consulting additional resources (e.g. textbooks in the library, Wikipedia entries, online expository articles) to find answers to your questions and to feed your curiosity. If you are considering applying to graduate programs in mathematics, then this is even more important— these are the practices of successful graduate students and research mathematicians.

Office Hours. Please consider bringing your questions to office hours. Office hours are times set aside specifically as an opportunity for you to get additional help. If your schedule conflicts with the scheduled office hours, please make an appointment to meet with me. Please do not think of this as an inconvenience to me—it is not. Additional help is available if you seek it out. However, it is your responsibility to come to office hours only after first making a sincere effort to answer questions on your own. Learning is difficult: work hard, try out new ideas, ask questions, and seriously consider the questions asked by your classmates. If you do this, you will see definite progress.

Piazza and E-mail. Please utilize the online discussion forum. Most students find it beneficial to read the questions and answers there. However, for this to work, you must participate too. There is an option to post questions anonymously; you are welcome to do so. If you choose to send an e-mail directly to me, be sure to include a polite salutation and sign your name. You should try your best to state your question clearly. If you are asking a question about a specific exercise or example in the textbook, please include a statement of the original problem.

Advice. The best way to learn mathematics is to write down your attempts to solve specific problems such as textbook exercises. If you find you are not making much progress, go back and write out the steps taken in the examples and theorems proved in the textbook. Don't limit yourself to problems assigned as homework; the textbook offers a variety of interesting problems and challenges. Try working out problems that sound interesting to you. If you need help with topics covered in pre-requisite courses, please drop by my office during office hours or make an appointment to meet with me.

I want you to succeed in this course, and I'm here to facilitate this goal. But the burden is upon you to work hard, to set aside realistic amounts of time for study, and to seek out help when you need it.

Some final advice: read the textbook. Then attempt some exercises and read the textbook again. I cannot emphasize this enough. Learn to read the textbook and seek out additional sources of information when the textbook is insufficient. This applies not only to this class, but to all of your university courses.