MTH 419H Honors Algebra II, Spring 2015
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: C-305 Wells Hall
Instructor’s Office Hours: W 2-3 p.m., Th 12:30 - 2 p.m., and by appointment

Required Course Materials & Resources
Piazza: You will receive an e-mail invitation to join our online class discussion forum hosted by Piazza:
https://piazza.com/

Course Web Page: I will not use Desire To Learn (D2L). Instead, all course materials are posted on our course web page:
http://www.math.msu.edu/~robertbe/mth419Hss15.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. 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 and multiplication and the distributive property which connects the two operations. Working over commutative rings with identity, we study polynomials, fractions, factoring, and 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. Among
your examples, you will be able to include simple examples, instructive
examples, and 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 about abstract
algebraic objects and constructions 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 is a broad and
not very well defined goal. This course is targeted at students who are
planning to move forward in their mathematical studies with the aim of
learning about and perhaps 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
elements, 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, Quizzes, Homework & Important Dates.

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Martin Luther King Day - University open, no classes</td>
<td>Monday, January 16</td>
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<tr>
<td>End of 100% Tuition Refund</td>
<td>Friday, February 6</td>
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<tr>
<td>Midterm Exam I</td>
<td>Monday, February 23</td>
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<tr>
<td>Last day to drop with no grade reported</td>
<td>Wednesday, March 4</td>
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<tr>
<td>Spring Break</td>
<td>Monday, March 9 to Friday, March 13</td>
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<tr>
<td>Midterm Exam II</td>
<td>Monday, April 13</td>
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<tr>
<td>Final Exam</td>
<td>Thursday, May 7, 12:45 - 2:45 p.m.</td>
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<tr>
<td>Quizzes</td>
<td>various dates, to be determined</td>
</tr>
<tr>
<td>Homework</td>
<td>various date, to be determined</td>
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Exams are written and completed in class without the aid of the textbook,
notes, calculators, or similar materials. The final exam is comprehensive, but
there will be an emphasis on topics studied later in the course.

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. If you have not made arrangements in advance and are absent, then
you will temporarily receive a zero; then, at the end of the semester, I will use
your final exam to determine a representative score for the exams and quizzes
on which you received a temporary zero.
Homework assignments which are not submitted on time will receive a 10 percent penalty. Homework which is not submitted during the class meeting which follows the original due date will not be accepted, and you will receive a score of zero.

**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.

<table>
<thead>
<tr>
<th>Graded Components</th>
<th>Grading Scale</th>
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<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>05%</td>
</tr>
<tr>
<td>Midterm Exams (2)</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
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<table>
<thead>
<tr>
<th>Grading Scale</th>
<th>4.0</th>
<th>90 ≤ x</th>
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<tbody>
<tr>
<td>3.5</td>
<td>84 ≤ x &lt; 90</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>78 ≤ x &lt; 84</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>72 ≤ x &lt; 78</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>66 ≤ x &lt; 72</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>60 ≤ x &lt; 66</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>55 ≤ x &lt; 60</td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>x &lt; 55</td>
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**Homework.** Homework will be assigned on a regular basis. Grading your written work gives me an excellent 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 work for grading.** You must completely and clearly state each problem by either copying the problem statement verbatim 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 a few 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 work for this problem.

You will be penalized if your homework is not legible. I encourage you to learn how to type your solutions and format them using \LaTeX. I would be glad to offer advice and support in acquiring this skill.

**How homework assignments are graded.** A score from 0-10 will be assigned to each graded problem using the criteria above.
completeness  3 points  (measures whether all parts were attempted)
correctness  5 points  (measures accuracy of the solutions)
clarity       2 points  (measures the quality of writing and presentation)

You should earn at least 5 points on each problem for which you have made a solid attempt (3 for completeness—making a solid attempt at each part, 1 for correctness—going beyond restating the problem, 1 for clarity—making it clear that you understand what steps need to be made to make progress towards a 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 65 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 not be constant.

Solutions to some 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.

Quizzes. Short in-class quizzes will given periodically throughout the semester. The purpose of these quizzes is to give you the opportunity to receive graded feedback on work completed under time pressure. Your solution to a quiz problem will receive a score of 0-10 points, similar to how homework problems are graded. You will have the opportunity to re-attempt quiz problems; these second attempts are due at the start of the next class. Your quiz score will then be updated as the average of your original score and your score on the second attempt (if you chose to to make a second attempt). At the end of the semester, your quiz scores will be totaled to determine a quiz grade for the course.

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.