The University of North Carolina at Greensboro
Department of Mathematics and Statistics

Advanced Abstract Algebra MAT 592 Spring 2014 Syllabus

Time and Place TR 11:00–12:15 Petty 007
Instructor Dr. Igor V. Erovenko
Office Petty 106
Office Hours T 12:30–2:00, R 3:30–4:30, and by appointment
E-mail igor@uncg.edu

Prerequisites Grade of at least C in MAT 516.

For Whom Planned This course is intended for first year graduate students and advanced undergraduate students. The sequence 591–592 leads towards the PhD qualifying examination in algebra.

Catalog Description Groups: homomorphisms, quotient groups, products of groups, Sylow theorems, finitely generated abelian groups. Rings: homomorphisms, ideals, quotient rings, integral domains, Euclidean domains, factorization. Fields: algebraic extensions of fields, Galois theory.

Student Learning Outcomes Upon successful completion of this course, students will be able to:

- *Define* various notions associated with rings and fields;
- *give examples* of Euclidean domains, principal ideal domains, unique factorization domains, normal and separable extensions of fields;
- *compute* Galois groups of polynomials;
- *compare* and *contrast* normal and non-normal field extensions, separable and inseparable field extensions, algebraic and non-algebraic field extensions;
- *combine* different methods to prove insolvability of the quintic;
- *categorize* factorization properties in commutative rings;
- *support* and *justify* statements with rigorous mathematical arguments.

Teaching Methods and Assignments for Achieving Learning Outcomes The course material will be presented via traditional lectures. Achievement of learning outcomes will be facilitated via

- weekly homework assignments;
- tests and a comprehensive final examination.

Evaluation and Grading The following weight distribution is going to be used to determine your final grades:

Homework	40%
Tests	30% (two at 15% each)
Final Exam	30%

The following grading scale will be used to determine the final letter grades for undergraduate students:

A+	97–100	B+	87–89	C+	77–79	D+	67–69		
A	93–96	B	83–86	C	73–76	D	63–66	F	below 60
A–	90–92	B–	80–82	C–	70–72	D–	60–62		

The following grading scale will be used to determine the final letter grades for graduate students:

		B+	87–89	C+	77–79		
A	93–100	B	83–86	C	70–76	F	below 70
A–	90–92	B–	80–82				

Required Texts The following book is required and will be used as a reference text:

- David S. Dummit and Richard M. Foote, *Abstract Algebra,* 3rd edition, Wiley, 2003.

The following books are recommended for supplementary reading:

- Nathan Jacobson, *Basic Algebra I,* 2nd edition, Dover Publications, 2009;
- Joseph J. Rotman, *Advanced Abstract Algebra,* 2nd edition, American Mathematical Society, 2010;
- Thomas W. Hungerford, *Algebra,* Springer, 1980;
- Serge Lang, *Algebra,* 3rd edition, Springer, 2002.

Topical Outline/Calendar Below is a tentative calendar for the course. Test markers indicate topic cut offs rather than actual test dates.

Week	Material Covered
1	Euclidean domains.
2	Principal ideal domains; unique factorization domains.
3	Polynomial rings.
4	Factorization in polynomial rings; irreducible polynomials. **Test 1**
5	Extensions of fields.
6	Algebraic extensions.
7	Splitting fields; algebraic closure; normal extensions.
8	Separable extensions; field automorphisms.
9	Galois extensions.
10	The Fundamental Theorem of Galois Theory. **Test 2**
11	Finite fields; composite extensions and simple extensions.
12	The fundamental theorem of algebra; cyclotomic extensions.
13	Cyclic extensions; Galois groups of polynomials.
14	Solvable and radical extensions, insolvability of the quintic.

Academic Integrity Policy Students are expected to adhere to the UNCG *Academic Integrity Policy* available at `http://academicintegrity.uncg.edu`. You are allowed to collaborate on homework assignments, but you are required to *write down the solution in your own words* and to properly acknowledge the sources of your ideas. You are not allowed to collaborate on tests!

Attendance Policy Regular class attendance is mandatory. Two consecutive absences or four total absences during the semester may result in student being dropped from the course. Any student who is more than 5 minutes late for class or leaves early is counted as absent. If you miss a class you are responsible for the material covered and for any assignments made. Due date of work is not different if you have been absent.

Final Examination There will be a comprehensive final examination on Thursday, May 1, 12:00–3:00 pm.