

Course Syllabus  
**Math 6413-01: Advanced Modern Algebra I**  
Summer Semester, 2015  
University of West Georgia

**Instructor:** Dr. David G. Robinson, Hum #221, 678-839-4137  
E-Mail: [davidr@westga.edu](mailto:davidr@westga.edu)  
Office Hours (Hum. #221): T, TH 10:30 - 11 a.m., 1:30 - 2 p.m., or by appt.

**Class Meetings:** T, TH 11 a.m. – 1:30 p.m., Boyd #304  
These will consist of a combination of lectures, question-and-answer sessions, problem presentations, and general discussions. All reading will be assigned in advance of the meeting thereon (see attached schedule.)

**Text/Resources:** Clark, Allan, *Elements of Abstract Algebra*, Dover Publ., Inc., NY, 1984 (pb.)

**Prerequisites:** Undergraduate courses in number theory, linear algebra, and abstract algebra,

**Course Description:** An in-depth study of the *theory of groups*.

**Topics:** *Review of set theory* (Ch.1 - §1 - 19): Sets, subsets, Boolean algebra, set equivalence (cardinality), products of sets; relations, mappings and mapping terminology, function composition and inversion; equivalence relations, partial orders, lattices.

*Review of number theory* (Ch.1 - §20 - 25): Mathematical induction, division algorithm, divisors, GCD's, LCM's, Euclid's algorithm, primes and prime factorization (Fundamental Theorem of Arithmetic), modular congruence arithmetic, residue classes, relatively prime integers, inverses mod  $n$ , Euler's phi function.

*Group Theory* (Intro. and Ch.2 - §26 - 86):

Group axioms and terminology, group tables, products of groups (§26 - 29)

Classical examples of groups (§30 - 34)

Subgroups, cosets and Lagrange's Theorem (§35 - 40)

Cyclic groups (§41 - 44)

Conjugation, normal subgroups and quotient groups (§45 - 49)

Center and Class Equation of a group (§50 - 51)

Prime power groups, Cauchy's theorem and Sylow's theorems (§52 - 59)

Group homomorphism, isomorphism and automorphism (§60 - 64)

Isomorphism theorems (§65 - 70)

Normal and composition series, Jordan-Holder theorem, (§71 - 73)

Simple groups and solvable groups (§74 - 75)

Symmetric groups, cycle decomposition, even and odd permutations (§76 - 82)

Simplicity of  $A_n$ , unsolvability of  $S_n$  for  $n > 4$ , transitive subgroups (§83 - 86)

*Miscellaneous topics* (Intro and other sources): Cubic and quartic formulas, Fundamental Theorem of Algebra, Semigroups, quasigroups, lattice of subgroups of a group, Fundamental Theorem of Abelian Groups

**General Objectives:** Besides developing your understanding of the topics mentioned above, there are some general skills you should improve upon along the way in order to be able to apply what you learn in this course to future courses of study. These include:

- use of mathematical terminology and notation
- mathematical abstraction
- mathematical problem-solving techniques
- mathematical proof techniques (induction, contradiction, double-counting, etc.)
- writing skills – both formal and informal

**Evaluation Procedures:** Your understanding of the subject material and your progress toward the aforementioned objectives will be evaluated on the basis of your graded *homework*, your performance on the *final exam*, and your *class participation* (attendance, preparedness and contributions.)

**Evaluation Criteria:** Grades on all work will be based upon

- accuracy of information (including calculations and use of mathematical notation and terminology)
- depth and breadth of solutions
- logic and clarity of arguments
- neatness and clarity of presentation
- correctness of grammar and spelling
- thoroughness and timeliness of work
- intellectual honesty and creativity
- achievement of personal potential
- relative difficulty of the assignment/test

**Grades:** My scale for converting numerical grades (i.e., percentage points) to letter grades will be as follows:

89-100 A, 77-88 B, 65-76 C, 50-64 D, below 50 F

Your final grade will be based on the following distribution of points:

<i>Homework</i>	70 %
<i>Final Exam</i>	20 %
<i>Class participation</i> *	10 %

\*Class participation includes *attendance* as well as *preparedness* and *discussion contributions*.

Missing more than one full class meeting *for any reason* may result in a deduction of 1 point per absence (beyond the first) from the 10 points available.

**Important Policies and Electronic Communication Information:**

- Attendance is important! However, should you find for some reason that you must miss a class meeting, remember that you are still responsible for any and all material you may have missed during your absence.
- *Graded homework assignments* must be turned in at the prescribed times (see attached schedule) in order to be eligible for any credit. *All work on these assignments must be your own, i.e., no help from anyone, without prior permission from the instructor. Failure to abide by this policy will lead to serious consequences: automatic zero on the assignment in question, possible expulsion from the class, etc.*
- *Tests* must be taken at the prescribed times (see attached schedule), except by permission from the instructor. Such permission will be given only under the direst of circumstances (serious illness, e.g.) and *only if your request is granted before the test is over. Otherwise you will receive a score of zero for that test.*
- All electronic correspondence between student and instructor about matters pertaining to this course should be by way of your UWG e-mail account. In particular, all documents for this course may be downloaded from the UWG website by opening the “files” folder for this course in the “myCOURSES” section of the “myUWG” site.