

Course Syllabus
Math 4043-01: Number Theory
Fall Semester, 2018
University of West Georgia

Instructor: Dr. David G. Robinson, Humanities #221, 678-839-4137
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Office Hours: *MWF* 11 – 11:50 a.m., 2 – 2:50 p.m.

Class Meetings: *MWF* 12:05 – 12:55 p.m., Pafford # 204
These will consist of a combination of lectures, question-and-answer sessions, and general discussions. All reading will be assigned in advance of the meeting thereon.

Text/Resources:

Required Text: Leveque, William, Elementary Number Theory, Dover Publications, Inc., NY, 1990

Some good alternative authors of texts on elementary number theory are: David Burton, William Davenport, and G. H. Hardy & E.M. Wright

Prerequisites: Math 3003 (Transitions) and Math 2853 (Elementary Linear Algebra), each with a grade of C or better.

Topics:

- *Foundations* (Ch.1, 2 weeks): Axioms of arithmetic, proof by contradiction, mathematical induction, figurate numbers, binomial coefficients, Fibonacci numbers, division algorithm, radix representation of a number.
- *Divisibility* (Ch. 2, 3.5 weeks): Divisors, greatest common divisor, least common multiple, Euclid's algorithm, prime factorization, relatively prime numbers, linear Diophantine equations, number and sum of divisors functions, perfect numbers, Mersenne primes, Fermat primes, etc.
- *Linear congruences* (3.1 – 3.5; 3.5 weeks): congruence relations, congruence arithmetic, complete residue systems, reduced residue systems, Euler's phi function, linear congruences, Chinese remainder theorem.
- *Polynomial congruences* (3.6 – 3.7; 2 weeks): Polynomial factor theorem, Lagrange's theorem, quadratic residues, quadratic congruences, Wilson's theorem, Euler's criterion.
- *Exponential congruences* (4.1 – 4.3; 2 weeks): Order of an integer modulo n , Fermat's and Euler's theorems, roots of unity, primitive roots, indices.

General Objectives:

Besides developing and deepening your understanding of the topics mentioned above, there are some general areas in which you should develop your skills in order to be able to apply what you learn in this course to future courses of study and future work situations. These are:

- use of mathematical terminology and notation
- mathematical abstraction
- mathematical problem-solving techniques
- proof-techniques and proof-writing
- appreciation of the role played by number theory in mathematics and the sciences

Assignments/Tests:

- *Conjecture Journal*: A written record of at least ten of your *own* well-formulated *number theoretic conjectures*, as they occur to you throughout the semester. Each conjecture must be accompanied by some evidence in its favor, but does not have to be proved or disproved.
- *Problem Sets*: Five sets of problems, some computational and some theoretical, creatively and logically solved/proved and neatly written up, using complete sentences and proper mathematical notation.
- *Discussions* (in class): commentaries, observations, questions, etc., based on the current reading and assignments
- *Midterm and Final Exams* : (See attached schedule for dates.)

Evaluation Procedures and Criteria:

Your understanding of the subject material and your progress toward the aforementioned objectives will be evaluated on the basis of your *oral and written work*, as described above. Grades on all work will be based upon

- accuracy of information (including calculations 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
- 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>Conjecture Journal</i> (two installments)	10 %
<i>Discussion Contributions</i> *	10 %
<i>Problem Sets</i> (10pts. each)	50 %
<i>Midterm Exam</i>	15%
<i>Final Exam</i>	15 %

*This includes attendance: There will be an automatic 1 point deduction for each meeting missed after the third, regardless of the reason for your absence.

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.
- Tests/assignments must be taken/turned in at the prescribed times (see attached schedule) in order to be eligible for any credit. *All work on these tests/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.*
- 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, any documents handed out in class can also be obtained from me via e-mail.
- I assume you will abide by the *UWG Honor Code*. *This means among other things that you will not submit any work for a grade that is not your own work.* Violators of the code will receive no credit for the work in question and, in more serious cases, may be expelled from the course with a grade of 'F'.