

Grove City College, Department of Mathematics
MATH 422 A: Number Theory, Spring 2012

Instructor: Dr. Eric Bancroft

Office: HAL 213B

Office hours: **M** 2-4 p.m.; **T** 10 a.m.-noon; **W** 2-4:30 p.m.; **R** 10 a.m.-12:30 p.m.; **F** 2-3 p.m.

I am also available to meet **by appointment** (you don't need an appointment during regular office hours).

Feel free to stop by my office any time - if I'm not available when you come by then we'll set up another time.

E-mail address: EDBancroft@gcc.edu



Phone: 724-458-3844 (homework questions should be asked in person or via e-mail).

Web page: <http://www2.gcc.edu/dept/math/faculty/BancroftED/>.



Class meeting time and location: MWF 10:00-10:50 a.m. in HAL 111.

Textbook: *Elementary Number Theory* by Gary Thompson.

Prerequisite: MATH 421.

Course Description: *This course is, in part, an application of some of the ideas encountered in Math 421. Various results from the theory of finite groups, particularly results about the structure of finite cyclic groups, will be established and used to prove classical results of elementary number theory. The course will also cover arithmetic functions, the structure of \mathbb{Z}_n^* , special numbers, and additional topics as time allows. One of the additional topics will be a new area known as “dismal arithmetic”,*

Course Objectives / Student Learning Outcomes: Upon completion of the course, the successful student will:

- (1) Understand the underlying mathematical concepts related to the topics listed above, and be able to explain those concepts. Relates to Department Goals 1, 2, and 3. To be assessed through homework and tests.
- (2) Be able to apply these mathematical concepts to solve problems that depend upon an understanding of those concepts, and present solutions to difficult problems in a logically consistent manner with sufficient explanations and rationale for each step in the solution process. Relates to Department Goals 1, 2, and 3. To be assessed through homework and tests.
- (3) Have further developed their ability to think logically and to solve problems, as demonstrated by solving increasingly complex problem sets. Relates to Department Goals 1, 2, and 3. To be assessed through homework, quizzes, and tests.
- (4) Understand how the topics covered in this course can be implemented in a computer algebra system such as Mathematica; be able to type up homework using \LaTeX . Relates to Department Goal 4. To be assessed through homework.

Grading: Final letter grades will assigned as follows:

A+ [98, 100], A [93, 98), A- [90, 93),
B+ [88, 90), B [83, 88), B- [80, 83),
C+ [78, 80), C [73, 78), C- [70, 73),
D+ [68, 70), D [63, 68), D- [60, 63),
F [0, 60)

Note: You should not expect any rounding or curves!

The final grade score is determined as follows:

40% Homework: There will be five collected homework assignments, as well as additional problems given for your edification that will not be collected (but which I still expect you to complete). The assigned homework will contain a mix of theoretical/proof-type and computational problems, but the collected homework will be biased toward problems that emphasize proofs and theoretical concepts. I will grade homework assignments twice: after I grade it the first time you will be able to correct any mistakes and resubmit the corrected homework and get back up to half of the points missed. Assignments will be posted on the web page and may also be announced in class. All homework is due at the end of class on the day indicated in the assignment. Unless you have a **documented emergency** absence, late homework will not be eligible for corrections and homework will not be accepted after the corrections due date.

Tentative due dates for the assignments are: **2/13, 3/5, 3/23, 4/18, 5/2**. Due dates for the corrections will be approximately one week after the assignment due dates.

L^AT_EX and Homework: As an incentive to encourage you to learn the mathematics typesetting system L^AT_EX, you must use L^AT_EX to typeset at least two of your homework assignments. For any additional assignments that you typeset in L^AT_EX, I will give you a bonus of 10% of your final grade on that assignment.

60% Tests and Final Exam: There will be two in-class tests and an in-class final exam. These three grades will be weighted as follows: the highest counts 25%, the lowest counts 15%, the other counts 20%. **No grades will be dropped!** Calculators or other electronic devices will **not** be allowed on the tests and final.

The tests will have a mix of theoretical/proof-type and computational problems, with a bias toward computational problems. Details on missed/make-up tests are below.

The final exam will be comprehensive. All students must take the final. As per college policy, **the final examination time may not be changed to suit the convenience of either instructor or students. Make your travel plans accordingly.**

Test and Final Exam Dates: These dates are predetermined and are as follows:

Test 1: Wednesday, February 29th

Test 2: Monday, April 23rd

Final Exam: Saturday, May 12th, 9-11 a.m.

Make-up Test Policy: Anticipated excused test absences must be brought to my attention in advance of the test date. These include authorized college activities or duties (excused by the Provost's office or its designees) or any other anticipated Provost-excused absence.

Emergency excused test absences must be reported to me as soon as possible, but not more than two days after the return to class. Examples of emergency absences are: illness or injury (certified by the Health and Wellness Center or an attending physician), death of an immediate family member (documented appropriately and notification sent to the Office of Student Life and Learning at studentlife@gcc.edu).

Make-up tests for excused absences will be of the same length and degree of difficulty as the in-class test.

Make-ups for oversleeping, car trouble, or any other excuse not approved by the college: If you miss a test and do not have an approved excuse, you **must** contact me and schedule to **take the make-up test within 24 hours of the end class** on the day the test was given, at my earliest convenience. Otherwise, you will receive a score of zero for the missed test. Make-up tests for unexcused absences may be more difficult than the in-class test. Only one unexcused make-up will be allowed per student. **No unexcused make-ups will be given for the final exam!**

If you miss a make-up and do not have an excused or emergency reason for doing so, then you will receive a score of zero for the test you missed.

Attendance: It is in your best interest to routinely attend class and to be on time, and attendance is expected for the entire scheduled class time. **Attendance will be taken into account in borderline cases when I determine the final grades.** Coming to class late (by more than 5 min) or leaving early will be counted as an absence. Also, any student who is not an active class participant for the full class meeting (i.e., **using technology inappropriately**, sleeping, doing other work in class, talking/socializing, reading the paper, etc.) or is being disruptive or disrespectful will be recorded as absent **and may also be asked to leave** for the remainder of that day. “Good attendance” is defined as having four or fewer unexcused absences. The college reserves the right to withdraw a student who misses more than 25% of the class meetings for any reason(s).

Grade and attendance records: Grades for all assignments and any absences will be posted in myGCC. If you have questions about the grading of any assignment, let me know no later than the second class after it is handed back. **Disputed/incorrect grades or absences must be brought to my attention within 10 days of being posted in myGCC or they will stand as recorded.**

Cheating: Cheating in any form will not be tolerated, and any suspected instances of cheating will be investigated. As a student of Grove City College, you have agreed to abide by the Honesty in Learning policy as outlined in the GCC Bulletin. Additional details regarding what I consider to be cheating in various situations are linked on the class web page. **It is your responsibility be certain about what is or isn't allowed on an assignment before working on it or turning it in, and to ask me if you need clarification.**

Students With Disabilities: Reasonable accommodations will be made for students with verifiable disabilities. Students must first contact the Office of Student Life and Learning at 724-458-2700. Once accommodations have been approved, the student may then contact the instructor if he/she wishes to take advantage of the available accommodations.

Course Schedule: This is a *tentative* schedule of what we will cover each week.

Week 1 (Jan 23-27): Syllabus, introduction, SS1.1, 1.2.

Week 2 (Jan 30 - Feb 3): §§1.3, 1.4.

Week 3 (Feb 6-10): §§1.4, 1.5.

Week 4 (Feb 13-17): §§1.5, 1.6.

Week 5 (Feb 20-24): §§1.7, 2.1.

Week 6 (Feb 27 - Mar 2): §§2.1, 2.2, **test 1**, spring break.

Week 7 (Mar 5-9): §§2.2, 2.3, 2.4.

Week 8 (Mar 12-16): §§2.4, 2.5.

Week 9 (Mar 19-23): §2.6, Dismal arithmetic.

Week 10 (Mar 26-30): Dismal arithmetic, §3.1.

Week 11 (Apr 1-6): Easter recess.

Week 12 (Apr 9-13): Easter recess, §§3.1, 3.2.

Week 13 (Apr 16-20): §§4.1, 4.2, 4.3.

Week 14 (Apr 23-27): **Test 2**, §4.3, select topics from chapters 5, 6, and 7.

Week 15 (Apr 30 - May 4): Select topics from chapters 5, 6, and 7.

Week 16 (May 7-9): Wrap-up and review.