	Time	Location
Lecture	MW 11:25-12:40pm	Eng. 1 Bld. 122

Instructor: Robert Ellis, Assistant Professor of Applied Mathematics

Office Info: Eng. 1 Bldg. Rm. 105C, 567-5336, rellis"aht"math·iit·edu (with appropriate modification)

Office hours: TBA (on course home page)

Appointments and emailed questions are also welcome. I encourage you to request joint appointments so that more people can benefit from the discussion, or simply bring others with you.

Course Home Page: http://math.iit.edu/∼rellis/430S11/ **Assignments posted here, check often!**

Prerequisites: Math 230 or Math 332

Text: *Applied Algebra*, Joseph Gallian, 7th ed., Houghton Mifflin
Textbook supplements are posted at http://www.d.umn.edu/∼jgallian/. We will employ supplementary online exercises including some with the program Group Explorer. The text is excellent, and each section covered must be fully read.

Description. This is a proofs-based course which treats the structure, properties, and relationships of groups, rings, and fields; a substantial amount of number theory is included along the way. Groups are motivated by the study of symmetry, and are employed in subjects such as polyhedral geometry, crystallography, quantum physics, and cryptography. Rings and fields are abstractions of the standard notions of addition and multiplication. This course is a critical bridge to further progress in cryptography, (linear) algebra, topology, and differential geometry, to name a few, as well as a prerequisite for most good graduate schools.

Cooperative Learning. This course requires full participation in group activities including class exercises, group homework, and group quizzes. Mastery of mathematics is not just individual and internal, but also includes the ability to communicate mathematics to others, and to positively contribute to group goals. Thirty percent of the course grade is drawn from group activities: (i) group homework; (ii) participation: class and group participation, and attendance; and (iii) group reading quizzes, randomly occurring throughout the semsester. The two tests and the final (together 70%) verify individual mastery of the course material.

Grade Breakdown. Group homework 10%. Participation (incudes attendance) 10%. Group random reading quizzes 10%. Exam 1, date TBA, 20%. Exam 2, date TBA, 20%. Final, date TBA, 30%. Part of the homework may consist of a group project with presentation, to be determined. The grading scale will be no more strict than A:89-100, B:78-88, C: 67-77, D:56-66.

Group Homework. Weekly group homework assignments typically be due on Wednesdays, with adjustments around exam days and days on which classes do not meet. One paper will be turned in per group. The paper must be accompanied by a signed statement from each group member the he/she participated fully and that each other group member participated fully in the assignment. Full participation means:

(1) To play a major role in solving the problem and communicating the problem to the person writing down the solution,
(2) To write down the solution after hearing the explanation from another group member—not just to copy another group member's written solution, or
(3) To fully discuss the solution with your group members until understanding all steps of the solution.

A written explanation must be attached to the assignment whenever a group member does not fully participate in it. Solutions **may not be sought** from solution manuals or any other pre-written solution (whether printed, web-based, or otherwise). The only persons that may be consulted are your own group members, the instructor, and designated ARC tutors for this course (if any, TBA).

Homework Presentation. Solutions should be presented carefully, and will be graded both on correctness of mathematics and on presentation, including clear, legible, and effective written communication. Write solutions so that a fellow student can understand – an un-annotated sequence of calculations is generally not well communicated mathematics. Homework will be due at the beginning of class on the due date so as not to disrupt the lecture.

Participation. Participation means attendance for the entire class period and full attention and positive contribution to the class components, including group activities, lecture, and discussion. **Class Attendance.** An absence not only lowers your course participation grade, but also deprives your group of your contribution. Chronic absence is not acceptable. Sitting in class while preoccupied with a non-class activity (surfing, texting, etc.) counts as absent. The text is excellent, but prompt and regular class attendance is required, as the group activities, lectures, and discussions are an indispensable means of mastering the material.

Random Group Reading Quizzes. At the beginning of each class, two 6-sided dice will be rolled, and if the result is between 2 and 5 inclusive, a group reading quiz will be given covering the most recent reading assignment (posted on the course homepage). Each group will have until 11:30am to submit one paper. Quiz questions might be short answer, True/False with explanation, or might require basic computations from definitions in the reading. Late arrivals will receive a 0 except for documented IIT activity (at instructor's discretion) or medical/family emergency. We know Chicago has traffic, so that will generally not be an acceptable excuse unless a road is closed or a train/bus canceled.

Exam Components. The exams and final exam will have the following 3-part structure: (i) examples, counterexamples, and definitions; (ii) algorithms, computations, and applications; and (iii) proofs. Typically there will be 1-2 routine proofs and 1-2 proofs of moderate difficulty. Notice will be given if this structure changes.

Topics. We will attempt to cover all material of Chapters 0–18 of the text. If optional material or outside material is included along the way, other material will be omitted. Course Outline:

0. Properties of Integers, Equivalence Relations, and Functions
1. Introduction to Groups
2. Groups
3. Finite Groups
4. Cyclic Groups
5. Isomorphisms
6. External Direct Products
7. Cosets and Lagranges Theorem
8. Normal Subgroups and Factor Groups
9. Group Homomorphisms
10. Fundamental Theorem of Abelian Groups
11. Introduction to Rings
12. Integral Domains
13. Ideals and Factor Rings
14. Ring Homomorphisms
15. Polynomial Rings
16. Factorization of Polynomials
17 Divisibility in Integral Domains

Academic Integrity. The Code of Conduct and applicable penalties in the IIT Student Handbook apply.

Missed Work. Assignments and exams cannot be made up except as approved by the instructor (e.g., due to official IIT activity or documented emergency). An exam missed for an excused reason must be made up promptly upon the student's return, the time frame being at the discretion of the instructor.

Holidays. You are expected to arrange your holiday travel so as not to interfere with your participation in the course.

Disability Assistance. IIT and this instructor are committed to accommodating students with disabilities. Reasonable accommodations will be made for students with documented disabilities. In order to receive accommodations, students must obtain a letter of accommodation from the Center for Disability Resources. The Center for Disability Resources (CDR) is located in Life Sciences Room 218, telephone 312.567.5744 or `disabilities@iit.edu`.