Math 555: Number Theory I – Fall 2008

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Office Hours:	MW 11am-12pm (*subject to change!*) or by appointment
Course Web Page:	http://www.math.utk.edu/~finotti/f08/m555/M555.html
	(Careful with lower and upper case letters!)
Textbook:	K. Ireland and M. Rosen, *A Classical Introduction to Modern Number Theory*, 2nd Ed., 1990, Springer.
Prerequisite:	One year of undergraduate abstract algebra (recommended).
Class:	TTh 11:10am-12:25pm at Ayres 309B. (Section 1.)
Midterm:	10/14 (Tue).
Final:	12/09 (Tues) from 10:15am to 12:15pm.
Grade:	30% for homework, 30% for the midterm, 40% for the final.
	Note the weight of the HWs!

Course Information

This is supposed to be an introductory course in number theory. Very little background will be assumed, but you should be familiar with groups, rings, and fields at the undergraduate level. On the other hand, the course will tailored to the students. Depending on the background of the audience, we will be able to cover more or even different topics. In particular, the knowledge of Galois Theory would be beneficial, but it will not be assumed. Also, some knowledge of basic real and complex analysis will be assumed, again on an undergraduate level, but I will give more details on those if needed.

We will start with very basic topics, such as factorization and congruences. I hope, depending on the audience, to move along those rather quickly, so that we can get to the more interesting parts soon, such as quadratic reciprocity, Gauss and Jacobi sums, equations over finite fields, and zeta function (for varieties over finite fields).

Course Structure

As stated above, I will try to tailor the course to the students. This makes it harder to have a very precise plan, but here is what I hope to cover:

- **Chapter 1**: all sections. (Quickly!)

- **Chapter 2**: all sections. (I will not rush through this chapter, as it contains new material.)

- **Chapter 3**: all sections. (Quickly, except maybe for section 4.)

- **Chapter 4**: all sections. (Not as quickly. Depends on the background of the class.)

- **Chapter 5**: all sections. (From here on, most of the material should be new, and I will slow down.)

- **Chapter 6**: I haven't decided yet. I might skip it or leave it to the end.

- **Chapters 7 and 8**: all sections. (I might go over sections 7.1 and 7.2, which introduces the basics of Finite Fields, quickly if the class have seen it before.)

- **Chapter 9**: Again, I haven't decided yet how to follow here. It is likely that I will leave it to the end, and possibly only cover sections 9.1 to 9.6 (Cubic Reciprocity) and leave the rest (Biquadratic Reciprocity) out.

- **Chapter 10 and 11**: all sections.

This might be too ambitious. I might skip a few sections in between, or just give an overview in some cases. I find it difficult to really choose much here, as the topics are all very interesting to me, and I am eager to cover them all. But I will try to keep my enthusiasm from overloading you, and you should help me with that.

Homeworks

Homeworks will be assigned after every class and will be posted at the section Homework of the course page (address above). No paper copy of the HW assignments will be distributed in class. **It is your responsibility to check the course page often!** Besides HW assignments, other important information will be posted there. (Check the section Important Notes often!)

The HWs will be collected on Thursdays. Each HW will have problems from the previous week (Tuesday and Thursday lectures). The problems to be turned in, as well as due dates, will be clearly posted in the course page. I will suggest a few problems and ask you to turn in two or three problems a week.

It's unlikely I will post solutions, but if you want to see some solution, you can come see me.

In my opinion, doing the HW is one of the most important parts of the learning process, so the weight for them is the same as the weight of the midterm, and I will assume that you will work very hard on them.

Also, you should try to come to my office hours if you are having difficulties with the course. I will do my best to help you. Please try to come during my *scheduled* office hours, but feel free to make an appointment if that would be impossible.

Finally, **it is your responsibility to keep all your graded HWs and Midterms**! It is very important to have them in case there is any problem with your grade. You can check all your scores at Blackboard (`http://online.utk.edu/`). (Blackboard will be used *only for scores*. The official course page is the one given above.)

E-Mails

You will have to check your e-mail at least once a week, preferably daily. I will use your e-mail (given to me by the registrar's office) to make announcements. If that is not your preferred address, write me an e-mail letting me know ASAP. I will assume that any message that I sent via e-mail will be read in a week or less, and it will be considered an *official* communication.

Feedback

I have an *Online Feedback Form* at

$$\text{http://www.math.utk.edu/~finotti/php/feedback.html}$$

where you can anonymously send me your comments and suggestions. I will consider your comments and try to do whatever I can to resolve possible problems before it is too late. So, please, feel free to use it whenever you have any constructive comment or suggestion. (In fact, I would greatly appreciate it.) If you don't want you comments to be anonymous, just send me an e-mail or come by my office and we can discuss the problem.

Additional Bibliography

There are many good books in number theory. Not all cover all the topics covered by our text. The best source of alternative bibliography is Ireland and Rosen's book itself. At the end of each section it gives references to other texts. In any case, here are a few standard books:

- I. Niven, H. Zuckerman, H. Montgomery, *"An Introduction to the Theory of Numbers"*, 5th Ed., 1991, Wiley.

- G. H. Hardy, E. Wright, *"An Introduction to the Theory of Numbers"*, 6th Ed., 2008, Oxford. (A *classic*!)

- H. Davenport, *"The Higher Arithmetic"*, 7th (or 8th) Ed., 2000 (or 2008), Cambridge.

Legal Issues

Conduct. All students should be familiar with and maintain their *Academic Integrity*: from *Hilltopics 2008/2009* (`http://dos.utk.edu/files/hilltopics_08-09.pdf`) pg. 40:

> ### Academic Integrity
>
> *Study, preparation and presentation should involve at all times the student's own work, unless it has been clearly specified that work is to be a team effort. Academic honesty requires that the student present his or her own work in all academic projects, including tests, papers, homework, and class presentation. When incorporating the work of other scholars and writers into a project, the student must accurately cite the source of that work.*

All students should follow the *Honor Statement*: from *Hilltopics 2008/2009*, pg. 11:

> ### Honor Statement
>
> *"An essential feature of The University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."*

You should also be familiar with the *Classroom Behavior Expectations* found at

`http://www.math.utk.edu/Courses/Expectations.pdf`.

Disabilities. Students with disabilities that need special accommodations should contact the *Office of Disability Services* (`http://ods.utk.edu/`) and bring me the appropriate letter/forms.

Sexual Harassment and Discrimination. For *Sexual Harassment* and *Discrimination* information, please visit the *Office of Equity and Diversity* at `http://oed.admin.utk.edu/` and check

`http://oed.admin.utk.edu/docs/complaint_sex_harass.pdf` (Sexual Harassment)

`http://oed.admin.utk.edu/docs/DiscrimCompProc.pdf` (Discrimination)