# ANALYTIC NUMBER THEORY

**Instructor:** Alina Bucur

**Office:** 2-167

**Phone:** x3-4397

**Email:** alina@math.mit.edu

**Office hours:** Check the course webpage.

**Course webpage:** http://www-math.mit.edu/∼alina/18.785/

**Textbooks:** available from MIT Coop, as well as and online booksellers (e.g. Amazon, http://www.quantumbooks.com).

- *Multiplicative Number Theory* by Harold Davenport, 3rd edition, Springer Verlag
- *A Course in Arithmetic* by Jean-Pierre Serre, Springer Verlag

**Pre-requisites:** Complex analysis (18.112), elementary number theory (18.781), undergraduate algebra (18.701 and 18.702). Or, of course, equivalent preparation.

**Homework:** Weekly (more or less) assignments throughout the semester.
*Collaboration policy:* you may (and should) work together on problems, but you must write up solutions individually, and you should indicate on your homework who you were working with. In case of ambiguity, I reserve the right to ask you to defend your solutions individually.

**Exams:** None.

**Grading:** 100% homework.

**Course Content:** The first part of the course will focus on analytic concepts and techniques used in number theory. We'll study the Riemann zeta function and Dirichlet character $L$-functions, as in Davenport. We'll prove the theorem about primes in arithmetic progression and PNT. We'll also derive some cool explicit formulas. Then we'll move on to modular forms and Serre's book. I plan to go rather quickly over the first few chapters (depending on the background of the audience) and then concentrate on Chapter VII. For the last part of the semester, I'd like to discuss some more advanced topics, depending on the interest of the audience. A list of possible topics (though not exhaustive by any means) is:

- automorphic forms on higher rank groups, e.g. GL(3);
- higher level modular forms;
- the adelic point of view;
- anything we might get side-tracked to.