Department of Mathematics
Johns Hopkins University

110.304 Elementary Number Theory Course Syllabus

The following list of topics is considered the core content for the course 110.304 Elementary Number Theory. The current text for the course is:

Text: **Depending on the Instructor, the choice of text is one of:**
- **Number Theory,** *1*st *Edition*, Andrews, G.E., Dover Publications, October 1994, **ISBN-10:** 0486682528, **ISBN-13:** 978-0486682525.
- **An Introduction to the Theory of Numbers,** *5*th *Edition*, Niven, I, Zuckerman, H.S., and Montgomery, H.L., John Wiley & Sons, January 1991, **ISBN-10:** 0471625469**, ISBN-13:** 978-0471625469.
- **A Friendly Introduction to Number Theory,** , *3*rd *Edition*, Silverman, J.H., Prentice Hall, March 2005, **ISBN**-10: 0131861379, **ISBN**-13: 9780131861374

The course provides historical background and explicit examples on topics of current research interest in number theory. Topics are expected to include primes and prime factorization, congruences, Euler's function, quadratic reciprocity, primitive roots, solutions to polynomial congruences (Chevalley's theorem), Diophantine equations including the Pythagorean and Pell equations, Gaussian integers, and Dirichlet's theorem on primes.

Course Topics

- **The principle of mathematical induction.**
- **The notion of divisibility and of prime number. The binomial theorem.**
- **Congruences, solutions of congruences; the Chinese Remainder Theorem.**
- **Basic concepts on groups, rings and fields.**
- **Euler's function, Gauss Quadratic Reciprocity Law.**
- **Primitive roots.**
- **Diophantine Equations.**
- **Gaussian integers, Dirichlet's theorem on primes.**
- **Farey fractions and irrational numbers.**
- **The geometry of numbers.**