

## U430 – NUMBER THEORY (Summer 2008)

- Time:** Mondays, Tuesdays, Wednesdays, Thursdays 3:20 – 5:00 pm  
**Place:** 241 Forsyth  
**Instructor:** Professor Egon Schulte  
469 Lake Hall, 373-5511  
schulte@neu.edu, www.math.neu.edu/~schulte  
**Office hours:** Wednesdays, Thursdays 2:00 – 3:00 pm and by appointment  
**Text:** J.H.Silverman, *A Friendly Introduction to Number Theory*  
(Third Edition), Pearson Prentice Hall, 2006.

### Course Outline

The course covers Chapters 1–27 and 30, 43–44 of the textbook.

- Week of May 5: Ch. 1 – What is Number Theory?  
Ch. 2 – Pythagorean Triples  
Ch. 3 – Pythagorean Triples and the Unit Circle  
Ch. 4 – Sums of Higher Powers and Fermat’s Last Theorem  
Ch. 5 – Divisibility and the Greatest Common Divisor
- Week of May 12: Ch. 6 – Linear Equations and the Greatest Common Divisor  
Ch. 7 – Factorization and the Fundamental Theorem of Arithmetic  
Ch. 8 – Congruences  
Ch. 9 – Congruences, Powers, and Fermat’s Little Theorem  
Ch.10 – Congruences, Powers, and Euler’s Formula
- Week of May 19: Ch.11 – Euler’s Phi Function and the Chinese Remainder Theorem  
Ch.12 – Prime Numbers  
Ch.13 – Counting Primes  
Ch.14 – Mersenne Primes
- Week of May 26: Ch.15 – Mersenne Primes and Perfect Numbers  
Ch.16 – Powers Modulo  $m$  and Successive Squaring  
Ch.17 – Computing  $k^{th}$  Roots Modulo  $m$   
Ch.18 – Powers, Roots, and “Unbreakable Codes”

Week of June 2: Ch.19 – Primality Testing and Carmichael Numbers  
Ch.20 – Euler’s Phi Function and Sums of Divisors  
Ch.21 – Powers Modulo  $p$  and Primitive Roots  
Ch.22 – Primitive Roots and Indices

Week of June 9: Ch.23 – Squares Modulo  $p$   
Ch.24 – Is -1 a Square Modulo  $p$ ? Is 2?  
Ch.25 – Quadratic Reciprocity  
Ch.26 – Which Primes are Sums of Two Squares?

Week of June 16: Ch.27 – Which Numbers are Sums of Two Squares?  
Ch.30 – Pell’s Equation  
Ch.43 – Cubic Curves and Elliptic Curves  
Ch.44 – Elliptic Curves with Few Rational Points

**Grading:** There will be five 45-minute Tests counting 60% in all. Your lowest Test score will be dropped, so only the highest four scores will count. There are no make-ups. The two-hour Final Exam will count 40%, or 50% if it helps your grade (in this case the Test scores are counted proportionally).

**Final Exam: Tuesday, June 24, 2008 at 1:00 pm.** All students without legitimate conflicts must take the final exam at the scheduled time. Contact the Registrar if you have a time conflict or three finals in one day.

**Attendance Policy:** Your regular attendance is expected. It is your responsibility to know assignments and other class information including any changes to the syllabus the instructor may make as they are announced in class. Students are responsible to know about all information given, even when they are absent. Feel free to use e-mail to ask me.

**To Talk to Someone Else:** If you have a concern about the course or the instructor that cannot be resolved by speaking to the instructor, the next step is to speak with the Undergraduate Director, Professor Martsinkovsky (471 Lake Hall, x5510, alexmart@neu.edu).

**Academic Honesty** from Student Code of Conduct: see

*<http://www.northeastern.edu/osccr/academichonesty.html>*

*“A necessary prerequisite to the attainment of the goals of the University is maintaining complete honesty in all academic work. Students are expected to present as their own only that which is clearly their own work in tests and in any material submitted for credit. Students may not assist others in presenting work that is not their own. .... Offenders are subject to disciplinary action.”*

**Changing grades, Incompletes:** It is University policy that no grade, including an Incomplete, may be changed after one year. Exceptions must be authorized by the Academic Standing Committee. Note that an “Incomplete” grade request requires a written understanding (contract) between the Instructor and student with details about what material will be made up and how. They are normally appropriate only for a student who is doing well, but becomes ill, or has a family emergency late in the semester.