MATH 4993 – Topics in Finite Fields

Northeastern University, Fall 2014

Instructor: Neranga Fernando, Ph.D.

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Office hours: MWR 12pm - 1pm, or by appointment.

Meeting times and location: MR 6 pm – 7.15 pm at NI 535.

Course Objectives: To learn the fundamentals of finite fields.

References:

R. Lidl and H. Niederreiter, Introduction to finite fields and their applications, Cambridge ; New York : Cambridge University Press, 1994.
R. Lidl and H. Niederreiter, Finite Fields, 2nd ed. Encyclopedia of Mathematics and its Applications, 20. Cambridge University Press, Cambridge, 1997.

Homework: Homework will be assigned, but will not be collected for grading.

Assignments: Three take-home assignments will be given on October 2, November 3, and December 1. Knowledge of a mathematical software (Mathematica, Matlab, or Maple) will be required.

Grading: The course grade will be determined as follows.

Assignments: 60%
Research project and end of semester presentation: 40%

Letter grades are determined numerically:

A > 92 , 92 >= A- > 89, 89 >= B+ > 86, 86 >= B > 82, 82 >= B- > 79, 79 >= C+ > 76,

76 >= C > 72, 72 >= C- > 69, 69 >= D+ > 66, 66 >= D > 62, 62 >= D- > 59, F =< 59

Schedule of Topics

Algebraic Foundations

- Group Theory
- Rings and Fields
- Polynomials
- Vector Spaces

Finite fields

- Introduction
- Extension fields
- Trace and Norm
- Bases

Exponential sums

- Characters
- Gaussian Sums
- Jacobi Sums

Linearized polynomials over finite fields

Permutation polynomials over finite fields

- Introduction
- Criteria for permutation polynomials
- Complete mappings
- Dickson polynomials
- Polynomial $g_{n,q}$

Research Project