

# Course Proposal Math 585: Introduction to Coding Theory and Design Theory

## **Rationale**

As part of the revision of the undergraduate mathematics major, a new Applied Discrete Mathematics track is being developed. This new course would be part of this track.

## **Course objectives**

Coding theory and design theory are important topics at the crossroads of mathematics, statistics, electrical engineering, and computer science. Codes and designs are applied, among others, in telecommunication (cell phones, data modems, internet connections), compact discs, statistical experiments, and linear regression models.

Coding theory and design theory are closely related. Designs are used to construct efficient error-correcting codes and, conversely, codes associated with designs are used to tackle some of the most difficult problems in design theory.

The objective of the course is to acquaint the students with the basic notions and with some applications of these important areas of applied mathematics.

## **Syllabus**

Basic concepts of error-correcting codes (one week)

Perfect codes, Hamming and Golay codes (two weeks)  
Linear codes and cyclic codes, BCH codes (two weeks)  
Balanced incomplete block designs, finite projective geometries, Latin squares  
(two weeks)  
Reed-Muller codes (one week)  
Applications of codes and designs (two weeks)

## **Textbook**

Raymond Hill, A First Course in Coding Theory, Oxford University Press, 1986.

## **Grading scheme**

Two midterms for 100 points each; final 200 points; homework 50 points.  
Total: 450 points.