

INSTITUTE OF MATHEMATICS  
College of Science  
University of the Philippines Diliman

**Math 197 (Special Topics)**  
**Introduction to the Theory of Error Correcting Codes**  
**Course Syllabus**

**A. Course Catalogue Description**

Course Number	Math 197
Course Title	Introduction to the Theory of Error Correcting Codes
Course Description	An introductory course to the theory of error-correcting codes. This includes the basic concepts on codes, linear codes, encoding, decoding, distance, duality, different families of codes and their properties, among others.
Prerequisite	Math 110.2/equiv or COI
Course Credit	3 units

**B. Course Content**

- I. Finite Fields
  - i. Review of fields
  - ii. Polynomial rings
  - iii. Structure of finite fields
  - iv. Vector spaces over finite fields
- II. Error detection, encoding and decoding
  - i. Communication channels
  - ii. Maximum likelihood decoding
  - iii. Hamming distance
  - iv. Nearest neighbor/minimum distance decoding
  - v. Distance of a code
- III. Linear codes
  - i. Definition of linear codes, parameters
  - ii. The dual of a linear code
  - iii. Generator matrix and parity check matrix
  - iv. Equivalence of codes
  - v. Encoding and decoding with linear codes
  - vi. Syndrome decoding
- IV. Some known linear codes
  - i. Constructing new codes from old
  - ii. Hamming codes
  - iii. Golay codes
  - iv. Reed-Muller codes
- V. Bounds on the size of a code
  - i. The main coding theory problem
  - ii. Sphere packing bound and perfect codes
  - iii. Gilbert-Varshamov bound
  - iv. Singleton bound and MDS codes
  - v. Griesmer bound
- VI. Cyclic codes
  - i. Definition and properties of cyclic codes
  - ii. Generator polynomial
  - iii. Generator and parity check matrices of cyclic codes