

Brock University
Department of Computer Science
COSC 5P01 – Coding Theory
Fall 2017

Instructor:

Sheridan Houghten, J313

Course Description:

This course examines concepts, problems and applications of error-correcting codes.

Textbook:

There is no required textbook for this course. We will use material from various books and other sources. The following books will be on reserve in the library:

- Introduction to the Theory of Error-Correcting Codes, Vera Pless, Wiley & Sons (several editions exist).
- Introduction to Coding Theory, Ron M. Roth, Cambridge University Press, 2006.
- Fundamentals of Error-Correcting Codes, W.Cary Huffman and Vera Pless, Cambridge University Press, 2003.

Note that a number of relevant electronic resources are also available from the library.

Mark Distribution:

- Assignments: 20%
- Class Presentation: 15%
- Exam (Oral): 30%
- Project: 35%

Tentative Outline:

- Introduction: communication, redundancy, codes, distance, encoding/decoding
- Distance metrics: Hamming, edit, insertion-deletion, etc.
- Linear codes: generator matrices, weight, syndrome decoding, sphere packing bound, dual codes, families of linear codes and their constructions.
- Non-linear codes: bounds, optimal codes, constructions to improve bounds, families and examples of non-linear codes.
- Searches for codes, including how equivalence can be used.
- Optional topics: exact topics and depth will be chosen according to student interest, but some of the following will be included: cyclic codes, BCH codes, LDPC codes, applications to bioinformatics, applications to complexity theory.

Important Dates:

- Last date for withdrawal without academic penalty: Tuesday November 7th, 2017.

Course Policies:

Illness: If you miss an assignment or other piece of work due to illness, you must submit a student medical certificate (<http://www.cosc.brocku.ca/forms/medical>) *within 3 days of the illness*, at the main office in the Computer Science department.

Plagiarism: The department views plagiarism as a serious issue. Students may visit <http://www.cosc.brocku.ca/about/policies/plagiarism> to view the department's policies on plagiarism. Plagiarism detection software may be used in this course.

Assignments:

- Assignments must be completed individually.
- Due dates for assignments will be printed on the assignment text. No late assignments will be accepted except in the case of extreme circumstances; see above course policy concerning illness.
- *Assignments must be submitted both as hard copies AND electronically.*
- Hard copies of all assignments must be submitted to the instructor in an envelope with an attached, signed cover page. To generate the cover page, visit <http://www.cosc.brocku.ca/forms/cover>.
- Instructions on electronic submission will be provided on the assignment text.

Class Presentations: All students will choose one advanced topic to teach to their fellow students. The student should plan to use an entire class (60-75 minutes) to teach this topic. The topic is to be chosen in consultation with the instructor. The class presentation schedule will be determined by the instructor according to topic.

Exam: The exam will cover all class material including presentations by students. It will be an oral exam to be booked on an individual basis, either on the last day of class or after classes are finished.

Project: Students will complete a project (which includes complete documentation) on an advanced topic related to coding theory. Topics must be approved by the instructor. Students must submit a written proposal to the instructor; the instructor will consider approval based on this written proposal. The project may extend the topic chosen by the student for their class presentation or may be on a different topic, as desired.