ELEC 405 – Error Control Coding

Term – Spring 2017

Instructor: Mr. Mostafa Esmaeili
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Office Hours
Days: Tuesday
Time: 11:30 - 1:30
Location: ELW A324

Course Objectives
The channel coding problem; Error control in data storage and transmission systems; Groups, rings and fields; Irreducible and primitive polynomials; Vector spaces and matrices; Linear block codes: generator and parity check matrices; Hamming codes and the Hamming bound; Coding bounds and dual codes; Syndrome decoding; Polynomial rings and cyclic codes; Encoding and decoding of cyclic codes; BCH and Reed-Solomon codes; Convolutional codes and the Viterbi algorithm.

Learning Outcomes
By the end of this course, students will be able to:
Explain the need for error correction in data communication and storage systems.
Apply mathematical tools from group and finite field theory in the design of codes.
Describe the fundamental limits of error correction.
Demonstrate the decoding of block codes including cyclic codes.
Explain the operation of a convolutional encoder.
Apply the Viterbi algorithm to decode a convolutional code.

Syllabus
- Course introduction; The channel coding problem.
- Vector spaces; Linear block codes.
- Groups, rings and fields; Primitive and irreducible polynomials.
- Polynomial rings and cyclic codes.
- BCH and Reed-Solomon codes.
- Convolutional codes and the Viterbi algorithm.

A-Section(s) for ELEC 405: A01 / CRN 21171, A02 / CRN 21172
Days: Tuesday, Wednesday, Friday
Time: 10:30 - 11:20
Location: ECS 108

Required Text
Title: Error Control Systems for Digital Communication and Storage
Author: Stephen Wicker
Publisher: Prentice Hall, Englewood Cliffs, NJ.
Year: 1995
Assessment:
Assignments: 30%  Due Dates: Will be announced during lectures.
Mid-term: 20%  Date: Friday, February 24, 2017.
Final Exam: 50%

Note:
The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

There will be no supplemental examination for this course.

Note to students: Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair’s Secretary to set up an appointment.

Accommodation of Religious Observance: http://web.uvic.ca/calendar2017-01/general/policies.html

Policy on Inclusivity and Diversity: http://web.uvic.ca/calendar2017-01/general/policies.html

Standards of Professional Behaviour: You are advised to read the Faculty of Engineering document Standards for Professional Behaviour, which contains important information regarding conduct in courses, labs, and in the general use of facilities. https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the entry in the current Undergraduate Calendar for the UVic policy on academic integrity. http://web.uvic.ca/calendar2017-01/undergrad/info/regulations/academic-integrity.html

Equality: This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Resource Centre for Students with a Disability located in the Campus Services Building. The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

Course Lecture Notes: Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.