ELEC4150 Information Theory and Error-Correcting Codes

Course Description

Communication and information theory; self and mutual information measures; channel models and capacity; source coding; hamming codes; cyclic codes; BCH and Reed-Solomon codes; convolutional codes and the Viterbi algorithm; burst error correction; Turbo coding.
Prerequisite(s): ELEC 2100

List of Topics

1. Overview & Introduction
2. Linear Block Codes
3. Abstract Algebra
4. Cyclic Codes
5. Well-Known Block Codes
6. Convolutional Codes
7. Basic Information Theory

Statement of Objectives/Outcomes:

Upon the completion of this course, students will acquire:

CO1 - an ability to apply knowledge of discrete mathematics, probability, and the coding principle to solve communication/storage system design problems

CO2 - an ability to use a coding/information theoretic approach to formulate communication/storage system design problems

CO3 - an ability to recognise and understand common coding related terminology in technical document and specifications.

CO4 - an ability to conduct a presentation and/or complete a course project through teamwork.

CO5 - an ability to use software tools to simulate coding schemes and evaluate them based on theoretical bounds and practical system performance measure.

Textbooks and References:

1. L. H. Charles Lee, *Error-Control Block Codes for Communications Engineers,* Artech House, 2000.
2. J. C. Moreira and P. G. Farrel, *Essentials of Error-Control Coding,* Wiley, 2006.
3. William E. Ryan and Shu Lin, *Channel codes: Classical and Modern*, Cambridge University Press, 2009.
4. Ranjan Bose, *Information Theory, Coding and Cyptography*, Tata McGraw-Hill, 2nd Edition, 2008.
5. Bernard Sklar, *Digital Communications: Fundamentals and Applications,* Prentice Hall, 2nd Edition, 2001.
6. Roger E. Ziemer and Roger L. Peterson, *Introduction to Digital Communication*, 2nd Edition, 2001.

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

Homework	20%
Project	30%
Midterm	20%
Final Exam	30%