

ENG EC 561 Error-Control Codes

2007-2008 Catalog Data:

Introduction to codes for detection and correction of errors, linear algebra over finite fields, bounds on sizes of optimal codes, perfect and quasi-perfect codes, analysis of probabilities of error detection and error correction, Hamming, BCH, Reed-Solomon codes, nonlinear codes for error detection, arithmetical codes, robust codes, introduction to application of codes for communication channels, for reliable memories, fault-tolerant computing, reliable interconnection networks, reliable and secure cryptographic devices.

Status in the Curriculum: Elective

Class/Lab Schedule:

Lecture: 4 hours/week

Laboratory: 2 hours/week

Textbooks and other required materials:

(Required) Mark Karpovsky, Lecture Notes, <http://mark.bu.edu/teaching/sc561>

(Complimentary) Coding Theory,. A First Course, San Ling and Chaoping Xing (ISBN-0 521 82191), 2004, Cambridge University Press.

Reference:

A First Course in Coding Theory (ISBN- 0 19 853804-9), Clarendon Press, Oxford

Coordinator:

Mark Karpovsky, ECE

Prerequisites by topic:

CAS MA 193

Goals:

Teach principles of linear algebra over finite fields

Teach design principles for codes for detection and correction of errors

Teach techniques for application of error control codes for design of reliable and secure computer hardware components, memories, communication systems, interconnection networks and cryptographic devices.

Course Outcomes:

1. Understand principles and tradeoffs in design and analysis of error detecting and error correcting codes
2. Understand principles of application of error detecting codes and error correcting codes in design of reliable and secure communication systems, computer components, computer interconnection networks and cryptographic devices
3. Be able to use the codes for design of reliable and secure computer/communication systems with on-line and off-line error detection/correction

Course Outcomes mapped to Program Outcomes:

	a	b	c	d	e	f	g	h	i	j	k
Program Outcomes	a	b	c	d	e	f	g	h	i	j	K
Course Outcomes	1,2	3	1,2,3	3	1,2,3	1,2,3	2,3	2,3	1-3	3	3
Emphasis (1-5)	5	3	5	3	5	4	4	4			

1=not at all; 5=a great deal;

Topics in Project Assignments:

Students will choose projects that synthesize their experience and learnings in the earlier part of the course. Projects will involve reprogramming of sensor network nodes and will focus on either (a) refinement of concepts for individual system components (e.g., implementing a new routing protocol) or (b) end-to-end application development (e.g., designing and implementing a reliable peer-to-peer delivery service).

Contribution of Course to Meeting the Professional Component:

Engineering topics: 70%

Math & Basic Science: 30%

General Education: 0%

Prepared by: Mark Karpovsky

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