

Tentative Syllabus and Schedule

The following is the tentative lecture-by-lecture syllabus for the course. Readings are drawn from Roth, *Introduction to Coding Theory*, McEliece, *Finite fields for Computer Scientists and Engineers* (find at Google books), and Ryan and Lin *Channel Codes: Classic and Modern* (chapters will be handed out). Respectively, readings are denoted “RX”, “MX”, and “RLX” where X = chapter number (or “A” for appendix). In the “out” and “due” columns, problem sets are denoted as “PSX” and mini-projects as “MPX”.

#	Date	Day	read	out	due	Topics
1	9/2	W	R1			course intro
2	9/9	W	R1	PS1		basic defs, channel capacity
3	9/14	M	R1,A			error-correction capability, groups, fields
4	9/16	W	R2	PS2	PS1	vector spaces, linear codes
5	9/21	M	R2			generator matrix, wt enumerator, dual code
6	9/23	W	R2	PS3	PS2	parity-check, Dmin via H, binary Hamming codes
7	9/28	M	R2			equiv classes, cosets, syndromes
8	9/30	W	R4	MP1	PS3	Hamming, Gilbert, Singleton Bounds, MDS codes
9	10/6	M	RA			RS are MSD codes, rings, integral domains, GCDs
10	10/8	W	M1,2	PS4		Euclidean domains, Euclid’s algorithm, ring E/m
11	10/12	M	M3,R2			factorization in E, constructing finite fields
12	10/14	W	R2	PS5	PS4	GF(8), primitive elements, facts about finite fields
13	10/19	M	R5		MP1	Vandermonde matrices, Generalized RS codes
14	10/21	W	R5	PS6	PS5	polynomial interp, cyclic RS codes, encoding RS
15	10/26	M	R6			decoding GRS, err. locator & eval. polys., key eqns.
16	10/28	W	R6	PS7	PS6	unique soln. of key eqns., eff. sol via ext. Euclid’s
17	11/2	M				new codes from old, Reed-Muller, concat., product
18	11/4	W	R7	MP2	PS7	properties of product codes, minimal polynomials
19	11/9	M	R7			minimal polynomials, conjugacy
	11/11	W				NO CLASS b/c of midterm
	11/12	R				midterm
20	11/16	M	R8			cyclic codes, generator polynomials
21	11/18	W	RL4	PS8		parity-check for cyclic codes, BCH codes
22	11/23	M	RL4			BCH bound, code construction, convolutional codes
23	11/25	W	RL4	PS9	PS8 MP2	state diagrams, trellis diagrams, introduction to decoding on trellises
24	11/30	M	RL5	MP3		Viterbi decoding: BSC, memoryless, AWGN
25	12/2	W	RL5		PS9	BI-AWGN, project recap, factor graph of [7, 4] code
26	12/7	M	RL5			MAP, counting & margin. by msg-passing
27	12/9	W	RL5			marginalization by msg-passing, sum-product
28	12/14	M			MP3	LDPC and Turbo codes, course wrap-up