MICHIGAN STATE UNIVERSITY
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

ECE 864: DETECTION AND ESTIMATION THEORY

Spring Semester, 2002

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Office Hours:

Web Page: **www.egr.msu.edu/classes/ece864**

Required Lecture Notes: Published on course web site

Optional Textbooks:
M.D. Srinath, P.K. Rajasekaran, and R. Viswanathan, *Statistical Signal Processing with Applications*, Prentice-Hall, 2000. (elementary)
H. Vincent Poor, *An Introduction to Signal Detection and Estimation*, Springer-Verlag, 1988 (1st ed.), 1994 (2d ed.).

Selected References:
M. Barkat, *Signal Detection and Estimation*, Artech House, 1991.
J.P. Egan, *Signal Detection and ROC Analysis*, Academic Press, 1975.
S. Haykin, *Adaptive Filter Theory* (3d ed.), Prentice-Hall, 1996.
S.M. Kay, *Fundamentals,of Statistical Signal Processing*, Vol. I: Estimation, Vol. II: Detection, Prentice-Hall, 1998.
J.M. Mendel, *Lessons in Estimation Theory ...*, Prentice-Hall, 1996.
B. Porat, *Digital Processing of Random Signals*, Prentice-Hall, 1994.
I. Selin, *Detection Theory*, Princeton U. Press, 1965.
Louis L. Scharf, *Statistical Signal Processing: Detection, Estimation, and Time-Series Analysis*, Addison-Wesley, 1991.
H.L. Van Trees, *Detection, Estimation, and Modulation Theory – Part I*, Wiley, 1968.

Course Outline and Schedule & Assignment Chart: Following page.

Examinations & Grading:

Midterm exam	30 points
Homework & class discussions	25 points
Mini-project & presentation	15 points
Final exam	30 points

Course grade will be based on a curve of total points received. A total of 90+ points is guaranteed to result in a 4.0 grade, 83+ in at least a 3.5, but the curve could be even more "favorable."

Notes on Grading & Exams:

1. INCOMPLETE (I) grades will be given only in unusual cases of illness or other personal emergency which causes the student to miss a significant amount of the course. It is university policy that this grade cannot be given for any other reason. Similarly, DEFERRED (DF) grades may only be given in the case that the instructor and student agree that a significant learning benefit would be obtained by allowing extra time to complete the requirements of the course. In this course, the only likely reason for the DF grade is the rare case in which the student requests more time to pursue the project in much greater depth than the assignment requires, and the instructor agrees that a learning benefit would result from such an extension.

2. Exam formats and material coverage to be described in class.

3. Exam dates are scheduled on the following page. These will are not likely to change.

ECE 864 – COURSE TOPIC & READING SCHEDULE – Spring Semester, 2002

Last updated: 01/04/02

(HW SCHEDULE TO APPEAR ON COURSE WEB SITE)
(TABLE OF CONTENTS FOR LEC. NOTES AVAILABLE ON WEB SITE)

WEEK OF	CLASS	TOPIC(S)	READING (SRV)
Week of Jan. 7	#1	*Organizational Mtg.*	
	#2	ELEMENTS OF DET'N THEORY Bayesian (simple hyp.), MAP, Min. P_e	3.1 – p. 49
Week of Jan. 13	#1	(continued)	
	#2	Minimax	3.3.2
Week of Jan. 21	#1	*Martin Luther King Day observed – No class*	
	#2	(continued)	
Week of Jan. 28	#1	Neyman-Pearson, CFAR	3.3.3 & 3.8
	#2	(continued), Multiple hypotheses (see HW)	3.5
Week of Feb. 4	#1	*Problem discussion*	
	#2	Composite hyp.	3.6
Week of Feb. 11	#1	Asymp. error rates	3.7
	#2	Seq'l. det'n.	3.9
Week of Feb. 18	#1	SIGNAL DETECTION Independent noise cases (bin. decision)	4.1-4.2
	#2	General Gaussian noise cases (bin. decision)	4.3
Week of Feb. 25	#1	General matched filter problem	4.4
	#2	(continued)	
Week of Mar. 4		*Spring Break – No classes*	
Week of Mar. 11	#1	Signals w/ unknown param's. in noise	4.6
	#2	Stochastic signals in noise	
Week of Mar. 18	#1	*Problem discussion & review*	
	#2	*Midterm Exam*	
Week of Mar. 25	#1	ELEMENTS OF PARAMETER ESTIMATION Bayesian incl. linear & nonlin. LMSE	5.1-5.3
	#2	Deterministic param's (Structural approach, MLE)	5.4-5.5
Week of Apr. 1	#1	(continued)	
	#2	EST'N OF SIGNAL PARAM'S IN NOISE Linear estimation	
Week of Apr. 8	#1	Nonlinear estimation	
	#2	*Problem discussions*	
Week of Apr. 15	#1	WAVEFORM EST'N Wiener filters	6.1-6.3
	#2	(continued)	
Week of Apr. 22	#1	Kalman filters	6.4-6.5
	#2	(continued)	
Week of Apr. 29		*Final Exam: Wed., May 1, 5:45 - 7:45 p.m.*	