ENEE 621 Detection and Estimation Theory

SYLLABUS (Spring 2005)

Course Description: This is a graduate course that covers the fundamentals of detection and estimation theory for statistical signal processing applications: theory of hypothesis testing (binary, multiple, and composite hypotheses, and Bayesian, Neyman-Pearson, and minimax approaches); theory of signal detection (discrete- and continuous-time signals, and deterministic and random signals); theory of estimation (signal and parameter); Bayesian, minimum-variance unbiased, maximum-likelihood, least squares, and maximum a posteriori approaches); estimator properties and bounds; linear time-invariant and time-variant estimators (Wiener and Kalman filters). The goal of this course is to provide the student with the tools to understand, analyze, and design detection and estimation algorithms and systems.
Prerequisites: ENEE 620, ENEE 601, or permission of instructor.

Topics:

I. Detection Theory
   - Binary, M-ary, and composite hypothesis testing
   - Detection of known signals in noise
   - Detection of signals with random parameters
   - Sequential, minimax, non-parametric, and robust detection

II. Estimation Theory
   - Fundamentals of estimation
   - Parameter estimation
   - Properties of estimators
   - Wiener and Kalman filtering

Texts: S. M. Kay, *Fundamentals of Statistical Signal Processing: Estimation Theory*, Vol. 1, Prentice-Hall, 1993, ISBN 0-13-345711-7. *Required*

S. M. Kay, *Fundamentals of Statistical Signal Processing: Detection Theory*, Vol. II, Prentice-Hall, 1998, ISBN 0-13-504135-X. *Required*

Grading:

Hmwk	~ 20%
Exams/Projects	~ 40%
Final	~ 40%

Class Meetings: MW 4 – 5:15pm PHYS 107

Office Hours: TBD, or by appointment, ITE 308 or TRC 255

Instructor: Prof. Joel M. Morris, PhD, TRC 255, (410) 455-3503/6500(fax), *morris@umbc.edu*