

University of Massachusetts Lowell

Electrical and Computer Engineering

**16.687 Applied Stochastic Estimation
Spring 2015**

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References: Course Notes
A first course in Stochastic Models, H. C. Tijms, Wiley, 2003
Lessons in Estimation Theory for Signal Processing and Control,
J.M. Mendel, Prentice Hall Signal Processing Series, 1995

Course Web Site: <http://morse.uml.edu/Activities.d/estimation/stochest687.html>

This course addresses the development of stochastic models and their application to problems in the field of communication systems and networks. Problems of queueing, resource allocation, signal estimation, prediction and forecasting are considered. Statistical metrics for estimation and hypothesis are presented. Methods for simulating queues and other dynamical systems are discussed and implemented in assigned projects.

Topic 1	Poisson processes ; Simulation and Estimation; Kolmogorov-Smirnov Hypothesis Test
Topic 2	Hypothesis Testing; Concept of Significance, p-values etc.
Topic 3	Multiserver Queueing Models : M/M/c Theory and Simulation
Topic 4	M/D/c Queue Models and Computation of Performance Measures
Topic 5	An L-Policy Scheduling Scheme : M/G/c System
Topic 6	Properties of Estimators; Cramer-Rao Bound
Topic 7	Time Series Models : AR , MA and ARMA Processes
Topic 8	Parameter Estimation for ARMA Models
Topic 9	State variable models; Gauss-Markov processes
Topic 10	State Estimation, Prediction and Filtering – Kalman Filter
Topic 11	Non-linear systems and the Extended Kalman Filter
Topic 12	Markov Decision Processes
Topic 13	Bayesian Networks ; Learning Networks from Data
Topic 14	Project Assignment and Presentations

Grading Policy

Home work and Computer Simulations 60%
One Mid-Term Take Home Exam 15% Final Project/Paper 25%