

# **8950 Advanced Topics: Estimation and Filtering**

**Fall 2006**

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**Electrical & Computer Engineering  
Univ. of Minnesota**

# course information & syllabus

*time/place:*

9:45 am - 11:00 am, TuTh, MecheE 108

*textbook:*

Optimal State Estimation: Kalman,  $H_\infty$ , and Nonlinear Approaches  
by D. Simon, Wiley, 2006.

*instructor info:*

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office hours: TuTh 2:00-3:00 P.M. & open door policy

*class webpage:*

<http://www.ece.umn.edu/class/ee8950/> (will be set up shortly)

## *topics & course description*

brief review of dynamical systems

basic concepts from probability theory & stochastic process

least-squares estimation & “linear-quadratic” estimation theory

– linear systems, the Gauss-Markov model, and linear filtering

– Kalman, Kalman-Bucy, Wiener, Levinson, smoothing

– computational aspects: square-root filters, and fast algorithms

$H_\infty$  filtering

nonlinear filtering

– extensions of Kalman filter, particle filters, and monte carlo methods

*grading scheme based on:*

homework, a mid-term exam, a project, and a take-home final

*prerequisites:*

A good foundation of linear systems theory and of probability theory is required.

Other than that the course is open to all graduate students.

## *references*

B.D.O. Anderson and J.B. Moore, *Optimal Filtering*

A. Gelb, *Applied Optimal Estimation*

Kalman Filtering: Theory and Application, Edited by H.W. Sorenson, IEEE Press

A.E. Bryson, and Y.C. Ho, *Applied Optimal Control: Optimization, Estimation and Control*, Taylor and Francis

P. Maybeck, *Stochastic Models, Estimation, and Control*, Academic Press