ECE 722 Kalman Filtering with Applications  
Spring 2016  
Syllabus and course schedule  
Wednesdays 4:30 pm – 7:10 pm
Room RSCH 201

GMU Catalog description:

Detailed treatment of Kalman Filtering Theory and its applications, including some aspects of stochastic control theory. Topics include state-space models with random inputs, optimum state estimation, filtering, prediction and smoothing of random signals with noisy measurements, all within the framework of Kalman filtering. Additional topics are nonlinear filtering problems, computational methods, and various applications such as global positioning system, tracking, system control, and others. Stochastic control problems include linear-quadratic-Gaussian problem and minimum-variance control.

Prerequisites: ECE 521 and ECE 528 or permission of the instructor. 
Students who have not formally taken one of the prerequisite courses but have equivalent prerequisite knowledge may be able to follow the course successfully, but they should discuss it with the instructor first.

Textbooks:
It is not absolutely necessary to buy this textbook, because enough equivalent material will be available through the course material website and through Blackboard,


Course material will be posted on BlackBoard

Homework and projects will have to be submitted to Blackboard.
Week-by-week Course Schedule (tentative, subject to modifications)

Chapter numbers refer to the book by Grewal and Andrews.

- Jan 20  Linear systems, state space models. Chapter 1. Chapter 2: 2.1-2.4
- Jan 27  Linear systems, continuation. Observability, Controllability. Chapter 2
- Feb 3   Gaussian random variables and processes  Chapter 3 up to sec 3.4
- Feb 10  Linear system models of random processes, sections 3.5 - 3.8;
- Feb 17  Quiz 1. Discrete-time Kalman Filter, sections 4.1-4.4
- Feb 24  Discrete-time Kalman Filter, Kalman - Bucy filter
- March 2 Matrix Riccati equations, up to section 4.11
- March 9 Spring Break
- March 16 Midterm Test and additional material
- March 23 Smoothers, predictors. Chapter 5
- March 30 Implementation methods, Chapter 6, Project proposals due date
- April 6  Quiz 2. Nonlinear filtering, Chapter 7, part I,
- April 13 Nonlinear filtering, Chapter 7, part II, Unscented Kalman
- April 20 Filter & some Student projects review
- April 27 Student projects presentations
- May 4 th Final Exam (same room and time)

Grading policy:

Homework 10%  Quizzes 10% each, Midterm 25%, Project 20%, Final Exam 25%
Quizzes are shorter tests, memory testing without much calculation.
Midterm and final will include problems to solve mathematically.

Grade scale (approximate, subject to adjustment):

61% - 76.9%  C;
77% - 70.9%  B-
80% - 84.9%  B,
86% - 89.9%  B+
90% - 92.9%  A-
93% - 95.9%  A
96% - 100%  A+

It is also possible to get an F, if the performance is very weak or if the student stops
attending without withdrawing.

Last updated 01/18/2016