**General Notes**

- This is the first time I have taught this class
- Lectures will be coarser than last term
- Lecture notes (first draft)
- Homework assignments (from text & me)
- Web site: [http://ece.pdx.edu/~ssp](http://ece.pdx.edu/~ssp)
- Office hours: Mondays & Wednesdays 4–5 pm (after class)

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**Lecture Overview**

**This Time**

- Discuss syllabus
- Class overview & logistics
- Introduction

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**General Notes**

- My focus this term is on the lectures
- You have more responsibility to read and master the material
  - No exams
  - Applied homework assignments
- Homework assignments will be applied and related to the projects
Homework Assignments

- Probably won’t be from the book
- Grading will be coarse and quick
- Assignments should be completed in electronic form (\LaTeX preferred)
- Application of the techniques to real data that you find
- Should be small, rough conference papers

Course Web Site: http://ece.pdx.edu/~ssp

- Syllabus
- Outline
- Lecture notes - very helpful
- Lectures (most useful for review)
- Homework assignments
- Textbook errata
- Project
  - Report requirements
  - Presentation tips
  - PowerPoint template
  - Examples from last year
- Grades
- Other resources

Classroom

- DLC 303
- Windows Media Archive?

MATLAB

- You will be required to complete homework assignments that use MATLAB
- I will include MATLAB code segments in my notes
- Will not teach you MATLAB - you are expected to already know it or learn it on your own
- There are many good introductory books
  - Web: http://www.ma.man.ac.uk/~higham/mg/
- Additional links are provided on the web site
### Final Report Format
- Must be in IEEE peer-review format (6 page maximum)
- Must be written in \LaTeX\ (recommended) or MS Word
- Must submit electronic copy
- Detailed formatting information is posted on the web site
- Scope should be similar to a long IEEE conference paper
- Focus: analysis of signals to answer a question
- Same assessment as last term (see web site)

### Assessment
- 15% Reading quizzes
- 20% Homework
- 3% Project proposal
- 3% Introduction and literature review draft
- 3% Methodology draft
- 3% Results draft
- 3% Discussion draft
- 5% peer review draft (completeness)
- 5% peer review (thoroughness)
- 5% oral presentation
- 35% final written report

### General Comments
- Most lectures will use the full period
- I expect much of your learning to occur out of lecture working on homework and the project
- Homework assignments will be heavy on MATLAB simulation
- Will focus on linear estimation
- Will not emphasize
  - Finite precision/ill-conditioning issues
  - Matrix decompositions

### Lecture Notes
- Will be posted on the class web site
- Will update them this term
- Watch for updated notes as late as 30 minutes before lecture, 1:30 pm
- Workspace provided for examples worked during lecture

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Coarse [sic.] Outline

• Optimum Linear Filters
  – Linear MMSE estimator derivation and normal equations
  – Geometric interpretations and orthogonality
  – Optimum filters, time and frequency domains
  – Linear prediction
  – Optimum IIR filters
  – Inverse filtering and matched filters

• Algorithms for Optimum Linear Filters
  – Fundamentals of order-recursive algorithms
  – Levinson and Levinson-Durbin recursions
  – Interpretations of parameters

• Kalman Filter State space models and innovations
  – Kalman filter derivation
  – Extended Kalman filter

Coarse [sic.] Outline Continued

• Least Squares Estimation
  – Derivation and solution of normal equations
  – Geometric interpretations and orthogonality
  – Least squares filters
  – Signal estimation and prediction

• Signal Modeling
  – All-pole models
  – Pole-zero models
  – Minimum variance spectral estimation
  – Harmonic models and frequency estimation techniques

Textbook


• Relatively new
• Many advanced topics
• Elegant notation and explanations
• Fairly concise
• Heavy on terminology
• Errors?
  – See errata on web site
General Comments on Class

- Challenging, but interesting and critical foundation topics of statistical signal processing
- Advanced class
  - Graduate level ECE course
- Will try to adjust the pace to the class
  - Feedback, regular attendance, and questions in class are essential to make this work

Logistics: Text & Workbook Errata

- Each error worth 25% of a homework
- Find four errors = can skip an assignment
- Cannot receive more than full credit for homework
- Typos and grammar count
- Must be first to email me
- May take me a few days to confirm
- Known errata are posted on the web site
- Expect errors in the HW solutions

Homework 1

- Will assign Wednesday
- For now
  - Read Chapter 6
  - Reading quiz: 6.1–6.2