

EE648: Topics

- Adaptive Signal Processing
- Space-Time Processing of Signals Carried by Propagating Waves
- High-Resolution Spatial Spectral Estimation
- Efficient Digital Schemes for Sampling Rate Conversion
- Digital Subbanding for Speech Compression
- Perfect Reconstruction Filter Banks
- Wavelets for Time-Frequency Analysis

EE648: Course Objectives

- treatment of recent developments in DSP having tremendous impact on design of current and future generation
 - digital audio systems
 - noise cancellation systems
 - wireless/cellular communication systems
 - speech/image transmission systems

EE648 IHETS: Text

- **Required:** P. P. Vaidyanathan, *Multirate Systems and Filter Banks*, Prentice-Hall, First edition, 1993.
 - not needed until 7th week of semester
- **Reference:** J. G. Proakis and D. G. Manolakis, *Digital Signal Processing: Principles, Algorithms, & Applications*, Prentice-Hall, Third edition, 1996.

Prerequisites

- a first course in digital signal processing
- *prerequisite background topics:*
- sampling theory
- I/O relationships for discrete-time systems in time domain and frequency domain
- discrete-time Fourier analysis
- digital filter design
- basics of A/D and D/A conversion

EE648: Computer Based HMWK

- *5 homeworks* involving use of Student Edition of Matlab (Version V strongly preferred)
 - not difficult from a programming standpoint
- **noise cancellation for automotive applications**
- **equalization of digital communication signals**
- **space-time processing for wireless communications**
- use any computer you have access to incl. PC's
 - dial-up access to Purdue's ECN available
- will do computer-based demos in class regularly

Final Mini-Project

- final small scale mini-project in lieu of a final exam either:
 - work related
 - chosen from a supplied set of possible course-related topics
- not time-consuming

EE648: Grade Breakdown

- one 75 minute exam: 20%
- 5 matlab homeworks: 60% (12% each)
- final mini-project 20%
- First Exam Date: Session 18
 - Live: Thurs., March 11
 - **correction**

EE648: Homework/Test Policy

- Matlab based homework assigned biweekly
- 5 homeworks worth 12 pts each -- 60% of final grade
- solutions to homeworks will be posted at course web site & mailed promptly
- narrative short answers will constitute substantial portion of in-term exam, in addition to workout problems

EE648 DSP II: Additional Notes

- EE648 DSP II is being offered over the following venues:
 - IHETS cable network
 - NTU satellite network (CC 761-M)
 - taped delay (GM, Ford, Calumet, IUPUI, FW)
- after each lecture, a “clean” version of the handwritten class notes will be scanned in and posted at course web wite

EE648 Course Web Site

- <http://shay.ecn.purdue.edu/~ee648/>
 - general course info. & announcements
 - solutions to matlab homeworks
 - matlab scripts for demos done in class
 - scanned in version of handwritten class notes: pdf file viewed via Adobe Acrobat
- acrobat reader is free software: download from <http://www.adobe.com>

Certificate in Signal Processing

- formally recognized certificate signed by Head of ECE and Head of CEE
- series of 5 courses related to DSP
- EE638 DSP I required
- **other EE courses:** EE600 Random Variables and Signals, EE648 Digital Signal Processing II, EE629 Neural Networks, EE637 Digital Image Processing I, EE649 Speech Processing by Computer, EE580 Optimization Methods for Systems and Control, EE602 Lumped System Theory, EE608 Computational Model/Methods
- **math courses:** MA511 Linear Algebra, MA525 Complex Anal.

Top Ten Reasons for Taking EE648

- 10. to be able to play “stump the digital audio salesperson”
- 9. you don't get enough TV watching in at home
- 8. no commercials during entire 75 min. viewing period -- pure entertainment
- 7. the 60 hr. work week, the family, and sporting activities just don't keep you busy enough -- too much spare time on your hands
- 6. to learn that a filter bank is NOT a place where you can deposit filters and watch their impulses responses grow with time

Top Ten Reasons for Taking EE648

- 5. so you can watch tape of lectures at night to help fall asleep
- 4. so Purdue can claim you as an alumnus and call you for donations (wait, that's one of *our* top ten reasons for you to take EE648)
- 3. playing golf/tennis/softball after work was providing too much exercise -- need to make time to sit in front of a TV monitor
- 2. to learn that wavelets are NOT the waves observed at the beach on a still (non-windy) day
- 1. in case you get caught in an embarrassing videotape, you want to know how to digitally alter the video and audio mastertape

Professor Contact Info

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- **Off-campus phone-in hours:**
 - MWF 2:30-3:30 pm (EST)
- **On-campus walk-in hours:**
 - TR 2:30-3:30 pm (EST)

Office Hours: TA

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