ECE 497 - MD: Wavelets in Signal Processing
Course Schedule – Fall 2002
10:00 – 11:20 Tuesdays and Thursdays, 163 Everitt Lab

Part I: Introduction and Background

Thu, Aug 29  Introduction. Why wavelets, filter banks and multiresolution signal processing. Application examples (Ch. 1).

Tue, Sep 3  Review of Hilbert spaces, orthonormal bases, Fourier theory, and sampling (Ch.2).
            Assign Homework # 1.

Thu, Sep 5  Multirate signal processing (Ch.2).

Tue, Sep 10 Time-frequency representation (Ch.2).
            Assign Homework # 2.

Part II: Discrete-Time Bases and Filter Banks

Thu, Sep 12  Series expansions of discrete-time signals (Ch.3).
            Collect Homework # 1.

Tue, Sep 17 Two-channel filter banks (Ch.3).
            Assign Homework # 3.

Thu, Sep 19  Tree-structured filter banks. Discrete wavelet transforms (Ch.3).
            Collect Homework # 2.

Tue, Sep 24  TBA.

Thu, Sep 26  Multidimensional filter banks. M channel filter banks. Adaptive filter banks (Ch.3).
            Collect Homework # 3.

Tue, Oct 1  First midterm test.

Part III: Continuous-Time Bases and Wavelets

Thu, Oct 3  Series expansions of continuous-time signals. Haar and Sinc wavelets. Multiresolution analysis (Ch.4).

Tue, Oct 8  Wavelets derived from iterated filter banks (Ch.4).
            Assign Homework # 4.

Thu, Oct 10 Wavelet series and its properties (Ch.4).
            Project proposals (2 pages) due.

Tue, Oct 15 Regularity and approximation properties (Ch.4).
            Assign Homework # 5.
Part IV: Overcomplete Expansions and Continuous Transforms

**Thu, Oct 17**  Frame theory. Wavelet frames (Ch.5).
*Collect Homework # 4.*

**Tue, Oct 22**  Oversampled filter banks. Pyramids (Ch.3 & Ch.6).
*Assign Homework # 6.*

**Thu, Oct 24**  The continuous-time wavelet transform. Characterization of regularity (Ch.5).
*Collect Homework # 5.*

Part V: Applications

**Tue, Oct 29**  Applications in compression. Review of rate-distortion theory, bit allocation (Ch.7).

**Thu, Oct 31**  Image compression. Subband/wavelet coding of images. Embedded codes (Ch.7).
*Collect Homework # 6.*

**Tue, Nov 5**  Second midterm test.

**Thu, Nov 7**  Denoising. Wavelet thresholding (Suppl.).

**Tue, Nov 12**  Texture characterization and classification (Suppl.).

Part VI: Advanced Topics

**Thu, Nov 14**  Non-linear approximation in Fourier and wavelet bases (Suppl.).

**Tue, Nov 19**  Best bases. Approximation with pursuits (Suppl.).

**Thu, Nov 21**  Non-separable filter banks and wavelets (Suppl.).
*Thanksgiving vacation*

**Tue, Dec 3**  Curved and directional wavelets (Suppl.).

**Thu, Dec 5**  Directional multiresolution image processing (Suppl.).

Final Project

**Tue, Dec 10**  Project presentations.

**Thu, Dec 12**  Project presentations.

Project reports due at 17:00 Tue, Dec 17, in the instructor’s mailbox (Beckman Institute).