**EE 596 Individual Studies**

**Wavelets and Filter Banks**

Instructor Ram Narayanan (rnarayanan@engr.psu.edu)

Office 202 Electrical Engineering East

Office Hours By appointment

Required Text:

*Wavelets and Filter Banks by -* Gilbert Strang and Truong Ngugen

Description:

This course will give exposure to wavelets and the liner algebra involved and how it will be applied to image reconstruction for Radar imaging as a signal processing tool. The course will involve independent research to further explore these topics and to understand how the wavelet decomposition of signals and images is being used to improve radar imaging of targets, what the current research is, and possible further research topics that can be undertaken.

Course Objectives:

Understand the linear algebra behind the wavelet transform as a signal processing tool

Understand the Wavelet transform and filter banks both theoretically and ass applied to Radar

Learn about the research process through further reading of scholarly journals and articles on the above subjects.

Evaluation:

25% Paper 1: Summary of Chapters 1-3 and supplementary materials

25% Paper 2: Summary of Chapters 4-5 and supplementary materials

25% Paper 3: Summary of Chapters 6-7 and supplementary materials

25% Paper 4: Summary of Chapters 8-9 and supplementary materials

Course Schedule:

**Week Topic Assignment Due**

**January 7** Chapter 1 Introduction and Background

Research

**January 14** Chapter 2: 2.1 – 2.4 Filters/Fourier Analysis

**January 21** Chapter 3: Down sampling and Up sampling

and additional research related to topic

**January 28** Chapter 4: Filter Banks Paper 1

**February 4** Chapter 5: Orthogonal Filter Banks

**February 11** Additional Research

**February 18** Additional Research

**March 4** Chapter 5: 5.1 – 5.4 Spectral factorization Paper 2

**March 11** Additional Research on the Compound Gaussian distribution

**March 18** Chapter 6: 6.1 – 6.4 Multiresolution

**March 25** Additional Research on Wavelets

**April 1** Additional Research on Wavlets

**April 8** Chapter 7: Wavelet Theory Paper 3

**April 15** Chapter 7 continued

**April 22** Chapter 8

**April 29** Chapter 9

**May 6** Final Research and paper organization Paper 4

Student Signature: Date:

Instructor Signature: Date: