**EE 596 Individual Studies**

**Bio-Inspired Radar**

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

Office 202 Electrical Engineering East

Office Hours By appointment

Required Text:

*Biologically-Inspired Radar and Sonar: Lessons from nature* – Alessio Balleri, Hugh Griffiths, Chris Baker

Description:

This course will investigate how sophisticated sensing techniques used in nature can be applied to radar and sonar systems to improve their performance. The course will involve independent research to further explore these topics and to understand how such methods are being developed to improve radar functionality/efficiency and where it is in need of improvement and further development.

Course Objectives:

Understand why bio-inspired approaches can offer major improvements to current radar systems.

Understand how nature performs remote sensing through biosonar/echolocation and how these techniques can be 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 4-6 and supplementary materials

25% Paper 3: Summary of Chapters 7-9 and supplementary materials

25% Paper 4: Summary of Chapters 10-11 and supplementary materials

Course Schedule:

**Week Topic Assignment Due**

**January 8** Chapter 1: Introduction

**January 15** Chapter 2: Bio-inspired signal processing from bats

**January 22** Chapter 3: Enhanced range resolution: matched filter

**January 29** Additional research related to chapters 1-3 Paper 1

**February 5** Chapter 4: Air-coupled sonar systems inspired

by bat echolocation

**February 12** Chapter 5: Analysis of acoustic echoes from

bat-pollinated plants

**February 19** Chapter 6: The biosonar arms race bats vs. insects

**February 26** Additional research related to chapters 4-6 Paper 2

**March 5** Spring Break

**March 12** Chapter 7: Biologically-inspired coordination of guidance

and adaptive radiated waveform

**March 19** Chapter 8: Cognitive system framework for target tracking

**March 26** Chapter 9: The biosonar of the Bottlenose Dolphin

**April 2** Additional research related to chapters 7-9 Paper 3

**April 9** Chapter 10: Human Echolocation

**April 16** Chapter 11: Object recognition in weakly electric fish

**April 23** Additional research related to chapters 10-11

**April 30** Final research and paper organization Paper 4

Student Signature: Date:

Instructor Signature: Date: