ENEE 434: Introduction to Neural Networks and Signals

Spring Semester 2010 (3 credits)

Lectures: Tuesday & Thursday **Time:** 3:30-4:45 pm **Room:** CSI 2120
Instructor: Nicholas De Claris, Sc.D, Professor ECE and Pathology **Office:** AV Williams 1363
Office Hours: Before & After Class by Appointment **email:** declaris@umd.edu; **Phone** 301-405-3639
Lecturers: As scheduled **Visitors:** Prior permission of the Instructor required. **Grader**

Course Description

Introduction to the generation and processing of bioelectric signals, structures and functions, biological membranes, synaptic structures, functions, and signals. Neural Network Systems. Biologically inspired Neural Circuit. Network and Computing System methodologies that make possible engineering and technological advances not otherwise possible. The Course is build on lectures and discussion sessions, invited guest researchers, recommended Reference Material and Websites, and the student Homework Assignments. It concludes with selected overviews of on-going inspired approaches for addressing rapidly emerging global-scale challenges.

Prerequisites

The course is self-contained for, **graduate, senior and qualified students from engineering and biological departments in good academic standing.** Students from other departments, contact the instructor for a personal consultation.

Recommended Textbooks

FOUNDATIONS OF CELLULAR NEUROPHYSIOLOGY, Daniel Johnston & Samuel Miao-Sin Wu, MIT Press ISBN 0-262-10053-3

THE NEURON, Cellular and Molecular Biology, Third Edition, by Irwin B. Levitan & Leonarrd K. Kacsmacarek, OXFORD University Press., ISBN 0-19-514523-2

NEURAL NETWORK DESIGN, Hagan, Demuth & Beal, COLORADO University, ISBN 0-97173121-08

Course Objective

Explore emerging novel Neural Signal and Network methodologies.

Topics Covered

1. Biological membranes, synaptic structures, functions, and signals
2. Biologically-inspired Neural Circuits, Neural Networks and Neural Systems Computing-methodologies
3. Multilayer Neural Networks
4. Self Organizing Structures
5. Computational Intelligence.
6. Novel Neural Networks enabling engineering and technological advances not otherwise possible.
7. Selected optional topics for Mini-Project in Liu of the Final Exam or for extra credit. Required prior discussion with the instructor, submission of written proposal and written approval of the instructor to commence Mini-Project.

Assignments, Participation/Discussions and Evaluation

1) **Attendance** to Lectures and Discussions are **Mandatory**,
2) **Homework** will be outlined in a written assignment to be carried out and submitted by each student as a **Workshop Report** in the required format and cover-page. **Workshop Reports** will be evaluated and returned to the class,
3) Following the class lecture **one Report** will be scheduled (volunteered or assigned) for **presentation in a discussion session with class participation,**
4) Any student may elect to **Revise hers/his Workshop Report** and resubmitted it within one week for re-evaluation and **grade improvement,**
5) Each student is required to maintain throughout the course a notebook entitled **MY ENEE 434 COURSE BOOK EXPERIENCE** builds on: 1) the student's Homework Assignments, 2) the lectures, discussion sessions 3} the Recommended Textbooks and 4) acquired Reference Material from selected Websites.
6) **Mid Term Exam** and **Final Exam** based on your own **ENEE 434 COURSE BOOK EXPERIENCE**

COURSE GRADE will be based on pre-agreed weighted average of: 1) the **homework/Workshop/Participation** Grade average, 2) the **Mid Term** and **Final Exam** Grades and 3) the **ENEE 434 COURSE NOTEBOOK** grade received at the completion of the Final Exam.