TO: The Engineering Faculty
FROM: School of Electrical and Computer Engineering
RE: New Dual Level Course

The faculty of the School of Electrical and Computer Engineering has approved the following new dual level course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ECE 528 Measurement and Stimulation of the Nervous System
Sem. 2. Class 3, cr. 3.
Prerequisites: ECE 301 and ECE 302, or permission of the instructor.

Engineering principles addressing questions of clinical significance in the nervous system: neuroanatomy, fundamental properties of excitable tissues, hearing, vision, motor function, electrical and magnetic stimulation, functional neuroimaging, disorders of the nervous system, development and refinement of sensory prostheses. Also offered as BME 528.

Reason:
This course will serve as a culminating experience for undergraduates in both BME and ECE who desire a bioelectrical focus, and as an entry level course for graduate students who wish to pursue research that benefits from knowledge in the areas of neural prostheses or neuroimaging. This course was offered as an experimental course ECE 595T in the Spring 2002, Spring 2003, Spring 2004, and Spring 2005 semesters with enrollments of 17, 14, 16, and 23 students respectively.

Mark J.T. Smith

Professor and Head

Supporting Documentation:

1. Course Objective:
As current technologies enable more extensive interfacing of man-made devices with biological systems, potential exists for development of advanced neural prostheses to repair or replace lost neural function in a human population. Understanding of the human central nervous system brought about by the past combination of neuroscience and engineering has enabled development of current and pending neural protheses for audition, vision and motor functions. Future developments will be shaped by multi-disciplinary teams that utilize traditional neurophysiologic study (e.g., electrophysiology, neuroimaging) with modern engineering technologies (e.g., MEMS). Students in this course will be exposed to both perspectives and demonstrate the integration thereof through a group research proposal related to enhancing our ability to repair or replace function in the impaired nervous system.

2 Level: Dual Level

3. Person-In-Charge: Thomas Talavage

4. Course Outline:

Topics	*Weeks*
• Overview of the nervous system; basic neuroanatomy	1 week
• Neurophysiology (cellular models; stochastic operation)	2 weeks
• Overview of neural systems	2 weeks
• Student presentations on nervous system measurement and stimulation	2 weeks
• Operation, measurement and correction of visual system	2 weeks
• Operation, measurement and correction of auditory system	2 weeks
• Operation, measurement and correction of motor system	2 weeks

- Student research paper presentations

5. Text: J Nolte, The Human Brain: An Introduction to Its Functional Anatomy, 5th Edition, Mosby, Inc., 2002. (ISBN: 0-323-01320-1)

   Recommended References:
   1) TF Weiss, Cellular Biophysics (Volume 2): Electrical Properties, 1st Edition, MIT Press, 1995. (ISBN: 0-262-23184-0)
   2) PE Roland, Brain Activation, 1st Edition, John Wiley & Sons, Inc., 1997. (ISBN: 0-471-18441-1)
   3) WW Orrison, Jr., JD Lewine, JA Sanders, MF Hartshorne, Functional Brain Imaging, 1st Edition, Mosby-Year Book, 1994. (ISBN: 0-8151-6509-9)