

BRAINS, MINDS AND COMPUTERS
ECEN 4831, 5831 – Spring 2011
Computational Neuroscience and Realistic Neural Modeling

Instructor: Dave Beeman (ECEE 124; (303) 492-2852; dbeeman@dogstar.colorado.edu)

Course Web page: <http://ece.colorado.edu/~ecen4831/>

Readings are from:

Kandel: "Principles of Neural Science" by Kandel, Schwartz, and Jessel

CNS Lectures: Lectures on Computational Neuroscience through the course web page.

BoG: "The Book of GENESIS: Exploring Realistic Neural Models with the GEneral NEural SIMulation System" by J. M. Bower and D. Beeman, 2nd Edition, (1998). Read or download the free internet edition through the course web page or at <http://www.genesis-sim.org/GENESIS/iBoG/iBoGpdf/>.

March 8 Modeling the Brain: Simplified vs. Realistic Models

Reading assignment: CNS Lectures: Online lecture notes for March 8 (course web page); BoG Chapter 2.

March 10 Modeling Voltage-activated Channels: Hodgkin-Huxley Model

Reading assignment: Review pp. 150 – 162 of Kandel Chapter 9; CNS Lectures "Introduction to Computational Neuroscience and the Hodgkin-Huxley Model", including the link to the "optional material on Details of the Hodgkin-Huxley Model"; BoG Chapter 4 through Section 4.7. Also bring the "Summary of the Hodgkin-Huxley model" handout to class.

March 15 Modeling Dendritic Structure and Synapses

Reading assignment: CNS Lectures "Modeling Dendrites and Synapses" and the link to the "optional material on Cable Theory of Passive Propagation in Dendrites"; BoG Chapters 5 through Section 5.5, and 6 through Section 6.4.

March 17 Modeling Complex Cells and Networks

Reading assignment: BoG Chapters 7 through Section 7.4, and 9 through Section 9.4; CNS Lectures "Modeling More Complex Cells and Networks"

March 21 – 25 Spring Break

March 29 EXAM II

March 31 Abstract of Presentation due (Grad students only)