

BRAINS, MINDS AND COMPUTERS  
ECEN 4831, 5831 – Fall 2009  
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

**Lectures on CNS:** Lectures on Computational Neuroscience through the course web page, or at <http://www.genesis-sim.org/GENESIS/cnslecs/cnslecs.html>.

**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/>.

**Nov. 17** Modeling the Brain: Simplified vs. Realistic Models

**Reading assignment:** Online lecture notes for Oct. 2 (course web page); CNS Lectures "Introduction to Computational Neuroscience" (up to "The Hodgkin-Huxley Model"); BoG Chapter 2.

**Nov. 19** Modeling Voltage-activated Channels: Hodgkin-Huxley Model

**Reading assignment:** Review pp. 150 – 162 of Kandel Chapter 9; CNS Lectures "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.

**Nov. 23 – 27** Fall Break

**Dec. 1** 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.

**Dec. 3** Modeling Complex Cells and Networks

**Reading assignment:** BoG Chapters 7 through Section 7.4, and 9 through Section 9.4.

**Dec. 12** EXAM III (Half of final exam period: 1:30 – 3 PM)