Upper-level Undergraduate/Graduate Course in Computational Neuroscience Center for Neural Science, NYU Instructor: John Rinzel

SPECIAL TOPICS IN NEURAL SCIENCE: Introduction to Computer Modeling of Neuronal Systems V80.0304001/G80.3042001

3 points. Spring term, 2012.

Monday, 4:00-6:00pm, Meyer Rm 815. J. Rinzel. 1st class: Jan 23, 2012 Prerequisite: Calculus I-II. (seek consent of instructor if in doubt).

We will use neural modeling software (and pre-written Matlab codes) to understand how neurons, synapses, and networks/systems work. We will simulate cellular neurophysiology experiments to explore resting and action potentials, firing properties, synaptic conductances and synaptic integration. Idealized models (firing rate and probability-based functional descriptions) will be used for system-level and network properties including receptive fields, perceptual and cognitive dynamics including decision-making, perceptual grouping and perceptual multistability. The software will include dynamic visualization and animation tools. The course will involve classroom lectures and interactive computing lab sessions, homework and a simulation project. No programming experience is necessary.

Books:

Neurons in Action2 by JW Moore and AE Stuart. Sinauer 2007, Book & Disk. Spikes, Decisions, and Actions: The Dynamical Foundations of Neuroscience by HR Wilson. Oxford University Press 1999. Available, no cost, online: http://cvr.yorku.ca/webpages/wilson.htm#book