

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

NEURL-UA 302-002; NEURL-GA 3042-006

3 points.

Spring term, 2016.

J. Rinzel.

Wednesdays 3-5pm, Meyer 7th Floor Conference Room.

1st class: January 27

Prerequisite:

Calculus I-II.

Undergrads should also have taken NEURL-UA 220 Behavioral and Integrative Neural Science

(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 Action by JW Moore and AE Stuart. Sinauer 2007, Book & CD or download (<http://neuronsinaction.com/home/main>)

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>