

ADVANCED TOPICS IN MATHEMATICAL PHYSIOLOGY (Neuronal Networks) (MATH-GA 2855.001/NEURL-GA 3042.001)

3 points. Fall term, 2015

Wednesday, 2:30pm-4:20pm, WWH 1314. J. Rinzel.

Prerequisite: familiarity with applied differential equations; most neurobiological background will be provided.

This course will involve the formulation and analysis of differential equation models for neuronal ensembles and neuronal computations. Spiking and firing rate mechanistic treatments of network dynamics as well as probabilistic behavioral descriptions will be covered. We will consider mechanisms of coupling, synaptic dynamics, rhythmogenesis, synchronization, bistability, adaptation, ... Applications will likely include: central pattern generators and frequency control, perceptual bistability, working memory, decision-making and neuro-economics, feature detection in sensory systems, cortical dynamics (gamma and other oscillations, up-down states, balanced states, ...). Students will undertake computing projects related to the course material: some in homework format and a term project with report and oral presentation.