MCB 166 - BIOPHYSICAL NEUROBIOLOGY (3 UNITS)

(Taken from the UC Berkeley Course Guide (http://guide.berkeley.edu))

COURSE OVERVIEW

SUMMARY

Electrochemistry and ion transport phenomena, equivalent circuits, excitability, action potentials, voltage clamp and the Hodgkin-Huxley model. Biophysical properties of ion channels. Statistical and electrophysiological models of synaptic transmission, Quantitative models for dendritic structure and neuronal morphogenesis. Sensory transduction, cellular networks as computational devices, information processing and transfer.

PREREQUISITES

Biology 1A, 1AL, Physics 8A-8B, Chemistry 1A, 3A/3AL-3B, or consent of instructor

Fall only

TOPICS COVERED

1. Derive equations for Nernst and GHK membrane potential from fundamental physics concepts.
2. Describe the experiments and theory underlying the Hodgkin-Huxley model.
3. Understand biophysical properties of gating particles called ion channels.

4. Apply and solve equivalent circuit models to describe resting and excitable cells, synaptic transmission and sensory transduction.
5. Use Poisson, Gaussian and binomial distributions to analyze the gating of ion channels, synaptic transmission, and absolute sensitivity of vision.
6. Model dendritic structure based on quantitative descriptors of shape and energy minimization theory.
7. Explain experiments and models of sensory transduction, neuronal integration and lateral inhibition.

WORKLOAD

TIME COMMITMENT

3 hours of lecture and 1 hour of discussion per week.