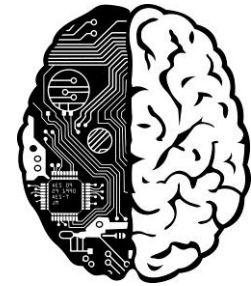


NBIO 890-003

Network Neuroscience 2014

Syllabus (Version 4.0)

Flavio Frohlich (flavio_frohlich@med.unc.edu)



This course provides a comprehensive introduction to cutting-edge interdisciplinary research of structure, dynamics, and function of brain networks. The course is designed to be informal and highly interactive and requires active participation. You will learn about electrophysiology and imaging in animal models and humans, neurology and psychiatry, brain stimulation, computational neuroscience, network science, information theory, and dynamic systems theory. We will focus on achieving an in-depth understanding of physiological and pathological network dynamics in neocortex and the thalamo-cortical system.

- Class meets on Tuesdays (9.30 – 12.15 am) in Fall 2014. Location: Dental Sciences Building, 5405B, Corner of Manning and South Columbia (contact: flavio_frohlich@med.unc.edu).
- Course credit: 3 units.
- Typically, students are required to read a review and a research paper in preparation for each class session. The papers will be posted on Sakai.
- Absences need to be discussed ahead of time.
- Grade will be determined by quality and quantity of class room contributions and the student presentations.
- Prerequisites: Basic neuroscience knowledge and an interest in quantitative approaches. Undergraduate students can take the course with permission by the instructor.

8/19/2014	Measuring activity of single neurons; Hodgkin-Huxley: Positive and negative feedback.
8/26/2014	Synaptic transmission: Excitation and inhibition; Synaptic and intrinsic plasticity
9/2/2014	Non-synaptic neuronal communication: electric fields, ion concentration dynamics
9/9/2014	Cell types and connections; microcircuits of hippocampus and neocortex.
9/16/2014	Neuromodulators: Dopamine, serotonin, acetylcholine, norepinephrine, histamine
9/23/2014	Extracellular electrophysiology: Action potentials
9/31/2014	Local field potential and electroencephalogram
10/7/2014	Calcium and voltage imaging
10/14/2014	Imaging structure and function with MRI
10/21/2014	Non-invasive brain stimulation: transcranial magnetic stimulation, transcranial current stimulation; deep brain stimulation
10/28/2014	Wiring diagrams of brain networks; functional connectivity; causal network interactions; information theory
11/4/2014	Delta oscillations: Sleep and anesthesia
11/11/2014	Theta oscillations: Memory and exploration
11/18/2014	Network neuroscience in action!
11/25/2014	Alpha oscillations: Resting state; Beta oscillations
12/2/2014	Gamma oscillations: Cognition, autism, and schizophrenia