

# CELLULAR AND MOLECULAR NEUROSCIENCE

AMC Center for Neuropharmacology & Neuroscience - NEU 606 (3 Credits)

SUNY-SPH Dept. of BioMedical Sciences - BMS 604 (3 Credits)

SPRING 2008

Course Directors: Allan Schneider (262-5837) and Richard Keller (262-4979)

Meets Tue and Thur @ 3:00 - 4:30 in MS-518 at AMC

## CLASS SCHEDULE

December 16, 2008

### I. INTRODUCTION TO NEUROSCIENCE (3 lectures)

1/22, 1/27, 1/29 *Overview of integrated nervous system* Keller, Lindsley  
structure/function of neurons and glia, cytoskeleton and axonal transport, blood-brain barrier, organelle trafficking

### II. ELECTRICAL SIGNALING WITHIN CELLS (2 lectures)

2/3, 2/5 *Electrical signaling within cells I and II* Fleck  
ion gradients, ion pumps, membrane potential, electrical properties of neurons  
ion channels, patch clamp, action potential, nerve conduction

### III. SYNAPTIC TRANSMISSION (7 lectures)

2/10 *Introduction to synaptic transmission* Keller  
electrical vs. chemical transmission, gap junctions, integration

2/12 *Release of transmitters* Schneider

2/17, 2/19 NO CLASS - SUNY Winter Break

2/24 *Inactivation of transmission - degradation and reuptake* Keller

2/26 **EXAM 1**

#### Postsynaptic/Receptor transduction mechanisms:

3/3 *Tyrosine kinase receptors* Teitler

3/5 *G protein-coupled receptors* Herrick-Davis

3/10 *Ligand-Gated Ion Channels* Fleck

### IV. TRANSMITTER MODEL SYSTEMS (5 lectures)

3/12 *Cholinergic neurotransmitter/receptor systems* Schneider

3/17 *Catecholamine and Neuropeptide neurotransmitter/receptor systems* Keller

3/19 *Glutamate and GABA neurotransmitter/receptor systems* Keller

3/24 *Histamine neurotransmitter/receptor systems* Hough

3/26 *Cannabinoids and their receptor systems* Morra

3/31 open

4/2 **EXAM 2**

4/7, 4/9 NO CLASS - AMC Awards Day - SUNY Spring Break

### V. GLIAL FUNCTION (3 lectures)

4/14 *Astrocytes: morphology, function and classification* Mongin

4/16 *Oligodendrocytes: development and myelin* Mongin

4/21 *Microglia: brain-immune system interactions* Mongin

### VI. CELLULAR BASIS OF LEARNING AND MEMORY (2 lectures)

4/23 *Cellular basis of learning and memory* - synaptic plasticity, habituation, sensitization Carlsson

4/28 *Cellular basis of learning and memory* - LTP, LTD Carpenter

### VII. DEVELOPMENTAL NEUROBIOLOGY (2 lectures)

4/30 *Overview of Developmental Neurobiology* Temple

5/5 *Selected Topics in Developmental Neurobiology* Temple

5/7 Paper due!

5/14 **EXAM 3**

**ALBANY MEDICAL COLLEGE**  
*Center for Neuropharmacology & Neuroscience*  
and  
**UNIVERSITY AT ALBANY SCHOOL OF PUBLIC HEALTH**  
*Department of Biomedical Sciences*

**CELLULAR AND MOLECULAR NEUROSCIENCE**  
**AMC NEU 606 - SUNY BMS 604**  
**3 credits - Spring Semester**

**Course objectives:** The goal of this course is for the students to understand the basic principles of the nervous system at the cellular and molecular levels. The emphasis of the course is on understanding intracellular communication via electrical signaling and intercellular communication via synaptic transmission.

**Course Description:** This team taught course provides an overview of the nervous system including the specialized structures of neurons and glia in relation to their functions. The two major types of rapid cellular communication in the nervous system will be covered in depth, namely, conduction of electrical impulses along axons and chemical neurotransmission at synapses. The life cycle of representative neurotransmitter systems will be discussed in detail, including their synthesis, storage, release, inactivation, and actions at receptors. An introduction to developmental neurobiology and the cellular basis of learning and memory in simple neuronal systems will be presented.

**Scheduling:** This class runs from January to May and is held on Tuesdays and Thursdays from 3:00 to 4:30 pm in Room MS-518 at AMC.

**Contact Information:**

Course Co-Directors:

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**Evaluations and Grading:** Letter grades (A-E) are given. There are three in-class examinations each covering approximately a third of the course plus an in-depth paper (10-15 pg) on a topic in cellular, molecular or developmental neurobiology of current interest. The 3 exams scores count for 75% of the final grade and the paper counts for 25% of the final grade.

**Prerequisites:** Biochemistry (AMC 500 / BMS 504A) or an equivalent background in biochemistry. A course in cell biology is suggested.

**Cross-Listing:** This course will be offered at AMC and cross-listed with the SUNY School of Public Health.

**Textbook:** No textbook is required; however, a good neuroscience text is recommended. Several are reviewed during the first lecture. There are no other required materials.

**Lecture Materials:** Lecture handouts are distributed prior to class and will also be available on the Internet via a course site on the AMC Sakai Server. All students enrolled in the course will be provided access to this site.

**Course Lecturers:** Jeff Carlson, David Carpenter, Mark Fleck, Kathy Herrick-Davis, Lindsay Hough, Richard Keller, Tara Lindsley, Alexander Mongin, Allan Schneider, Milt Teitler, Sally Temple, and Matt Hynd.

[December 16, 2008]