

CELLULAR AND MOLECULAR NEUROSCIENCE

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

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

SPRING 2011

Course Director: Richard Keller (262-4979)

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

CLASS SCHEDULE

December 21, 2010

I. INTRODUCTION TO NEUROSCIENCE (3 lectures)

1/20, 1/25, 1/27 *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)

2/1, 2/3 *Electrical signaling within cells I and II* Shin
ion gradients, ion pumps, membrane potential, electrical properties of neurons
ion channels, patch clamp, action potential, nerve conduction

III. SYNAPTIC TRANSMISSION (6 lectures)

2/8 *Introduction to synaptic transmission* Keller
electrical vs. chemical transmission, gap junctions, integration
2/10 *Release of Neurotransmitters* Mazurkiewicz
2/15 *Inactivation of transmission - degradation and reuptake* Keller
2/17 **EXAM 1**
2/22, 2/24 NO CLASS - SUNY Winter Break

Postsynaptic/Receptor transduction mechanisms:

3/1 *G protein-coupled receptors* Herrick-Davis
3/3 *Tyrosine kinase receptors* Teitler
3/8 *Ligand-Gated Ion Channels* Fleck

IV. TRANSMITTER MODEL SYSTEMS (4 lectures)

3/10 *Cholinergic neurotransmitter/receptor systems* Schneider
3/15 *Catecholamine and Neuropeptide neurotransmitter/receptor systems* Keller
3/17 *Glutamate and GABA neurotransmitter/receptor systems* Keller
3/22 *Histamine neurotransmitter/receptor systems* Hough
3/24 **EXAM 2**

V. GLIAL FUNCTION (3 lectures)

3/29 *Astrocytes: morphology, function and classification* Mongin
3/31 *Oligodendrocytes: development and myelin* Mongin
4/5 *Microglia: brain-immune system interactions* Mongin
4/7 NO CLASS - AMC Awards Day

VI. GROWTH FACTORS

4/12 *Growth Factors and Neurodegenerative Disease* Chen

VII. DEVELOPMENTAL NEUROBIOLOGY

4/14 *Cellular and Molecular aspects of Development* Ferland

4/19, 4/21 NO CLASS - SUNY Spring Break

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

4/26 *Cellular basis of learning and memory* - synaptic plasticity, habituation, sensitization Carlson
4/28 *Cellular basis of learning and memory* - LTP, LTD Carpenter

5/5 Paper due!

5/10 **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 Director:

Richard W. Keller, Jr., PhD
Center for Neuropharmacology & Neuroscience
Albany Medical College - Rm MS-134
Phone: 262-5253
eMail: kellerr@mail.amc.edu

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: Jeffrey Carlson, David Carpenter, Xiang Yang Chen, Mark Fleck, Russ Ferland, Kathy Herrick-Davis, Lindsay Hough, Richard Keller, Tara Lindsley, Joseph Mazurkiewicz, Alexander Mongin, Allan Schneider, Damian Shin, and Milt Teitler.

[December 21, 2010]