

CELLULAR AND MOLECULAR NEUROSCIENCE (2015)

From 9/2 – 12/16

Lectures/Discussion (M, W, F) will be held at 9:55 a.m. – 10:45 a.m. in Room 140 Bardeen

Problem Sets (Th) will be held at 9:55am - 10:45 a.m. in Room 140.

Date	Lecturer	Title
9/2/15	Chiu	Course introduction; resting potential
9/3/15		Action potential/patch clamping/ion channels
9/4/15		Energetics of ion channels and structure of the pore
9/07/15		LABOR DAY
9/09/15		Single-channel analysis
9/10/15		Problem set 1 (BC)
9/11/15		Molecular classification of potassium channels
9/14/15		Channel inactivation I
9/16/15		Channel inactivation II
9/17/15		Problem set 2 (BC)
9/18/15		Activation of voltage-sensitive channels
9/21/15	Lou	Synaptic transmission basic concepts
9/23/15		Presynaptic Ca ²⁺ signal and transmitter release
9/24/15		Problem set 3 (XL)
9/25/15		Quantal release
9/28/15		Vesicle recycling: exocytosis and endocytosis
9/30/15		Neural modulation of transmission
10/01/15	Jones	Binding & Gating
10/02/15		Excitatory transmission
10/05/15		Inhibitory transmission
10/07/15		Ligand-gated ion channels I: pentameric LGICs
10/08/15		Problem set 4 (MJ)
10/09/15		Ligand-gated ion channels II: Glutamate Receptors
10/12/15		Shaping of the synaptic potential
10/14/15		Dendritic Integration (temporal and spatial summation)
10/15/15		Scilab problem set and review
10/16/15		Firing Patterns & Oscillations
OCT 17- 21		Neuroscience Meeting
10/19/15		NEUROSCIENCE MEETING – no class
10/21/15		MID-TERM EXAM (in class – Chiu, Lou and Jones lectures)
10/22/15	Jones	Learning/memory, LTP/LTD, Pattern Storage & Recall
10/23/15		Hippocampal place/grid cells

10/26/15	Jones	Epilepsy I
10/28/15	Roopra	Second messengers: protein kinases & phosphatases
10/29/15		Mid-term exam, review of answers (Chiu, Lou and Jones)
10/30/15		Signaling cascades – slow modulation
11/02/15		Assembly, transport & targeting of receptors
11/04/15		Introduction to transcription regulation in the nervous system
11/05/15		Problem set 6 (AR)
11/06/15		Transcriptional activators and repressors
11/09/15		Chromatin and gene regulation
11/11/15		Activity dependent regulation of transcription
11/12/15		Problem set 7 (AR)
11/13/15		Epilepsy II
11/16/15	Fettiplace	G-protein linked receptors
11/18/15		Photoreceptors: rhodopsin and G-protein cascade
11/19/15		Problem set 8 (RF)
11/20/15		Rods and cones
11/23/15		Synaptic transmission in the retina
11/25/15		Olfaction 1
11/26/15		THANKSGIVING
11/27/15		THANKSGIVING
11/30/15		Olfaction 2/TRP channels
12/02/15		Cutaneous mechanoreceptors
12/03/15		Problem set 9 (RF)
12/04/15		Whisker mechanoreceptors; the barrel cortex
12/07/15		Hair cells
12/09/15		Hair cell frequency selectivity
12/10/15		Problem set 10 (RF)
12/11/15		Development of sensory maps
12/14/15		Final Review session (BC, XL, MJ, RF, AR)
12/16/15		FINAL EXAM (2 hours, in class, cumulative) Room 140 Bardeen from 10am to 12 pm

PLEASE NOTE:

Wednesday 10/21: MID-TERM EXAM (in class – Chiu, Lou and Jones lectures)

Wednesday 12/16: FINAL EXAM (in class – covers all lectures)

INSTRUCTORS

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EXAMS There will be two in-class exams (multiple choice format). The mid-term exam is scheduled for Oct. 21, 2015 during class time, 9:55 – 11:00 am, and will count for a third of the final grade (and will cover Chiu, Lou and Jones lectures). The final exam is cumulative and will count for two thirds of the total grade. The exam is scheduled from 10am to 12pm on Dec 16, 2015.

PROBLEM SETS These will be usually held on Thursdays and are primarily to review the material in the lectures by going through the answers to problem sets given out earlier in the week. These will not be graded but they will provide a good guide to your understanding and also to the types of questions in the exams. In a few cases, these will also be used as **DISCUSSION SETS** or to review original literature, and/or go over simulations. They are an important part of the course and attendance is required.

TEXT BOOKS

Recommended:

From Neuron to Brain JG Nicholls et al., 5th edition (2012), Sinauer Press. This edition of a classic text is a very readable account of both cellular and molecular neuroscience. Original experiments and references are cited.

Other texts and online resources:

Principles of Neural Science ER Kandel, et al. 5th edition (2012) McGraw Hill, is a comprehensive textbook of neuroscience with good chapters on the cellular and molecular topics. The book will also be useful for those taking the systems neuroscience course, Neuro 611.

Ion channels of excitable membranes B. Hille. (2001) 3rd edition, is a rigorous tome on ion channels and a good source book.

Molecular Biology of the Neuron R.W. Davis & B.J. Morris (2004) 2nd edition, OUP. Gives detailed coverage of molecular neurobiology, including material not in the course but a bit out of date.

Guide to Research Techniques in Neuroscience M. Carter and J. Shieh (2010) Elsevier <http://www.sciencedirect.com/science/book/9780123748492>. Provides basic background information on the techniques used in neuroscience.

Neuroscience Online by John Byrne <http://neuroscience.uth.tmc.edu/index.htm>

Apart from textbooks, I encourage you to read review articles. Some of these will be mentioned during the lectures and discussion sessions. However you can find reviews for yourself in the following journals: **Trends in Neurosciences** (excellent, didactic and highly recommended), **Current Opinions in Neurobiology** (very condensed and research oriented, but sub-divided into categories such as 'Signaling mechanisms', 'Development' and 'Sensory Systems'), **Nature Reviews of Neuroscience** (research oriented).