CELLULAR and MOLECULAR NEUROBIOLOGY
BIOLOGY/BIBB 251
COURSE SYLLABUS (REVISED)
FALL 2014

Lectures: Monday, Wednesday, 2:00-3:30
Room LEIDY 10

Instructors:
(MFS) Marc Schmidt (course director), 312 Leidy Labs/6018, 898-9375, marcschm@sas.upenn.edu
(MK) Mike Kaplan, Neurolab (Leidy Labs), 573-2654 mkap@sas.upenn.edu
(TEA) Ted Abel, 10-133 Translational Research Center, 746-1122, abele@sas.upenn.edu

Teaching Assistants

Chris Angelakos	can@mail.med.upenn.edu
Janani Saikamar	sjanani@sas.upenn.edu
Brendan Whitelaw	brwhit@sas.upenn.edu
Nick Trojanowski	ntroj@mail.med.upenn.edu
Lindsey Goodman	lindsey@goodman.net
Yunshu Fan	yunshuf@mail.med.upenn.edu

Required text: Nicholls, Martin, Wallace, and Fuchs: **From Neuron to Brain**, 5th Edn., Sinauer, 2012 (ISBN 978-0-87893-609-0).

Lecture notes, slides and other materials available on the class website (canvas.upenn.edu)

lecture		*date*	*topic*	*lecturer*	*readings*
1	W	Aug 27	Introduction	MFS	*TA-MK-MFS chapter 1*
			Part 1: Ion channels and the membrane potential		
2	W	Sept 3	Membrane currents and the resting potential	MK	Ch. 6
3	M	Sept 8	Action potential: macroscopic currents, Hodgkin & Huxley	MK	Ch. 7
4	W	Sept 10	Action potential: patch clamp and single channel currents	MK	Ch. 4
5	M	Sept 15	Molecular biology of ligand-gated ion channels 1	TEA	Ch. 5
6	W	Sept 17	Molecular biology of ligand-gated ion channels 2	TEA	Ch. 5
7	M	Sept 22	Cable properties	MFS	Ch. 8
	W	Sept 24	REVIEW	MK, TA, MFS	
	M	Sept 29	EXAM 1 (lectures 1-7)		
			Part 2: Synapses and synaptic plasticity		
8	W	Oct 1	Synapses 1: Four facts about neurotransmission	MK	Ch 11, 13; end of Ch. 8 (139-140)
9	M	Oct 6	Synapses 2: Presynaptic mechanisms	MK	Ch. 11, 13, and 15
10	W	Oct 8	Synapses 3: ionotropic transmission	MK, TA	Ch. 12

11	M	Oct 13	Synapses 4: metabotropic mechanisms	MK	Ch. 12
12	W	Oct 15	Synaptic plasticity 1: *Aplysia*	TA	Carew chapter 10; Kandel 2001
13	M	Oct 20	Synaptic plasticity 2: *Drosophila*	TA	Carew chapter 11
14	W	Oct 22	Synaptic plasticity 3: LTP	TA	Ch. 16
15	M	Oct 27	Synaptic plasticity 4: LTP and genetics	TA	Ch. 16, Abel 1997
16	W	Oct 29	Integration and dendritic physiology	MFS	Ch. 8 (137-141); Ch. 24 (498-501); *Paper: Magee et al. (2000).*
	M	Nov 3	EXAM 2 (Lectures 8-16)		

Part 3: Cell and molecular systems neuroscience

17	W	Nov 5	Olfaction: molecular maps	TA	Purves, Ch. 15
18	M	Nov 10	Olfaction neural mechanisms	MFS	Purves, Ch. 15; Smear et al. 2011
19	W	Nov 12	Guest lecture: Michela Gallagher*		

**(This program is made possible by a grant from the Fund to Encourage Women (FEW) of the Trustees of Penn Women)*

20	M	Nov 17	Ion channel diversity and electrical diversity	MK	Nusbaum and Beenhacker 2002
21	W	Nov 19	Glia	MFS	Ch. 9 (151-157); Ch.10; Ch 15 (305-306)
22	M	Nov 24	Information processing in the retina 1	MFS	Ch. 2 (26-29); Ch. 20 (407-431)
	W	Nov 26	NO CLASS		
		Nov 27	*Thanksgiving break (Nov. 27-30)*		
23	M	Dec 1	Information processing in the retina 2	MFS	Ch. 20 (407-431)
24	W	Dec 3	Auditory system 1	MFS	Ch. 19 (392-396);
25	M	Dec 8	Auditory system 2	MFS	Ch. 22 (453-467)
		Dec 16	**FINAL EXAM** 6-8 p.m. location T.B.A.		

REVIEW SESSIONS

EXAM 1 (Sept. 29)

Wednesday, Sept. 25	FACULTY REVIEW	2-3:30	LEIDY 10
Friday, Sept 28	TA-led REVIEW	5-6:30	GODDARD 101

EXAM 2 (Nov. 3)

Thursday, Oct. 30	TA-led REVIEW	4:30-6:00	LEIDY 10
Friday, Oct. 31	FACULTY REVIEW	3-5:00	LEIDY 10

FINAL EXAM (Dec. 16): TBA

OFFICE HOURS

Instructors:	**Time:**	**Location:**
Ted Abel	T.B.A.	204G Lynch Labs
Mike Kaplan	Wednesdays 11:30-1:30	Neurolab, Leidy Labs
Marc Schmidt	T.B.A.	312 Leidy Labs

ADDITIONAL READINGS

Abel, T., Nguyen, P.V., Barad, M., Deuel, T.A., Kandel, E.R., and Bourtchouladze, R. (1997). Genetic demonstration of a role for PKA in the late phase of LTP and in hippocampus-based long-term memory. Cell *88*, 615-626.

Fatt, P., and Katz, B. (1952). Spontaneous subthreshold activity at motor nerve endings. J Physiol *117*, 109-128.

Kandel, E.R. (2001). The molecular biology of memory storage: a dialogue between genes and synapses. Science *294*, 1030-1038.

Magee J. C. (2000) Dendritic Integration of excitatory synaptic input Nature Reviews Neuroscience 1: 181 - 190

Mombaerts, P., Wang, F., Dulac, C., Chao, S.K., Nemes, A., Mendelsohn, M., Edmondson, J., and Axel, R. (1996). Visualizing an olfactory sensory map. Cell *87*, 675-686.

Nusbaum MP, Beenhakker MP (2002) A small-systems approach to motor pattern generation. Nature 417:343-350.

Smear et al. (2011) Perception in sniff phase in mouse olfaction *Nature* **479**: 397 - 400