

**CELLULAR NEUROBIOLOGY  
BIOLOGY/BIBB 251  
COURSE SYLLABUS  
FALL 2006**

**Lectures:** Tuesday, Thursday, 10:30-12:00  
Room CHEM 102

**Instructors:** (*TEA*) Ted Abel, 204G Lynch Labs/6018, 898-5614, [abele@sas.upenn.edu](mailto:abele@sas.upenn.edu) (course director)  
(*MK*) Mike Kaplan, Neurolab (Leidy Labs), 573-2654 [mkap@sas.upenn.edu](mailto:mkap@sas.upenn.edu)  
(*LDP*) Lee Peachey, 309 Leidy Labs/6018, 898-5788, [lpeachey@sas.upenn.edu](mailto:lpeachey@sas.upenn.edu)  
(*MFS*) Marc Schmidt, 312 Leidy Labs/6018, 898-9375, [marcschm@sas.upenn.edu](mailto:marcschm@sas.upenn.edu)

**Guest Lecturer:** (*PH*) Philip G. Haydon, 422 Johnson Pav./6060, 746-6788, [pghaydon@mail.med.upenn.edu](mailto:pghaydon@mail.med.upenn.edu)

<b><u>Teaching Assistants</u></b>	<b><u>Email</u></b>
Matt Abramian	<a href="mailto:abramian@mail.med.upenn.edu">abramian@mail.med.upenn.edu</a>
Josh Hawk	<a href="mailto:hawk@mail.med.upenn.edu">hawk@mail.med.upenn.edu</a>
Rishi Kalwani	<a href="mailto:rishiki@mail.med.upenn.edu">rishiki@mail.med.upenn.edu</a>
Jon McEuen	<a href="mailto:mceuen@mail.med.upenn.edu">mceuen@mail.med.upenn.edu</a>
Rachel White	<a href="mailto:whiters@mail.med.upenn.edu">whiters@mail.med.upenn.edu</a>
Karolina Skibicka	<a href="mailto:skibicka@mail.med.upenn.edu">skibicka@mail.med.upenn.edu</a>
Josh Jacobs	<a href="mailto:jojacobs@mail.med.upenn.edu">jojacobs@mail.med.upenn.edu</a>

**Required text:** Nicholls, Martin, Wallace, and Fuchs: **From Neuron to Brain**, 4th Edn., Sinauer, 2001 (ISBN 0-87893-439-1).

**Required** lecture notes: Available at CAMPUS COPY CENTER

**Required simulation book and CD:** Moore and Stuart: **Neurons in Action CD-ROM** (ISBN 0-87893-538-X).

<b><u>WEEK</u></b>	<b><u>DATE</u></b>	<b><u>TOPIC</u></b>	<b><u>LECT.</u></b>	<b><u>READINGS</u></b>
<b><u>MEMBRANE POTENTIALS AND ION CHANNELS</u></b>				
Th	Sept 7	Equilibrium, resting, and action potentials in neurons	<i>LDP</i>	Ch. 1, 5, App. A
Tu	12	Membrane currents and voltage clamp measurements	<i>LDP</i>	Ch. 4 (61-65), Ch. 6 (91-100 top)
Th	14	Hodgkin-Huxley analysis of action potentials; voltage-gating	<i>LDP</i>	Ch. 6 (100-104 middle)
Tu	19	Patch clamp, ion channels and channel selectivity	<i>LDP</i>	Ch. 2, Ch. 6 (100-107 middle)
Th	21	Molecular biology of voltage gated ion channels	<i>TEA</i>	Ch. 3, Ch. 6
Tu	26	Molecular biology of ligand-gated ion channels	<i>TEA</i>	Ch. 3
Th	28	<b>EXAM I</b>	-----	
<b><u>SYNAPSES AND INTEGRATION</u></b>				
Tu	Oct 3	Synapses I: presynaptic mechanisms I	<i>MK</i>	Ch. 7 (129-131), Ch. 9 (156-162), Ch. 11
Th	5	Synapses II: presynaptic mechs II; intro to postsynaptic mechs.	<i>MK</i>	13
Tu	10	Synapses III: postsynaptic mechanisms II	<i>MK</i>	Ch. 9 (163-170), Ch. 10
Th	12	Passive and active conduction of potential changes	<i>MFS</i>	Ch. 7 (113-127)
Tu	17	<i>no class (SFN Meeting)</i>		
Th	19	Synaptic inhibition, integration, dendritic physiology	<i>MFS</i>	Ch. 7 (128-129); Ch. 9 (171-174), Ch. 14 (273-276)
<b>FALL BREAK (October 21-24)</b>				
Th	26	Glia: More than just glue	<i>PH</i>	Ch. 4 (66-75); Ch. 8; Haydon (2001)
Tu	31	Synaptic plasticity, learning and memory I: <i>Aplysia</i>	<i>TEA</i>	Kandel (2001)
Th	Nov 2	Synaptic plasticity, learning and memory II: LTP	<i>TEA</i>	Chapter 12

**BIOL/BBB251: Course Syllabus****SPRING 2006**

<u>WEEK</u>	<u>DATE</u>	<u>TOPIC</u>	<u>LECT.</u>	<u>READINGS</u>
Tu		7 Genes, neurons and behavior	<i>TEA</i>	Ch. 12; Abel et al. (1997)
<b>Th</b>	<b>9</b>	<b>EXAM 2</b>		
Tu		14 Ion channels and rhythmic activity	<i>MFS</i>	Marder and Bucher (2001)
<b><u>NEURAL SYSTEMS</u></b>				
Th		16 Simple network oscillators	<i>MFS</i>	Nusbaum and Beenhakker (2002)
Tu		21 Information processing in the retina	<i>MFS</i>	Ch.1, Ch. 19
<b>Th</b>	<b>23</b>	<b>THANKSGIVING</b>		
Tu		28 Information processing in the visual system	<i>MFS</i>	Ch. 20; Ch. 21 (427-431; 440-445)
Th		30 Visual system development	<i>TEA</i>	Ch. 21 (427-431; 440-445), Ch. 23 (512-520), Ch. 25 (549-567)
Tu Dec	5	Hearing and sound transduction	<i>MFS</i>	Ch. 11 (Bear, Connors and Paradiso)
Th Dec	7	Auditory processing	<i>MFS</i>	Ch. 11 (Bear, Connors and Paradiso)

**FINAL EXAM: Dec 20 (LOCATION: TBA)****COMBINED READING LIST**

<u>In Nicholls text:</u>	Chap. 1-3, all	Chap. 19-20
	Chap. 4, pp. 61-75	Chap 21, pp. 427-431 and 440-445
	Chap. 5-14	Chap. 22, pp. 447-458
	Chap. 17 (347-350)	Chap. 25
	Chap. 18, pp. 366-377	Chap. 26
		Appendix A

*Supplemental readings***Glia:**

Haydon (2001). Glia: listening and talking to the synapse. *Nature Reviews Neuroscience* 2:185-193.

**Synaptic Plasticity:**

Abel et al. (1997). Genetic demonstration of a role for PKA in the late phase of LTP and in hippocampus-based long-term memory. *Cell*, 88:

Kandel (2001). The molecular biology of memory storage: a dialogue between genes and synapses. *Science* 294(5544):1030-8.

**Motor:**

Marder & Bucher (2001). Central pattern generators and the control of rhythmic movements. *Curr. Biol* 11:R986-996.

Nusbaum & Beenhakker (2002). A small systems approach to motor pattern generation. *Nature* 417:343-50

**Auditory:**

Bear, Connors and Paradiso. Neuroscience, 3<sup>rd</sup> edition. 2007 Lippincott, Williams, and Wilkins.

**Also responsible for lecture handouts, all laboratory material and simulations, and other material handed out during the semester**

**RECITATION, LABORATORY, AND PROBLEM SET SCHEDULES**

<u>Week</u>	<u>Dates (Th → M)</u>	<u>Recitation</u>	<u>Laboratory</u>	<u>Problem Set in</u>	<u>Problem Set out</u>
1	Sept 7 – 11	Membrane pot., elect. circuits	<b>1. <i>Passive membrane, RC circuit</i></b>		1
2	Sept 14 – 18	Action potentials	<b>2. <i>Hodgkin-Huxley simulations</i></b>	1	2
3	Sept 21 – 25	Mol. bio. of ion channels	<b>3. <i>Review for Exam I</i></b>	2	3
EXAM 1: Sept 28					
4	Sept 28 – Oct 2	Ion channel structure	<b>3. <i>No lab</i></b>		
5	Oct 5 – 9	Presynaptic mechanisms	<b>4. <i>Intracellular recording I</i></b>	3	4
6	Oct 12 – 16	Postsynaptic mechanisms	<b>5. <i>Synaptic potentials</i></b>	4	5
7	Oct 19 – 23	FALL BREAK			
8	Oct 26 – 30	Spread of potentials, integration	<b>6. <i>Cable and integration</i></b>	5	6
9	Nov 2 – 6	Synaptic plasticity	<b>7. <i>Intracellular recording II</i></b>	6	7
EXAM 2: Nov 9					
10	Nov 9 – 13	Ion channels and rhythmic activity	<b>8. <i>Ion channel diversity simulations</i></b>	7	8
11	Nov 16 – 20	Visual system	<b>9. <i>Intracellular recording III</i></b>	8	9
12	Nov 23 – 27	THANKSGIVING			
13	Nov 30 – Dec 4	Auditory system	<b>10. <i>lab write up due</i></b>	9	
FINAL EXAM: Dec 20					

**COVERAGE OF MATERIAL ON EXAMS**

<u>EXAM</u>	<u>Date</u>	<u>Lecture dates</u>	<u>Recitation weeks</u>	<u>Problem sets</u>
EXAM I	Sept 28	Sept 7 – Sept 21	1 - 3	1 - 2
EXAM II	Nov 9	Sept 26 – Nov 2	4 - 9	3 - 6
EXAM III	Dec 20	Nov 7- Dec 7	10-13	7 - 9
FINAL	Dec 20	all	all	all

**REVIEW SESSIONS, LEIDY LABS Room 10**

**Exam I (Sept 28)**

Monday	Sept 25	5 – 6	Faculty
Wednesday	Sept 27	5 – 6	TAs

**Exam III/Final (Dec 20)**

Friday	Dec 15	4 – 5	Fac
Monday	Dec 18	5 – 6	TAs

**Exam II (Nov 9)**

Monday	Nov 6	5 – 6	Faculty
Wednesday	Nov 8	5 – 6	TAs

**OFFICE HOURS**

**Instructors:**

Ted Abel  
 Mike Kaplan  
 Lee Peachey  
 Marc Schmidt

**Time:**

Monday, 2-4 pm; Thursday 2:30-4 pm  
 Monday, 1-2 pm  
 Tuesday 12 to 2 pm & Wednesday 11 to 1 pm  
 Wednesday 1 to 3 pm

**Location:**

B28 Solomon  
 Neurolab  
 309 Leidy Labs  
 312 Leidy Labs

**Lunches with faculty** at the Penn Faculty Club (Inn at Penn)

*(Meet after class on Tuesdays, or at the Inn at Penn on Wednesdays)*

Tuesday	October 3
Wednesday	October 25
Tuesday	November 14
Wednesday	December 6