

## BIOLOGY 641-002: SYSTEMS NEUROSCIENCE

<b>INSTRUCTOR:</b>	Dr. Farzan Nadim	<b>EMAIL:</b>	<a href="mailto:farzan@njit.edu">farzan@njit.edu</a>
<b>OFFICE:</b>	Central King Bldg.	<b>OFFICE HOURS:</b>	T, R: 9:00AM - 10:00AM
<b>COURSE SCHEDULE:</b>	T, R: 10:00AM – 11:25AM ▪ CKB 217	<b>COURSE WEBSITE:</b>	<a href="http://moodle.njit.edu/">http://moodle.njit.edu/</a>

**COURSE DESCRIPTION:** This course will examine neurophysiological phenomena from the systems perspective. After reviewing the basic concepts of cellular neuroscience such as excitability, impulse conduction, we focus on the integration of activity at the network level. The goal is to provide the basic knowledge to understand neurobiological processes at the systems level.

### TEXTBOOK:

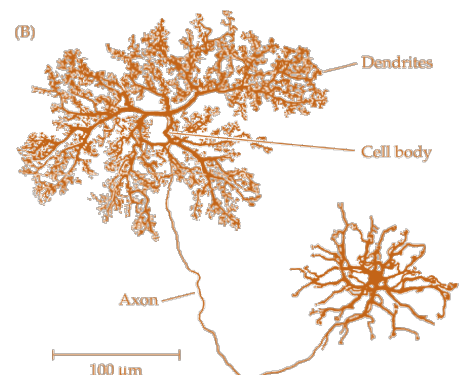
- ⊕ Neuroscience (Fifth Edition); Dale Purves, et al Editors, Sinauer Associates © 2012; **eText:** ISBN-10: 0-87893-587-8, ISBN-13: 978-0-87893-587-1; **Print:** ISBN-10: 0-87893-695-5, ISBN-13: 978-0-87893-695-3.

### LEARNING OUTCOMES:

1. Describe the cellular structure of the nervous system and the general organization of the central and peripheral nervous system
2. Understand the electrical properties of neurons and how action potentials are generated and propagate along axons
3. Describe the mechanisms of neural interaction through synaptic transmission
4. Describe the principles of sensory transduction
5. Describe the principles of motor function
6. Understand how neural networks can lead to the production of sensory perception, motor behavior and higher level functions such as learning and memory
7. Describe the development of the nervous system and the basic principles of neural plasticity
8. Understand how to choose and review a scientific topic

### IMPORTANT RULES AND COURSE POLICIES:

- ⊕ **Academic Integrity:** The [Academic Integrity Code](#) strictly enforced!
- ⊕ **Electronic Devices:** The use of cell phones and other electronic devices during class or exam times is prohibited.
- ⊕ **Make-Up Exams and Quizzes:** There will be no make-up exams or quizzes. Students who miss an exam due to a valid medical excuse will need to provide a doctor's note. The grade of any missed exam resulting from a verifiable valid excuse will be determined on a case-by-case basis. Any missed exam or quiz, with a valid excuse, will be calculated based on the student performance in other quizzes and exams.

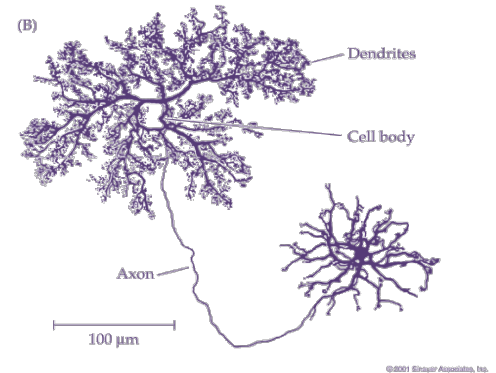


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**GRADING POLICY:** The final grade in this course is determined as follows:

COMPONENT	PERCENTAGE
Quizzes:	18%
Midterm Exams I:	20%
Midterm Exam II:	20%
Paper/Presentation:	20%
Final Exam:	22%
<b>TOTAL:</b>	<b>100%</b>

GRADE SCALE:	
A	93-100
B+	84-92
B	75-83
C+	67-74
C	60-66
F	0-59



**REVIEW PAPER:**

Each student will write a paper during the semester based on a topic related to Systems Neuroscience.

- ⊗ A topic statement of <150 words is due on **Sunday, April 3**. The draft must include Title and Author and a brief description of the topic.
- ⊗ A draft version will be due on **Sunday, April 17**. Submit the files electronically on Moodle in Word format (NOT pdf). The draft must include Title and Author, draft Summary (abstract) and highlights of the sections in the Body (see the final version instructions below) and a brief bibliography (at least 5 references). In addition, attached as an Appendix, the draft should include a 150-250 word summary of at least three scientific research papers on this topic. These summaries may be in bullet-point format.
- ⊗ The final version will be due on **Sunday, May 1**. Submit the files electronically on Moodle in Word format (NOT pdf). The paper should consist of:
  - Title and Author
  - Summary (max 200 words)
  - Introduction (Significance and Background)
  - Body (divided into sections)
  - Conclusions
  - References (no web page references allowed)

There will be a maximum of 2,500 words (including all the above sections except references). Papers must be submitted via *Turnitin*.

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**COURSE OUTLINE:**

WEEK	DATES	TOPICS
1	Jan. 19 & Jan. 21	Basic Properties of Neurons / The Membrane Potential
2	Jan. 26 & Jan. 28	The Resting Membrane, Ion Channels and Transporters
3	Feb. 2 & Feb. 4	Action Potentials; The Hodgkin-Huxley Formalism; Propagation; <b>QUIZ 1</b>
4	Feb. 9 & Feb. 11	Synaptic Transmission, Excitation and Inhibition
5	Feb. 16 & Feb. 18	Neurotransmitters and Receptors; <b>MIDTERM EXAM 1</b>
6	Feb. 23 & Feb. 25	Synaptic Plasticity; Functional Organization of the Nervous System
7	Mar. 1 & Mar. 3	Somatic Sensory System: Touch and Proprioception; Pain
8	Mar. 8 & Mar. 10	Vision: the Eye and Transduction of Light ; Central Visual Processing; <b>QUIZ 2</b>
9	Mar. 15 & 17	<b>SPRING BREAK – MARCH 13-20, 2016</b>
10	Mar. 22 & Mar. 24	The Auditory System: the Ear & Transduction of Sound; Central Auditory Processing
11	Mar. 29 & Mar. 31	The Olfactory System); <b>MIDTERM EXAM 2</b>
12	Apr. 5 & Apr. 7	Lower Motor Systems; Upper Motor Systems
13	Apr. 12 & Apr. 14	Development of the Nervous System (Dr. Friedman); Basal Ganglia (Dr. Koos)
14	Apr. 19 & Apr. 21	Central Pattern Generation; Sleep 1
15	Apr. 26 & Apr.28	Sleep 2; Learning and Memory
16	May 3	Classes Follow a <b>Friday</b> schedule on Tuesday- <b>NO CLASSES</b>
<b>FINALS</b>		<b>FINAL EXAM WEEK: MAY 6-12, 2016</b>