Biology 375 : Cellular Neurobiology
Fall, 2018

Course Description: This course will provide students with an overview of the major functional and structural features of neurons, with special attention to the cellular mechanisms of electrical excitability and the processes of chemical signaling and signal transduction that lead to complex processing by nervous systems and complex behavior in animals.

Students completing this course will be able to:

- explain how ion channels and the electromotive forces for ion diffusion produce resting potentials and action potentials in neurons
- demonstrate understanding of the concepts and major facts regarding the synthesis, storage, release, and removal of neurotransmitters
- explain the differences between ionotropic and metabotropic receptors, in terms of how they function at a molecular level and how they affect neuronal excitability
- demonstrate understanding of how neurons can assemble into functional circuits by means of their synaptic interconnections, transmitter receptors, and ion channels

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Office Hours: Monday, 1:00 – 2:00; Wednesday, 2:00 – 3:00; Thursday, 11:00 – 12:00

Class Meetings: Monday, Wednesday & Friday, 10:30 – 11:20 a.m., in ISC 115

Required Course Texts: Nicholls et al. (2012) From Neuron to Brain, 5th ed. Sinauer Associates.
Moore & Stuart (2007) Neurons in Action, version 2. Sinauer Associates

Schedule of Topics (Tentative)

Date		**Topic of Discussion**
M Aug	27	Introduction & Overview; Principles of Signaling in the Brain (Chapter 1)
W	29	More Principles of Signaling in the Brain (Chapter 1)
F	31	Cytology of the Nervous System
M Sept	3	*Labor Day – No Class!*
W	5	Ionic Basis of the Resting Potential (Ch. 6)
F	7	Ionic Basis of the Resting Potential, cont'd (Ch. 6)
M	10	Ionic Basis of the Action Potential (Ch. 7)
W	12	Ionic Basis of the Action Potential, cont'd (Ch. 7)
F	14	Electrical Signaling in Neurons (Ch. 8)

M		17	Electrical Signaling in Neurons, cont'd (Ch. 8)
W		19	Ion Transport across Cell Membranes (Ch. 9)
F		21	Ion Transport, cont'd (Ch. 9)
M		24	Voltage-sensitive Ion Channels (Ch. 5)
W		26	Voltage-sensitive Ion Channels, cont'd (Ch. 5)
F		28	Mechanisms of Direct Synaptic Transmission (Ch. 11)
M	Oct	1	Direct Synaptic Transmission, cont'd (Ch. 11)
W		3	Ligand-gated Ion Channels (Ch. 5)
F		5	Ligand-gated Ion Channels, cont'd (Ch. 5)
M		8	*Fall Break – No Class!*
W		10	Mechanisms of Neurotransmitter Release (Ch. 13)
F		12	Neurotransmitter Release, cont'd (Ch. 13)
M		15	Neurotransmitter Release, cont'd (Ch. 13)
W		17	Indirect Mechanisms of Synaptic Transmission (Ch. 12)
F		**19**	**Exam 1 (through material on Oct. 12th)**
M		22	Indirect Synaptic Transmission, cont'd (Ch. 12)
W		24	Indirect Synaptic Transmission, cont'd (Ch. 12) *Term paper topics due today!*
F		26	Neurotransmitters in the Central Nervous System (Ch. 14)
M		29	Neurotransmitters in the CNS, cont'd (Ch. 14)
W		31	Neurotransmitter Synthesis and Storage (Ch. 15)
F	Nov	2	Transmitter Synthesis and Storage, cont'd (Ch. 15)
M		5	Properties and Functions of Neuroglia (Ch. 10)
W		7	Properties and Functions of Neuroglia (Ch. 10)
F		9	Synaptic Plasticity (Ch. 16)
M		12	Synaptic Plasticity, cont'd (Ch. 16)
W		14	Synaptic Plasticity, cont'd (Ch. 16)
F		16	Cellular Mechanisms of Behavior (Ch. 18)
M		19	Mechanisms of Behavior, cont'd (Ch. 18)
W		21	*Thanksgiving Holiday – No Class!*
F		23	*Thanksgiving Holiday – No Class!*
M		26	Mechanisms of Behavior, cont'd (Ch. 18)
W		28	Vertebrate Reflexes & Coordinated Movements (Ch. 24)
F		30	Vertebrate Reflexes and Coordinated Movements, cont'd (Ch. 24)

M	Dec 3	Vertebrate Reflexes and Coordinated Movements, cont'd (Ch. 24)
W	5	Development of the Nervous System (Ch. 25)
F	7	Neural Development, cont'd (Ch. 25)
		Term papers due today!
M	10	Neural Development, cont'd (Ch. 25)

R Dec 13 Final exam! 3:30 - 6:00 p.m., ISC 115

Evaluation:	Exams	60%
	Term paper	30%
	Homework	10%

Term paper: An analytical review paper on some topic of your own interest within the course, 6 to 9 pages in length (double-spaced, with 1" margins). More details will be provided shortly.

Homework:. There will be a number of homework exercises for you to carry out using the Neurons in Action program. You will have a week to complete each exercise. There will also be several assignments to read journal articles having significant conceptual value and/or historical interest. Along with each reading will come a set of homework questions. You will have a week to read each paper and answer the questions.

Accommodations: SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. Students should contact Dean Buggie-Hunt in the Office of Disability Services (tbuggieh@geneseo.edu or 585-245-5112) and their faculty to discuss needed accommodations as early as possible in the semester.