BIOLOGY 4752 - NEUROBIOLOGY II
2025 Serial

1. Instructor. Dr. Robert J. Omeljaniuk, CB-4013, (ext 8236)

2. Intent. To provide senior undergraduate students with an opportunity to study selected aspects of neurobiology in a directed study approach.

3. Marking Scheme. 10 Assignments valued at 10 final marks each = 100 final marks. Assignments are due as indicated; late assignments will not be accepted. In the event of extenuating circumstances students are encouraged to request extensions on an individual basis in writing. **Assignments are to be submitted into the Assignment box no later than 1200 hrs on the Friday of the Assignment Deadline week**.

4. Execution.

a. General. Students will be assigned specific readings from the course textbook and will be prepared to discuss the subject matter and any difficulties they may have with it in group discussion on a weekly basis. **Attendance at coordination and discussion meetings is required.** Students' comprehension and mastery of the material will be evaluated on the basis of assignments submitted no later than one week following discussion of the subject matter. Answers to assigned questions may take any neatly presented format including text, figures and tables submitted as a hard copy; paragraph and short-essay answers supported by diagrams of the student's own design will be most appropriate.

b. Tentative Outline.

Serial	Chapter #	Chapter Title	Discussion Date (week of)	Assignment Deadline (week of)
1	17	Sensory Coding	06 Jan	13 Jan
2	18	Receptors of the Somatosensory System	13 Jan	20 Jan
3	19	Touch	20 Jan	27 Jan
4	21	The Constructive Nature of Visual Processing	27 Jan	03 Feb
5	22	Low-level Visual Processing: the Retina	03 Feb	10 Feb
6	23	Intermediate-level Visual Processing and Visual Primitives	10 Feb	17 Feb Reading Week
7	24	High-level Visual Processing: From Vision to Cognition	17 Feb Self-Study	24 Feb
8	26	Auditory Processing by the Cochlea	24 Feb	03 Mar
9	28	Auditory Processing by the Central Nervous System	03 Mar	10 Mar
10	29	Smell and Taste: the Chemical Senses	10 Mar	17 Mar

5. Textbook.

Principles of Neural Science (5th ed). E.R. Kandel, J.H. Schwartz, T.M. Jessell, S.A. Siegelbaum, and A.J. Hudspeth. McGraw-Hill. New York. 1709 pp. 2013. ($188.95 @ Amazon.ca).

NOTE: Answer lengths quoted are exclusive of diagrams and tables submitted in support.

Assignment 1.

1. Consider how stimuli are represented in the nervous system by the firing patterns of neurons. (Limit 5.0 pp; 5.0 marks).

2. Consider the means by which central nervous system circuits refine sensory information. (Limit 4.0 pp; 5.0 marks).

Assignment 2.

1. Describe the diversity, operation, and specificity of the receptors associated with somatic sensations and the diversity of somatosensory nerve fibres. (Limit 8.0 pp; 8.0 marks).

2. Consider the entry of somatosensory information into the central nervous system via spinal and cranial nerves. (Limit 2.0 pp; 2.0 marks).

Assignment 3.

1. Use the mechanoreceptors of the hand as a model of study and consider their structures, distributions, operations, and specific sensitivities to tactile modalities including a discussion of receptor adaptation. (Limit 6.0 pp; 5.0 marks).

2. Consider the propogation and final destinations of two tactile sensory modalities with the central nervous system.Provide a thoughtful analysis of the processing of specific tactile modalities within the brain (Limit 6.0 pp; 5.0 marks).

Assignment 4.

1. Review visual processing in the geniculostriate pathway. (Limit 2.0 pp; 2.0 marks).

2. Consider the propogation of visual information from the retina to the visual cortex and processing of visual form, color, motion, and depth in the cerebral cortex. (Limit 2.0 pp; 2.0 marks).

3. Discuss the structural organization of the visual cortex as well as the inherent pathways for processing specific visual information. (Limit 6.0 pp; 6.0 marks).

Assignment 5.

1. Describe the structure and operation of retina photoreceptors. (Limit 6.0 pp; 6.0 marks).

2. Discuss retinal structural and functional architecture and visual signal output to the optic nerve. (Limit 4.0 pp; 4.0 marks).

Assignment 6.

1. Define and discuss cortical areas and pathways associated with intermediate level processing. (Limit 2.0 pp; 2.0 marks).

2. Describe how object shape (and movement) is analyzed and defined. (Limit 4.0 pp; 4.0 marks).

3. Describe the relationship among cortical connections, functional architecture, and perception. (Limit 3.0 pp; 4.0 marks).

Assignment 7.

1. Define the role of the inferior temporal cortex in object perception. In particular consider the pathways involved in object recognition. (Limit 3.0 pp; 4.0 marks).

2. Consider the relationship between object perception and recognition. (Limit 3.0 pp; 3.0 marks).

3. Discuss the role of visual memory in conception of the visual image. (Limit 3.0 pp; 3.0 marks).

Assignment 8.

1. Define the structures of the inner ear to the level of cell placement. (Limit 6.0 pp; 5.0 marks).

2. Describe the mechano-electrical substrates of sound transduction into auditory neural signals. (Limit 6.0 pp; 5.0 marks).

Assignment 9.

1. Define the pathways (cytology, histology, and operation) and final cortical destinations of auditory signals. (Limit 5.0 pp; 5.0 marks).

2. How does the superior olivary complex differentiate interaural time and intensity. (Limit 4.0 pp; 4.0 marks).

3. What is the role of the inferior colliculus in passage of auditory information in the auditory cortex. (Limit 4.0 pp; 2.0 marks).

Assignment 10.

1. Describe the structure, operation and geographic localization of olfactory receptors. (Limit 5 pp; 5 marks).

2. Define the pathways and final destinations of olfactory information. (Limit 3 p; 5 marks).

3. OPTIONAL BONUS. Define the structures associated with and operation of the gustatory system. (5 marks).