BIOLOGY 4752 - NEUROBIOLOGY II
2017 Serial

1. Instructor. Dr. Robert J. Omeljaniuk, CB-4013, 343-8236

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. All assignments must be credibly completed; in the event a student completes the course with a mark between 40 and 49 %, they will be eligible to apply for a Special Exam to be arranged with Lakehead University Scheduling. The examination will cover the entire course material and the examination mark will take the place of the course mark.

b. Tentative Outline.

Serial	Chapter #	Chapter Title	Discussion Date (week of)	Assignment Deadline (week of)
1	21	Sensory Coding	09 Jan	16 Jan
2	22	The Somatosensory System: Receptors and Central Pathways	16 Jan	23 Jan
3	23	Touch	23 Jan	30 Jan
4	25	The Constructive Nature of Visual Processing	30 Jan	06 Feb
5	26	Low-level Visual Processing: the Retina	06 Feb	13 Feb
6	27	Intermediate-level Visual Processing and Visual Primitives	13 Feb	20 Feb
7	28	High-level Visual Processing: Cognitive Influences	Self Study	27 Feb
8	30	The Inner Ear	27 Feb	06 Mar
9	31	The Auditory Central Nervous System	06 Mar	13 Mar
10	32	Smell and Taste: the Chemical Senses	13 Mar	20 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.

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

Assignment 1.

1. Discuss and explain the mathematical relationship between the physical properties of stimuli and resultant sensations. (Limit 4.0 pp; 3.0 marks).

2. Explain how differential physical stimuli are quantitatively encoded into sensory signals. (Limit 6.0 pp; 5.0 marks).

3. Describe the geographic specificity of "modality-specific" sensory pathways. (Limit 4.0 pp; 2.0 marks).

Assignment 2.

1. Describe the diversity, operation, and specificity of the receptors associated with somatic sensations. (Limit 7.0 pp; 5.0 marks).

2. Consider the propogation of diverse somatosensory information from just before entry into the spinal cord to its receipt in the appropriate Brodman areas of the somatosensory cortex. Include a thoughtful consideration of the organization and role of the thalamus (see: Chapter 16). (Limit 6.0 pp; 5.0 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. (Limit 6.0 pp; 5.0 marks).

2. Provide a thoughtful analysis of the processing of specific tactile modalities within the brain (Limit 4.0 pp; 4.0 marks).

3. Provide an accurate and concise summary statement onthe dissociation of touch processing from the tonotopic model to an abstract construct. (Limit 1.0 pp; 1.0 marks).

Assignment 4.

1. Clearly define the three types of visual processing in terms of optical phenomena (ie. form, color, motion, and depth), location of processing and results at each level. (Limit 2.0 pp; 2.0 marks).

2. Carefully trace and discuss the movement of optical information within and from the retina to the visual cortex. Your discussion needs to include a consideration of receptive fields. (Limit 3.0 pp; 3.0 marks).

3. Describe the organization of the visual cortex and differential passage of visual signals through it. (Limit 4.0 pp; 5.0 marks).

Assignment 5.

1. Describe the structure and operation of retina photoreceptors. (Limit 4.0 pp; 4.0 marks).

2. Discuss retinal structural and functional architecture and visual signal output to the optic nerve. (Limit 4.0 pp; 5.0 marks).

3. Provide a summary statement on light adaptation in the retina. (Limit 2.0 pp, 1.0 marks).

Assignment 6.

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

2. Describe how object shape 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 and final cortical destinations of auditory signals. (Limit 4.0 pp; 4.0 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).