FA

BIOLOGY 4751 - NEUROBIOLOGY I
2015 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.

Submitted assignments. 9 X 10 marks = 90 final marks (Prorated to 100 final marks).

4. Execution.

a. General.

(1) 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 discussions on a weekly basis.

(2) 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. Page limits refer to narrative and not to figures or tables; assignment answers exceeding page limits will not be marked. In many cases, the preparation of an answer will require sourcing information from several sections of the textbook.

(3) All assignments must be credibly completed; **class attendance is mandatory**. 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, which covers all course material, to be arranged with Lakehead University Scheduling. Students' term marks will be prorated to 50% of the course mark; the Special Exam will be valued at 50% of the final mark. **Assignments are due no later than 1200 hrs on the Friday of the week identified in the Tentative Outline below and are to be submitted into the appropriate assignment box on the third floor of the Biology area of the Centennial Building.**

b. Tentative Outline.

Serial	Chapter #	Chapter Title	Discussion Date (week of)	Assignment Deadline (week of)
1	15	The organization of the central nervous system.	14 Sep	21 Sep
2	52	Patterning the nervous system.	21 Sep	28 Sep
3	53	Differentiation and survival of nerve cells.	28 Sep	05 Oct
4	54	The growth and guidance of axons.	05 Oct	12 Oct
5	55	The formation and elimination of synapses.	12 Oct	19 Oct
6	56	Experience and the refinement of synaptic connections.	19 Oct	26 Oct
7	57	Repairing the damaged brain	26 Oct	02 Nov
8	58	Sexual differentiation of the nervous system.	02 Nov	09 Nov
9	59	The aging brain.	09 Nov	16 Nov

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.

Assignment 1.

1. Describe and discuss the structures and organization of the central nervous system. (3 p. narrative limit; 3 final marks).

2. Identify and describe the organizational principles shared by the major functional systems. (2 p. narrative limit; 2 final marks).

3. Describe and discuss the gross- and fine-structure of the cerebral cortex as well as the nuclear-basis for organization of subcortical regions. (5 p. narrative limit; 5 final marks).

Assignment 2.

1. Describe and discuss the neural tube from its earliest formation to its differentiation and regionalization in the context of tissue formation and movements. (2 p. narrative limit; 1 final marks).

2. Discuss rostrocaudal differentiation of the neural tube from the perspective of cell and tissue differentiation/migration and the signaling factors and mechanisms involved. (4 p. narrative limit; 3 final marks).

3. Consider the signaling factors/tissue movements associated with dorsoventral patterning of the neural tube. (3 p. narrative limit; 2 final marks).

4. Describe how subclasses of local neurons are derived. (3 p. narrative limit; 2 final marks).

5. Describe the factors influencing the development and differentiation of the forebrain. (2 p. narrative limit; 2 final marks).

Assignment 3.

1. Explain the factors/signaling mechanisms which direct the fate of ectodermal cells either into neurons, or, glial cells. (2 p. narrative limit; 2 final marks).

2. Consider the influences and roles that glial cells have on the migration of neurons and neural crest cells. (3 p. narrative limit; 3 final marks).

3. What determines a neuron's neurotransmitter phenotype. (2 p. narrative limit; 2 final marks).

4. Discuss the origin and roles(s) of neurotrophic factors which contribute to neuron survival. (2 p. narrative limit; 3 final marks).

Assignment 4.

1. Comment on differences in molecular properties in the early development of axons and dendrites. (1 p. narrative limit; 2 final marks).

2. Describe the basis for growth cone projection and directionality. (3 p. narrative limit; 3 final marks).

3. Carefully describe the structures/signaling associated with visual ganglion cell projection. (3 p. narrative limit; 3 final marks).

4. Consider trans-spinal cord migration of neurons. (1 p. narrative limit; 2 final marks).

Assignment 5.

1. Describe the mechanisms underlying the formation of specific synapses. (2 p. narrative limit; 3 final marks).

2. Consider the mechanisms associated with synaptic differentiation. (4 p. narrative limit; 4 final marks).

3. Compare and contrast the development of CNS-synapses with that of the neuromuscular junction. (3 p. narrative limit; 3 final marks).

Assignment 6.

1. Consider the effects of postnatal activity on development of binocular circuits in the visual cortex. (3 p. narrative limit; 3 final marks).

2. Describe and discuss alterations in synaptic connections associated with reorganization of visual circuits during the "critical period". (2 p. narrative limit; 3 final marks).

3. Discuss the influence of circuit activity in the refinement of circuit connectivity in the CNS. (3 p. narrative limit; 4 final marks).

Assignment 7.

1. Consider the effects of physical "insult" to a neuron and comment on why CNS axons regenerate poorly after injury. (2 p. narrative limit; 3 final marks).

2. Discuss the means by which some therapeutic interventions might promote regeneration of compromised CNS neurons. (3 p. narrative limit; 4 final marks).

3. Can new neurons arise in the brain consequent to injury? (1 p. narrative limit; 3 final marks).

Assignment 8.

1. Describe and discuss the factors which contribute to the physical differentiation of males and females. (2 p. narrative limit; 3 final marks).

2. Consider the sexual differentiation of the brain and development of sexually dimorphic behavior. (2 p. narrative limit; 3 final marks).

3. Discuss relationships between sexual dimorphism of specific brain areas and gender identity and sexual orientation. (2 p. narrative limit; 4 final marks).

Assignment 9.

1. Describe the typical changes in structure and function of the brain associated with aging. (3 p. narrative limit; 4 final marks).

2. Describe the structural changes in the brain at the organ, tissue, and cellular level associated with Alzheimer's Disease. (4 p. narrative limit; 6 final marks).