

## **NEUR 461: Cellular and Molecular Mechanisms of Neurodegenerative Disorders**

### **Syllabus**

Term: Fall 2020

Monday 1:30 pm – 2:45 pm (Online, Synchronous)

plus weekly asynchronous video/lecture material

Instructor: Dr. Shahrnaz Kemal

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Office hours: Online, by appointment

#### **Description:**

Neurodegenerative disorders have devastating consequences and limited treatment options. Alzheimer's alone is the sixth leading cause of death in the United States. Understanding the basic biology of these disorders is at the heart of disease treatment and prevention. This course is designed to familiarize students with neurodegenerative disorders such as Alzheimer's, Parkinson's, Amyotrophic Lateral Sclerosis, spinal cord injury, and others. The focus will be on cellular and molecular mechanisms and to appreciate how our understanding of these influences diagnostic and therapeutic approaches.

This interactive course is intended for advanced undergraduate students or graduate students with the appropriate prerequisites in Neuroscience, Cell Biology, and Biochemistry. It is an in-depth seminar-style course comprising asynchronous lectures in addition to synchronous discussions and student presentations. The emphasis will be on learning through the primary literature. Students should come prepared to discuss the assigned readings, which will include review articles, research articles, and popular science in the news.

#### **Course objectives:**

By the end of this course, students will:

1. Develop an understanding of common neurodegenerative disorders.
2. Become aware of the medical, social, and economic impact of such disorders.
3. Be able to draw comparisons between cellular and molecular mechanisms of different disorders.
4. Better understand how basic scientific research leads to drug discovery and treatment.
5. Improve their ability to critically read, evaluate, and present primary research articles.

**Topics:**

- Neuronal cell biology as it relates to neurodegeneration
- Overview of neurodegenerative diseases
- Protein misfolding and aggregation
- Autophagy and apoptosis
- Axonal transport
- Neuroinflammation
- Alzheimer's disease
- Prion diseases
- Traumatic brain injury and Chronic traumatic encephalopathy
- Parkinson's disease
- Huntington's disease
- Amyotrophic Lateral Sclerosis
- Spinal Cord Injury
- Multiple sclerosis

**Schedule:**

Week	Date	Synchronous (Monday 1:30 pm - 2:45 pm)	Asynchronous
1	8/24/2020	Course Introduction	Neuronal cell biology
2	8/31/2020	Neuronal cell biology & Discussion	Neurodegenerative disorders intro
3	9/7/2020	<b>No class (Labor Day)</b>	Alzheimer's
4	9/14/2020	Instructor presentation & Discussion	Alzheimer's
5	9/21/2020	Student presentation & Discussion	Alzheimer's
6	9/28/2020	Student presentation & Discussion	Prion diseases
7	10/5/2020	Student presentation & Discussion	Traumatic Brain Injury and CTE
8	10/12/2020	<b>No class</b>	Parkinson's
9	10/19/2020	Student presentation & Discussion	Parkinson's
10	10/26/2020	Student presentation & Discussion	Huntington's
11	11/2/2020	Student presentation & Discussion	Amyotrophic Lateral Sclerosis
12	11/9/2020	Student presentation & Discussion	Spinal cord injury
13	11/16/2020	Student presentation & Discussion	Spinal cord injury
14	11/23/2020	Student presentation & Discussion	Multiple Sclerosis
15	11/30/2020	Student presentation & Discussion	<b>No asynchronous session</b>

**Readings:**

Reading material will be posted on Blackboard. Readings will include scientific review articles, primary research articles, book chapters and excerpts, and news articles. Students should complete the assigned reading before the synchronous class discussion and presentations.

**Grading / Assessment:**

	<b>Points</b>
Write-ups	40
Presentations	30
In-class assignments	10
Class participation	10
Assigned questions	5
Synchronous Attendance	5

**Write-ups:**

A one-page write-up summarizing and evaluating each of the assigned research articles will be due on the Sunday before the corresponding synchronous class presentation and discussion. Students presenting the article are not required to submit a write-up.

**Presentations:**

A major component of this course is student presentations of the assigned research articles. These will be ~40 minutes long. Over the course of the semester, each student can expect to give two presentations with a partner.

**In-class assignments:**

Throughout the semester, short in-class assignments will be completed. These will be in the form of questionnaires, assessments, quizzes, activities, etc. The purpose of the in-class assignments is to gauge student understanding of the reading and lecture material.

**Class participation and Assigned questions:**

Students will be given points for participating in discussions based on the assigned readings and other material relevant to the course. In addition, for each research article presentation, students will be assigned to bring prepared questions for the presenters. Each student will be given this assignment for two different research article presentations.

**Synchronous attendance:**

This course has 13 synchronous sessions. Full attendance of each synchronous session is worth half a point. Hence it is possible to obtain 1.5 bonus points for attending all the sessions.