Cellular and Molecular Neuroscience

Instructor: Thomas Kuhn, 907-474-5752, tbkuhn@alaska.edu
Department of Chemistry and Biochemistry
Reichardt Building Room 184

Lecture: MWF 11:45 am – 12:45 pm (YES, you can bring your lunch)

Office Hours: immediately following lecture or arrange via phone/email

Textbooks: either one of the three text books will be adequate for the course

- From Molecules to Networks: An Introduction to Cellular and Molecular Neuroscience (3rd Edition, 2014); Academic Press **ISBN-13:** 978-0123971791 or **ISBN-10:** 0123971799
  John H. Byrne, Ruth Heidelberger, M. Neal Waxham;

- From Neuron to Brain (5th Edition); Sinauer Associates
  John G. Nicholls et al, **ISBN-13:** 978-0878936090 or **ISBN-10:** 0878936092

- Neuroscience (5th Edition); Sinauer Associates
  Dale Purves et al., **ISBN-13:** 978-0878936953 or **ISBN-10:** 0878936955

Additional Reading: scientific research articles and review articles (PDF via Blackboard)
Handouts provided in class

Course Description (modified from catalogue)
Neuroscience is a complex discipline integrating concepts of chemistry, physics, biochemistry, cell biology, pharmacology, physiology, anatomy, and psychology. The goal of this course is to provide both undergraduate and graduate students a comprehensive foundation of the cellular and molecular concepts governing the function and communication of the developing and adult nervous system ultimately forming complex behaviors such as learning and memory. Topics addressed will include membrane excitability, ion channel function, G protein signaling, synaptic transmission, development of the nervous system and innervation patterns,

Course Goals:
- Acquire the foundation of the cellular and molecular concepts governing neuronal communication
- Understand how cellular and molecular concepts integrate into complex behaviors
- Appreciate parallels between development and plasticity of neuronal interconnectivity
- Acquire the ability to critically evaluate scientific research articles in cellular, molecular, and developmental neuroscience

Learning Outcomes:

- To understand membrane potential and excitability
- To understand neuronal action potentials
- To understand synaptic transmission
- To understand structure/function aspects of voltage and ligand-gated ion channels
- To understand G protein signaling
- To understand early brain development (gastrulation, neurulation)
- To understand cellular adhesion and neuronal process outgrowth
- To understand basic techniques and experimental approaches in cellular and molecular neuroscience.

Course Structure:
This course will be composed of lectures (approximately 70%), discussions (approximately 20%) of relevant research articles, and presentations (approximately 10%) for graduate students only. The suggested textbooks serve as a basic reference. Being prepared for discussion is essential hence preparation and reading of material is critical. **Blackboard** will be utilized as a central communication platform for announcements, posting of lectures and reading material, and distribution/collection of exams. It is assumed that every student is frequently visiting blackboard to check for announcements as well as email notifications.

Graduate students are expected to take the lead in participation and discussion of primary research articles. Each graduate student will have to present one research article or portion of an article during the semester (~10 to 15 min). At the end of the semester, each graduate student will present (~ 30 min Power Point) on a contemporary topic in cellular, molecular, or developmental neuroscience to provide additional knowledge to topics previously addressed in the course

All students will maintain a portfolio of short summaries/reviews pertinent to topics discussed in class. This portfolio will serve as an on-going homework assignment over the course of the semester.

Cell phones are turned off silenced answering in emergencies only via permission of instructor authorized use by instructor NO texting/calling

Course Policies:

Attendance: Regular attendance is expected to ensure consistency in discussions and presentations. Active student participation is essential and will be accounted for in the final grade (5%). If you are unable to attend class, you should contact the instructor in advance.

Exams: Two exams will be given including one midterm and one final exam (see grading for details). These exams will be a combination of in-class and take-home and consist primarily of essay questions. Graduate student-led discussions and end-of-semester presentation will be graded using a rubric (posted on blackboard). Students are encourage to make an appointment to discuss the outline of their presentation. Importantly, ***makeup exams*** will only be allowed with pre-approval of the instructor or with an acceptable, documented reason such as unexpected illness, family

emergencies or other unavoidable events. The format of a make-up exam could vary from the original. Alternatively, an oral exam may also substitute if acceptable with student.

Presentations: Graduate students will receive adequate preparation time for all oral assignments including research article discussions and end-of-semester presentation. Scoring of presentations will be performed using a rubric (posted on blackboard).

Portfolio: Essential topics addressed over the course of the semester will be summarized as short essays occasionally guided by specific questions. Generally assignments are due one-week after the date they were assigned or as specified by the instructor.

Grading:

Exam type	Undergraduates	Graduates
Midterm Exam	30 %	30 %
Final Exam	45 %	40 %
Discussion	10 %	5 %
Portfolio	15 %	5 %
Paper		10 %
Presentation		10 %
Total	100 %	100 %

Student-led discussions will be evaluate on a scoring matrix including material read (10%), understanding of methodology (20%), ability to answer questions directly related to text (50%), ability to answer questions applying learned knowledge (20%)

Presentations will be scored (ranking 1 – 5) by Organization, Introduction of topic, Delineation of problem, Understanding of methodology, Quality of source material, and Addressing audience questions.

Grade:	***Percentage:***
A+	97-100
A	90-96
A-	88-89
B+	86-87
B	80-85
B-	78-79
C+	76-77
C	70-75
C-	68-69
D+	66-67
D	60-65
D-	58-59
F	0-57

Ethical Considerations:
The Chemistry Department's policy of cheating is as follows: *"any student caught cheating will be assigned a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course"*.

Plagiarism Policy:
Plagiarism is defined as the use of "other" intellectual property without proper reference to the original author. Intellectual property includes all electronic, spoken or print media ***thus any information taken of the web is included under this statement***. Students are expected to cite all sources used in oral and written presentations. Cases of plagiarism will be taken seriously with a grade 0 for the particular assignment. Severe cases may be referred to the Department Chair or Dean or class failing considered.

Services –Support, Disabilities:
Support services will be provided by the University of Alaska Library system, online resources and the instructor. Additional services are available through Student Support Services (http://www.uaf.edu/sssp/) at UAF. We will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide accommodations for students with disabilities. Please contact the instructor as soon as possible to allow adequate time to prepare necessary accommodations. A written letter from Disabilities Services is necessary preferable in the first week of the semester.

Amending Syllabus
The instructor may initiate changes to this syllabus subject to majority approval by students. Any and all changes will be clearly communicated (oral, email). The instructor reserves the right to make minor change to the lecture schedule or calendar and any grading policies that are favor of the student.