

# Chemistry 670 - Spring 2021



Cellular and Molecular Neuroscience (CRN: 36694) Online: 3 Credits



## **CHEM 470/670: Cellular / Molecular Neuroscience**

**Instructor:** Dr. S. Ryan Oliver

**Meeting Times:** MWF 3:30 – 4:30 pm via Zoom

**Office Hours:** Wed 9-11 am via Slack

**Email:** [sroliver@alaska.edu](mailto:sroliver@alaska.edu)

**Phone:** 907 474 5621



## **CHEM 470/670: Cellular / Molecular Neuroscience**

**Instructor:** Dr. Kelly Drew

**Meeting Times:** MWF 3:30 – 4:30 pm via Zoom

**Office Hours:** By Appointment

**Email:** [kdrew@alaska.edu](mailto:kdrew@alaska.edu)

**Phone:** 907 474 7190

**Textbooks:** We will be following Purves for assigned readings and course organization but either one of the three text books will be adequate for the course.

## **Course materials**

The following are *required* for the course and can be purchased in the UAF bookstore or elsewhere:

- Neuroscience (6th Edition); Sinauer Associates, Dale Purves et al., **ISBN:** 9781605353807
- Perusall Account (Free!) for online literature discussions
- [Slack account registration](#) (Free!) – See Blackboard for registration instructions
- [Course syllabus](#) is linked and available on Google docs and sheets. Link available on Blackboard.
- A University of Alaska email address is required for all communication in the class. This also provides access to the Blackboard system for individual scores and grades.
- [Link to Course Schedule](#)

### *Alternative Recommended Texts*

- From Neuron to Brain (5th Edition); Sinauer Associates, John G. Nicholls et al, **ISBN-13:** 978-0878936090 or **ISBN-10:** 0878936092
- From Molecules to Networks: An Introduction to Cellular and Molecular Neuroscience (3rd Edition, 2014); Academic Press John H. Byrne, Ruth Heidelberger, M. Neal Waxham, **ISBN-13:** 978-0123971791 or **ISBN-10:** 0123971799

**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. Fundamentals of the functional properties of neurons will provide the background for discussions of small neuronal circuits that regulate behavior, the cellular/molecular basis of learning and memory, and pharmacological approaches for the treatment of neuronal pathologies.

## **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 60%), discussions of relevant research articles (approximately 10%), and projects (approximately 30%). The suggested textbooks serve as a basic reference. Being prepared for discussion is essential, hence preparation and reading of material is critical. **Blackboard**(<https://classes.uaf.edu>) will be utilized as a central communication platform for announcements, posting of lectures and reading material, and distribution/collection of assignments. It is assumed that every student is frequently visiting blackboard to check for announcements as well as email notifications. Slack will also be used for office hours, group communications/planning, and other discussions.

## **Course Policies:**

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

*Quizzes:* Each chapter will have a quiz associated with it and will be delivered via Blackboard. A time window will be made available for students to login and take the quiz. Quizzes will consist of 5 questions from the lecture material and will be timed. Importantly, **makeup quizzes** 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 quiz could vary from the original. Alternatively, an oral quiz may also substitute if acceptable with student.

*Graduate led discussions:* Graduate student-led discussions will be graded using a rubric (given in class). Undergraduate students are required to work with lead graduate students and contribute to class discussions. Reading and commenting on literature prior to class is needed to contribute meaningfully to discussions.

*Lecture Groupwork:* Students will receive adequate preparation time for research article discussions and in class assignments. Scoring of discussions will be evaluated based on participation in class. Undergraduate students will work with assigned graduate students to drive discussions and complete assignments.

*Projects (5 total):* Group projects will be assigned throughout the semester. Students will work in small groups and turn in projects together. Details and rubric for projects will be uploaded to Blackboard. Graduate students will have one extra project dedicated to creating a presentation and delivering to the class at the end of the semester.

*Homework:* Questions pertaining to lecture material will be uploaded onto Blackboard and students are required to work problems out of their own (no groups allowed) and submit answers on Blackboard. Homework problems of key topics will help you check whether you understand the concepts fully, and also help to integrate the material into the greater context. **Homework is due on Monday by 11pm (AK time).**

*Literature reading and discussion:* Each week at least one piece of primary literature will be assigned and uploaded onto Perusall. Students will be required to read and participate in a discussion on the Perusall website. In addition, students will participate in an in class discussion of papers and clinical applications on every Friday. Registration instructions for Perusall will be given during the first day of class as well as on Blackboard.

*Work Ethic:* It is expected that all work turned in by each student is work completed by the student. Student's submitted work must be conducted and written by that student. Any copying or

plagiarism will earn a zero for that assignment and will be reported to the University. All work must be that of the student and not homework help sites (Chegg), peers, tutors, etc. Anyone caught using these resources on assignments strictly told to not use them will earn a zero for the assignment and will be reported to the University.

*Late assignments:* Are not accepted. Students are given at least one week to complete assignments.

**Paper discussions:** Research paper(s) pertinent to topics addressed in readings, unit videos, and other exercises will be discussed with respect to rationale, hypothesis, research data, and analysis. Papers will be discussed using Preusall, a free discussion board. Papers will be available to start working on **one week prior** to the due date. You will be required to respond to at least five instructor questions, but responding to your peer's post will also be counted towards your grade. These discussions are important to translate science knowledge into understanding i.e. the application of science.

## Grading:

Evaluation Type	Undergraduates	Graduates
Quizzes	10 %	10 %
Group Projects	40 %	50 %
Lecture Discussion/Literature	15 %	15 %
Packback	15 %	10 %
Homework	10 %	5 %
Final Exam	10 %	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%).

<b>Grade:</b>	<b>Percentage:</b>
<b>A</b>	90-100
<b>B</b>	80-89
<b>C</b>	70-79
<b>D</b>	60-69
<b>F</b>	0-59

## **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”.***

Students must also adhere to UAF policies, the student code of conduct as well as the University of Alaska *Honor Code*, which states:

*Students will not collaborate on any quizzes or take-home assignments that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in assignments. Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses, and other reports. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion.*

**Use of Chegg (or other similar sites) on Graded Assessments constitutes an Academic Integrity Violation and will result in strict adherence to the Department Policy on Cheating. (Yes I will check).**

## **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.

## **Disabilities**

Students with a physical or learning disability are required to identify themselves to the Disability Services office, 474-7043, located in the Center for Health and Counseling. The student must provide documentation of the disability. Disability Services will then notify the instructor of special arrangements for taking tests, working homework assignments, and doing lab work.

**Computer Access:** Currently Department of Computing and Communications (DCC) maintains two open labs on campus: the Bunnell Lab, and the Node (Rasmussen library). The Node has 24-hour access.

**Support Services:** Support can be obtained through 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.

**Classroom Etiquette:** The purpose of this information is to assist students in understanding proper classroom behavior. The classroom should be a learning centered environment in which faculty and students are unhindered by disruptive behavior. Students are expected to maintain proper decorum in the online classroom. The University of Alaska Fairbanks is an institution of higher education that promotes the free exchange of ideas. However, students must adhere to the rules set forth by the University and the instructor. Failure to comply with classroom rules may result in dismissal from the class and/or the University. Faculty have the authority to manage their classrooms to ensure an environment conducive to learning. The University of Alaska Student Code of Conduct (the Code), part of the Board of Regents Policy 09.02, is available at <https://www.alaska.edu/bor/policy/09-02.pdf>. You should be familiar with the Code as you will be held accountable to maintain the standards stated within. The Code includes the following statements:

P09.02.020.A As with all members of the university community, the university requires students to conduct themselves honestly and responsibly and to respect the rights of others. Students may not engage in behavior that disrupts the learning environment, violates the rights of others or otherwise violates the Student Code of Conduct (Code), university rules, regulations, or procedures. Students and student organizations will be responsible for ensuring that they and their guests comply with the Code while on property owned or controlled by the university or at activities authorized or sponsored by the university.

P09.02.030.B Behavior that occurs on property owned or controlled by the university, in university online environments and classes, or at activities sponsored by or authorized by the university, is subject to university student conduct review and disciplinary action by the university. The Student Code of Conduct may also apply to behavior that occurs off campus when it may present a potential danger or threat to the health and safety of others or may reasonably lead to a hostile environment on campus. The Student Code of Conduct may also apply to behavior exhibited online or electronically via email, social media, text messaging, or other electronic means.

### **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, blackboard). 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.

**COVID-19 Awareness:** Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this website:

<https://sites.google.com/alaska.edu/coronavirus/uaf/uaf-students?authuser=0>

Further, students are expected to adhere to the university's policies, practices, and mandates and are subject to disciplinary actions if they do not comply.

**Special Dates pertinent to the course**

See academic calendar for details at <http://catalog.uaf.edu/calendar/>.