

## Cellular and Molecular Neuroscience

**Instructor:** Dr. Maegan Weltzin, 907-474-6527, [mmweltzin@alaska.edu](mailto:mmweltzin@alaska.edu)  
Department of Chemistry and Biochemistry  
Murie 113E

**Lecture:** MWF 11:45 am – 12:45 pm (YES, you can bring your lunch)  
REIC 203

**Office Hours:** 1-3 M Murie 113E or arrange via phone/email

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

- Neuroscience (6th Edition); Sinauer Associates  
Dale Purves et al., **ISBN:** 9781605353807
- 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 and group work (approximately 10%), and presentations (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 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 present two research articles during the semester. At the end of the semester, each graduate student will present (~ 20 min) and write a review paper 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 End of Chapter Questions that will function as 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% graduates). 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. These exams will be take-home and consist primarily of essay questions. 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.

**Graduate led discussions:** 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.

**End of Semester Presentations:** 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). Undergraduate students will work and present in small groups, while graduate students will present independently. Presentations should be about 15-20 min in length.

**End of Semester Review Paper:** Each graduate student will write a review paper on a contemporary topic in cellular, molecular, or developmental neuroscience to provide additional knowledge to topics previously addressed in the course. The topic can be the same as your end of semester presentation. Scoring rubric will be posted on blackboard.

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

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

### Grading:

<b>Evaluation Type</b>	<b>Undergraduates</b>	<b>Graduates</b>
Midterm Exam	30 %	30 %
Final Exam	40 %	40 %
Participation/Discussion	10 %	5 %
Portfolio	15 %	5 %
Paper		10 %
Semester Presentations		5%
End of Semester Presentation	5 %	5 %
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%).

Paper presentations will be scored (ranking 1 – 5) by organization, introduction of topic, delineation of problem, understanding of methodology, and quality of source material.

<b>Grade:</b>	<b>Percentage:</b>
<b>A+</b>	97-100
<b>A</b>	90-96
<b>A-</b>	88-89
<b>B+</b>	86-87
<b>B</b>	80-85
<b>B-</b>	78-79
<b>C+</b>	76-77
<b>C</b>	70-75
<b>C-</b>	68-69
<b>D+</b>	66-67
<b>D</b>	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"*.

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, in-class exams, or take-home exams 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 quizzes and examinations. 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.*

**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 classroom and to stay for the entire length of class. If the student must plans to leave during class, they should inform the instructor prior to the start of class. 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.