Zool 432G: Neurobiology  Spring 2011

Lecture: MW 10:00–10:50, Waggoner 202
Laboratory: F 1:00–3:50, Waggoner 366

Instructor: Dr. Jeff Engel
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Email: je-engel@wiu.edu ("Neurobiology" in subject line, and don’t assume I received it unless I reply)
Office: Waggoner 359 (if I am not there, try my laboratory, Waggoner 373)
Office Hours: M 11:00–12:00, T 1:00–2:00, W 11:00–12:00, Th 1:00–2:00, and by appointment or drop-in

Course Web Site: Start from https://westernonline.wiu.edu/. You should make a habit of checking there for announcements, links, and some course handouts.

ISBN: 978-0-87893-697-7
Both of the above can be ordered as a bundle to save $15 using ISBN: 978-0-87893-554-3

Course Description: Provides a quantitative understanding of neurophysiology in the context of neural systems that underlie animal behavior. Laboratory uses animal preparations and computer models.

Course Prerequisites: Math 123 (or higher) with a grade of C or better, and either Biol 100 (or higher) or Psy 343 with a grade of C or better, and minimum of Junior standing; or permission of instructor.

Course Objectives: Students will:
  • display a solid understanding of cellular neurophysiology
  • apply standard electrophysiological equations in problem sets and exams
  • examine how neurons act together in neural systems that underlie animal behavior
  • carry out extracellular and intracellular nerve and muscle recording
  • organize experimental data and present them in laboratory reports

Grading:
  exams 260 points
  problem sets / NIA / Lab Reports 240 points
  (these are typically 10 points; if fewer than 24 in semester, will prorate up to 240 points)
Grading scale: 90–100% = A; 80–89.9% = B; 70–79.9% = C; 60–69.9% = D; below 60% = F.

Exams will include multiple choice items and short answer or essay items. You may be asked to diagram structures or processes or perform calculations. “Understanding” includes the ability to apply knowledge to new situations in an exam. You should bring a calculator to exams. The final exam is not explicitly “cumulative,” but you will need to apply knowledge from earlier in the course due to the integrative nature of Neurobiology.

Late problem sets or reports will be penalized one grade level (10% of maximum possible points) for every week late or part thereof. If you are absent from a laboratory session you should write a report based on your classmates’ data, but if the absence is not excused, you will lose two grade levels (20% of possible points).
**Adjustment of exam scores:** Sometimes particular exam questions turn out to be unexpectedly difficult or obscure. I believe that in a class of capable students such as this, earning an "A" must be a realistic goal. Therefore, I adjust exam and quiz scores in two steps. First, any multiple choice item answered correctly by fewer than 25% of students, or short answer item with an average score below 25%, is eliminated and all students get those points. Second, points are added to every student's score for that exam or quiz so that the highest score in the class becomes 100% of the perfect score.

**Attendance** is required for lecture examinations and all laboratory sessions. Make-up exams will only be given if the absence is due to an official university trip with advance notice, or a personal or family emergency validated by Student Development (SEAL-301, 298-1884) or other appropriate documentation, or by prior arrangement with me. *It is your responsibility to provide valid documentation* for absences.

Make-up exams may be essay format. Make-up exams must be scheduled within one week of the test except in exceptional circumstances such as an extended illness. A student who misses the final exam (with valid excuse) must make up the exam within the first six weeks of the next semester. A score of zero will be given for a missed exam that is not made up within the stipulated time period.

If you are absent from a laboratory session without excuse you will lose 5 points (10% of one grade level for this course). Extreme tardiness may be treated as an absence.

**Graduate students** will earn the G credit by writing a term paper and giving a brief (15 minute) presentation to the class on the same topic. This paper will be 5–10 pages in length about some topic in Neurobiology approved by me, based on at least 5 primary research journal articles published in the last 5 years. It should not significantly overlap other papers you have written. The paper will be typed in proper scientific format (Biology Department Thesis Guide or APA).

**RESOURCES AND SUPPORT:**

**Study Skills Seminars** are offered on Tuesdays (changing later to Wednesdays) at 4 p.m. starting Sept. 13 at the University Counseling Center (Memorial Hall basement Room 22). Get the schedule at: http://www.wiu.edu/student_services/ucc/programs/studyskills.php

More tips for study and time management are at: http://www.wiu.edu/student_services/ucc/resources/ and: http://www.wiu.edu/users/ccss/study_skills/

The **Writing Center** provides support for writing assignments. The Writing Center is in Room 341 Simpkins, at the **very** top floor of Simpkins Hall. Drop in or call 762-9481 Ext. 321 for an appointment. Their Web page is: www.wiu.edu/users/miwrite/.

Whatever your level of writing ability, you can benefit from working with an expert. Take along my comments on your first draft and any relevant handouts.

**Audio Recorders:** You may record my lectures for your own review. I retain the copyright for my lectures.

**Disability Resource Center** offers various kinds of support for note taking, exams, etc. to qualified students. They are at 117 Seale Hall, 298-2512, and on the Web at: http://www.wiu.edu/student_services/disability_resource_center/

**Accommodations:** In accordance with University policy and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. For the instructor to provide the proper accommodation(s) you must obtain documentation of the need for an accommodation through Disability Resource Center (DRC) and provide it to the instructor. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire about such particular needs of students. Students who may require special assistance in emergency evacuations (i.e. fire, tornado, etc.) should contact the instructor as to the most appropriate procedures to follow in such an emergency. Contact Disability Resource Center (DRC) at 298-2512 for additional services.
ACADEMIC CONDUCT:

It is the student’s responsibility to be familiar with the information (including required forms, definitions, and time lines) contained in the following university web sites. Each student should access these web sites and carefully read the information they contain. Your instructors will hold you responsible for knowing this information. If you have questions about any of the information contained in the web sites, ask your instructor:

Students’ Rights and Responsibilities: [http://www.wiu.edu/provost/students/](http://www.wiu.edu/provost/students/)


**Academic dishonesty**, including but not limited to plagiarism, cheating, or lying, will be penalized in accordance with university policy. Penalties may include failing the course or expulsion from the university. Please review the following policy of the WIU Department of Biological Sciences:

**Definition of Plagiarism**

The faculty of the Department of Biological Sciences subscribe to a definition of plagiarism as expressed by V. E. McMillan in *Writing Papers in the Biological Sciences* (Bedford/St. Martin’s Press, New York, pg 16)

“*Plagiarism* is the theft of someone else’s words, work, or ideas. It includes such acts as (1) turning in a friend’s paper and saying it is yours; (2) using another person’s data or ideas without acknowledgement; (3) copying an author’s exact words and putting them in your paper without quotation marks; and (4) using wording that is very similar to that of the original source but passing it off as entirely your own even while acknowledging the source.”

This includes information in textbooks or laboratory manuals, honors and masters theses, all writing assignments, and images. The faculty of the Department attempt to monitor student writing assignments (essay exams, papers, laboratory reports, and other writing assignments or exercises) for incidence of plagiarism. If plagiarism is found, the faculty will discuss the situation with the student and indicate to the student the penalty for this academic dishonesty. Potential penalties include those cited in the academic dishonesty section of the WIU web page, [http://www.wiu.edu/policies/acintegrity.php](http://www.wiu.edu/policies/acintegrity.php).

**Collaboration:** I encourage consultation with your peers because it will help you learn and it is how scientists really work. I also encourage you to make use of the skilled helpers in the University Writing Center. At the same time, I expect the report's author to carry out *each aspect* of writing and data presentation.

No matter how much two students may discuss their work as they write their reports, if they follow the above guidelines their writing will be significantly different. Writing that is too similar (either in wording or in the detailed organization of thoughts) will be interpreted as evidence of plagiarism.

For data layouts (tables and graphs) my standard is different. Collaboration can help students learn, but if two students work together to create the perfect graph, it seems unreasonable to require one of them to change it before submitting it. Therefore, I will accept identical graphs or tables without penalty *if* both students include a written statement that acknowledges the collaboration and states that both students made substantial contributions to the collaborative process.

Your report should include an Acknowledgments section to describe the specific contributions of any other individuals (especially your lab partners).
LABORATORY WORK:

Preparation prior to laboratory: Crawdad exercises were developed for laboratory sessions lasting 3–5 hours. Our laboratory session is 3 hours. We will manage this with some advanced preparation on my part and focused agendas. It is essential that you arrive on time and ready to start the exercises as soon as class begins so that your group can finish.

Laboratory Reports: In this course, laboratory reports are intended to make you organize your results and think about their meaning in a structured way. (This is different from a WID course, where one of the goals would be to learn to write fully developed articles in a professional style). Therefore, the most important aspects will be the presentation of data (Results and figures or tables) and the interpretation of data (Discussion).

Reports will follow a standard scientific format, modified to emphasize Results and Discussion:

Introduction: Briefly tell what principles or questions motivated the work, what was done, and any predictions.

Materials and Methods: Cite the Crawdad lab manual or handouts, and mention any important modifications of methods.

Results: Text: guide the reader through the data figures and tables. Data that are too simple for a table or graph should be given in the text. Along the way, point out in writing the significant features of the data that the reader should notice. Figures: Trim and paste physiological recordings into neat, informative figures (remember to include scale bars for both X and Y dimensions). Graphs may be generated by computer or drawn neatly by hand (graph paper is recommended, and do use a ruler). Tables: include results for the whole class (if available) with statistical parameters (such as mean and SD) as appropriate.

Discussion: Discuss your results in terms of the goals and predictions set out in the Introduction. Offer possible explanations for differences from predicted outcomes or differences from other lab groups. Briefly discuss the neurophysiological mechanisms that underlie the phenomena you observed (or intended to observe, if the experiment did not work as planned). The main job of the Discussion section in this class is to make sense of your results, but you are also welcome to discuss the significance of your results in a broader context and suggest further questions, hypotheses and experiments.

References: List references cited in the report.

Reports will be due one week after the experiment is carried out. They will be returned to you (usually one week later) with comments and a grade. You may revise your report and submit it within one week for regrading; you must attach the original report too. Reports will not be accepted unless they are typed and include figures, graphs and tables. You should keep backup copies of your reports, because in the unlikely event that I lose your report, you will be responsible for providing me with another copy.

Problem sets may be revised and resubmitted within one week. For another week after you receive your rescoring, I am willing to work individually with you for a higher score. I do encourage you to discuss the problem sets with your classmates, me, or with anyone else before you submit them. Just be sure that you have worked the problems yourself and understood them.
**Date** | **Lecture** | **Readings** | **Laboratory (Friday)**
---|---|---|---
08-22 | L01 overview; membrane potential | Chapter 2 | 08-26 Ohm’s Law; intro to NIA (patch, $V_m$); orientation to LabScribe (pulse tutorial)
08-24 | L02 resting potential and driving force | Chapter 2 | 09-02 time constant; electrotonic decay (CD1) making microelectrodes
08-29 | L03 action potential and voltage clamp | Chapter 3 | 09-09 crayfish resting potentials (CD4)
08-31 | L04 ion channels, patch clamp, equivalent circuit | Chapter 4 | 09-23 neuromuscular synapse (CD8)
09-05 | **No Class – Labor Day** | | 
09-07 | L05 electrotonic signals; action potential propagation | Chapter 3 | 09-30 synaptic plasticity (CD9)
09-12 | L06 action potential propagation; electrical synapses | Chapter 3, 5 | 10-07 stretch receptor (CD10)
09-14 | L07 chemical synapses: presynaptic mechanisms | Chapter 5 | 10-14 Human Psychophysics (PsyCog, etc.) neuroanatomy part 1 (CD3)
09-19 | L08 ionotropic receptors and postsynaptic integration | Chapter 5, 6 | 10-21 neural networks and CPGs (GENESIS)
09-21 | L09 metabotropic receptors; neuropharmacology | Chapter 6, 7 | 10-28 neuroanatomy part 2 (CD3)
09-26 | **Exam 1** (L01–L08 and labs through 09-23) | | 
09-28 | L10 synaptic plasticity: non-associative | Chapter 7, 8 | 11-04 (to be announced)
10-03 | L11 synaptic plasticity: associative | Chapter 7, 8 | 11-11 (to be announced)
10-05 | L12 sensation: olfaction | Chapter 15 | 
10-10 | L13 sensation: audition | Chapter 13 | 11-18 (to be announced)
10-12 | L14 sensation: vision | Chap. 11, 12 | 
10-17 | L15 sensation (as needed) | Chap. 16, 17 | 
10-19 | L16 motor control: vertebrate hierarchy, reflexes | Chapter 16 | 12-02 (grad student talks, review)
10-24 | L17 motor control: oscillators and pattern generators | Chapter 16 | 12-09 (exam review, etc.)
10-26 | L18 motor control: manipulation | Chapter 17 | 
10-31 | **Exam 2** (L9–L17 and labs through 10-25) | | 
11-02 | L19 sensorimotor integration | Chapter 20 | 
11-07 | L20 plasticity in sensorimotor systems | Chapter 24 | 
11-09 | L21 developmental plasticity | Chapter 24 | 
11-14 | L22 neural development | Chap. 22, 23 | 
11-16 | L23 neural development | Chap. 22, 23 | 
11-21 | **No Class – Thanksgiving** | | 11-25 **No Class – Thanksgiving**
11-23 | **No Class – Thanksgiving** | | 
11-28 | L24 neurogenetics | | 
11-30 | L25 neurogenetics | | 
12-05 | L26 neural evolution | | 
12-07 | L27 neural evolution | | 
**Final Exam** (L18–L27 and labs): Monday, December 12, 10:00–11:50 am

* Chapter references for the Purves text are starting points. Often, other readings will be assigned and given to you.

**Problem Sets** will be assigned weekly and will be due in class one week later.

**Laboratory Reports** will be due in class one week after the laboratory session.

The above schedule is tentative. All aspects, including exam times, are subject to change with notice.