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### BIOH 458.01: Neuroscience Research Techniques

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**BIOH 458W, CRN 73136**  
**Neuroscience Research Techniques**  
**Fall 2020**

**Faculty Instructors and Research Project Leaders:**

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Dr. Kasper Hansen: ISB 216, [kasper.hansen@umontana.edu](mailto:kasper.hansen@umontana.edu)

Dr. Jesse Hay (Coordinator): HS 302A, [jesse.hay@umontana.edu](mailto:jesse.hay@umontana.edu), 406.243.2381

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**Prereq:** Junior or Senior Standing UM Neuroscience Program

**Credits:** 4 credit hours

**Time:** Tuesday and Thursday 2:00-5:50 pm and other times

**Place:** ISB 008

**Course Description:**

This course is a team-taught laboratory course that introduces students to current methods and techniques used in neuroscience research. The course consists of three units led by three faculty instructors and three Neuroscience Ph.D. students. Among the topics to be covered will be disease-modeling behavioral assay techniques, electrophysiology, and neuronal cell culture and imaging techniques. Students will gain theory and practical experience in experiment design, data collection, results analysis and scientific writing. Students will perform research independently or within a group as well as attend formal classroom presentations and discussions.

**Learning Outcomes:**

1. To gain first-hand experience executing scientific research.
2. To acquire laboratory skills common to the field of neuroscience and specific to the project you are working on.
3. To communicate research goals and findings in clear and concise writing.
4. To amend and strengthen research findings and laboratory reports following content and writing evaluation.
5. To understand basic analysis and statistical procedures and how they support hypothesis testing.

**Moodle** is the learning management system (LMS) prescribed by the University. Moodle is our conduit for posting course announcements, information, lecture notes, grades, etc. It will also be used by the instructors for communicating with students through bulletins and email. All correspondence will be through your official UM email account, so be sure to check this account regularly. Students should be familiar and competent with Moodle. There are Moodle tutorials etc. available on the UM Online web site <https://moodle.umt.edu/> or contact IT for further assistance.

**Required materials:** A textbook is not required for this course. A significant portion of your grade will be a lab notebook and three separate lab reports. A lab notebook can either be a formal lab notebook from the UM Bookstore, Staples, Amazon, etc., a three-ring binder, or an electronic notebook that follows our specific format guidelines. Lab reports are to be separate documents submitted electronically.

**Attendance Policy:** Lab attendance and participation is mandatory and will be evaluated individually even though much of the work is team based. Students are responsible for all material covered in class. Assigned readings are meant to assist the student in their comprehension of course materials.

**Late Assignment Policy:** Assignments submitted after the instructor's deadline are subject to an automatic 5-pt. deduction. Furthermore, the instructor may decide to delay the grading of late assignments until all on-time assignments have been graded and posted. Do not expect timely grading of late assignments! More significant point deductions and grading delays may be levied at the instructors' discretion for excessively late submissions.

**Professionalism and Student Conduct:** All students must act professionally and practice academic honesty. Academic misconduct is subject to academic penalty by the course instructors and/or disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Student Conduct Code is available at <http://www.umt.edu/student-affairs/community-standards/> and in the Student Handbook.

**Students with Disabilities:** Students with disabilities may request reasonable accommodations by contacting the course coordinator. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). "Reasonable" means the University permits no fundamental alterations of academic standards or retroactive modifications. For more information, please consult <http://www.umt.edu/disability>.

Other Policies:

- Cheating may be grounds for expulsion from the program.
- Students are allowed to appeal lab report grading to the course coordinator. Appeals must be written, attached to the original report and submitted to the course coordinator within **one week** from the time the report is returned.
- Students have the right to evaluate each professor's instruction. Students should take the faculty and TA evaluations seriously and be professional.

### Course Grading:

<b>Part I – Neurophysiology</b>	<b>120 pts</b>
Lab report Introduction	40
Final lab report	40
Lab notebook	10
In-class presentation	20
Lab attendance & participation	10
<b>Part II – Cell Culture &amp; Microscopy (same points)</b>	<b>120 pts</b>
<b>Part III – Neurogenetics &amp; Behav. (same points)</b>	<b>120 pts</b>
<b>Total:</b>	<b>360 pts</b>

### Grading Scale:

A 93-100%    A- 90-92%

B+ 88-89%    B 83-87%    B- 80-82%  
C+ 78-79%    C 73-77%    C- 70-72%  
D+ 68-69%    D 63-67%    D- 60-62%  
F <60%

**Writing Assignments:** The lab reports and lab notebooks required in this course make up the majority of your grade. Accordingly, you will want to prepare the best documents possible. We will provide instructions for the writing assignments, which will be the same for every part of the course (I,II, III), however, another valuable resource in greater detail for preparing scientific reports can be found here: <http://writingcenter.unc.edu/tips-and-tools/scientific-reports/>.

A critical aspect of any writing course is the requirement to revise a document based on feedback. **Each individual student will be required to write an Introduction to their groups' lab report, due in the middle of each of the three lab sections.** This document will be graded and returned to the student in time for them to revise it for incorporation into the final lab report. In the final lab report, the Results and Method sections can be written as a group, but each student must individually write the Introduction and Discussion sections.

**In-class presentations:** Each student or student group will give an oral presentation using Powerpoint or Keynote slides to describe the background information, scientific rationale, findings, and conclusions for each section.

**Working in Groups:** Much of the work will be conducted in groups of 2-4 students to allow efficient use of equipment and to accelerate progress. Each instructor will decide the number of groups and group sizes depending upon the needs of the projects. Instructors will assign students to their groups, and students should not expect to work in the same groups during different sections of the class.

**Grading consistency:** Categories of evaluation and points per category will be identical between all 3 instructors. However, each instructor reserves the right to use their own stringency of grading and/or to expect better performance as the course progresses.

**Pandemic accommodations & social distancing requirements:** every reasonable effort will be made to make this course safe during the pandemic. At the same time, this course still requires real-time participation from every student, even when it has to be done remotely over the internet. We will adapt our approach during the semester if UM conditions and local covid-19 levels change. Social distancing measures will include multiple approaches, including the following as needed:

- Wearing masks, using hand sanitizer, and disinfecting equipment and surfaces frequently.
- Working in shifts in the lab to reduce crowding.
- Adjusting the balance of in-person and real-time remote participation.
- Meeting in larger rooms for whole-class presentations and/or lectures.

**Course Schedule:**

<b>Week</b>	<b>Dates</b>	<b>Instructor</b>	<b>Topic</b>
<b>Part I: Neurophysiology – TA Nirvan Rouzbeh</b>			
1	Aug. 20	Certel Hansen Hay	Introduction
2	Aug/Sept 25, 27	Hansen	Intro to electrophysiology, LabChart, and protocols
3	Sept. 1, 3	Hansen	Cockroach Ventral Nerve Cord: Extracellular recordings of action potentials Introduction section Topic: Shaun Wachter Dissertation Defense Time: Aug 13, 2020 09:00 AM Mountain Time (US and Canada) Meeting ID: 925 6924 9189
4	Sept. 8, 10	Hansen	Cockroach Ventral Nerve Cord: Extracellular recordings of action potentials
5	Sept. 15,17	Hansen	Final experiments, data analyses, and figure preparation Presentation of projects, Lab report and notebook due
<b>Part II: Cell culture &amp; microscopy – TA Carly Anderson</b>			
6	Sept. 22, 24	Hay	Intro to the projects, choose projects Intro to cell culture, sterile technique, transfection, gene knockdowns and microscopy techniques
7	Sept./Oct. 29, 1	Hay	Begin project experiment(s) Introduction section due the 1st
8	Oct. 6, 8	Hay	Project experiment(s)
9	Oct. 13, 15	Hay	data analysis, preparation of figures Presentation of projects, lab report and notebook due
<b>Part III: Modeling human disease: Genetics of Behavior – TA Lewis Sherer</b>			
10	Oct. 20, 22	Certel	Introduction and disease-related gene activity
11	Oct. 27, 29	Certel	Modeling of Autism: student research project Introduction section due the 29th
12	Nov. 5	Certel	Modeling of Autism: student research project
13	Nov. 10, 12	Certel	Project experiment(s), data analysis
14	Nov. 17, 19	Certel	Discussion, Presentation of projects, Lab report and notebook due no class or final on the 17th