

COURSE SYLLABUS

BIOL 430.3 (02): Neurobiology of Behaviour

MWF 8:30-9:20 am, GEOL 161

Lab Sections:

(L01) Th 1:30-5:20 pm, THORV G74A

Instructor: **Dr. Jack Gray**
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Office hours: by appointment

Lab Instructor: **Mr. Sinan Zhang**
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Office hours: by appointment

Communicating with your instructors: Your instructors are routinely available by email or CANVAS message. A one-on-one meeting (in-person or via Zoom) can also be scheduled if needed. Questions about course content can be asked during the lecture or lab periods or via the course CANVAS Discussion board. The instructors will monitor the discussion board and provide answers as appropriate. We will endeavor to respond to your email or text quickly, but please remember that normal work hours are Monday to Friday 8:30 a.m. to 4:30 pm. Communications received outside of work hours may not be answered immediately.

Instructor Profiles & Other Information: Dr. Gray is a professor in the Department of Biology. He has a Ph.D. in neurobiology and maintains an active research laboratory conducting research on the neural control of animal behaviour, effects of pesticides on neural function, and biologically-inspired algorithms for robotic control. Mr. Zhang holds a M.Sc. degree in neurobiology and is currently a Ph.D. student supervised by Dr. Gray. His project studies how populations of sensory interneurons encode visual motion information related to locust collision avoidance behaviours. Mr. Zhang is responsible for coordinating all aspects of the laboratories for BIOL 430.

Catalogue Description

Studies how activities in an animal's nervous systems produces and modifies natural behaviour. Topics in the course include: the detection and coding of information from the environment, integration of information for decision-making, generation of motor patterns that underlie behaviour, and general constraints on form and function of neural circuits.

Prerequisite(s): Biology 317 or NEUR 350; or permission of the instructor

Learning Outcomes

By the completion of this course, students will be expected to:

1. Have an in depth understanding of the physiological and cellular mechanisms that underlie the adaptive behaviour seen in animals.
2. Through an examination of the original literature and experiments that constitute our current understanding of neuroethology, to develop an appreciation of the experimental and quantitative basis of modern neuroscience.
3. Through analysis of experimental data, to develop and improve skills in critical thinking, analysis, and synthesis.
4. Further develop their scientific writing skills
5. Be able to find and read scientific literature at an intermediate level
6. Develop their oral presentation skills
7. Develop group working skills
8. Develop an appreciation for the scientific method and actively engage in understanding new information

Information on literal descriptors for grading at the University of Saskatchewan and more can be found in the Academic Courses Policy on course delivery, examinations and assessment of students learning: <http://students.usask.ca/academics/grading/grading-system.php>

Please note: There are different literal descriptors for undergraduate and graduate students.

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: <https://teaching.usask.ca/about/policies/learning-charter.php>

Course Overview

The course consists of 50 minutes of face-to-face lectures on the MWF schedule (8:30-9:20 am). Lectures will be complemented by weekly lab exercises on Thursday afternoons (1:30-5:20 pm). The experiments will provide a practical illustration of some of the major behavioural and physiological mechanisms and are coordinated with lecture material as shown in the schedules below. Completion of the labs is a required course component. For these exercises, you will work in small groups (of about 3 students) to collect and analyze sets of experimental data. You will hone your scientific writing and oral communication skills through the preparation of lab reports, drafting a manuscript following guidelines from a scientific journal, drafting a research proposal, and a class presentation based on your proposal. Each student will be responsible for completing the assignments and giving one 10-minute oral presentation. More information about formatting for the lab reports, manuscript, and research proposal will be provided in lab and lecture periods. The schedule for the oral presentations will be determined on the day of the presentations. Lab reports and the manuscript assignment are to be completed individually, although it is expected that students will work in their groups to analyze the experimental data and prepare preliminary figures or table of their results. The research proposal assignment is to be completed individually. The deadlines for lab assignment submission will be strictly adhered to and a penalty will apply for late reports (see grade assessment section below).

Course Lecture Schedule

Week	Dates	General Lecture Topic
1	Jan. 4, 6	Introduction to the course, History of Neuroethology
2	Jan. 9, 11, 13	History of Neuroethology, Review of neuronal structure and function
3	Jan. 16, 18, 20	Review of neuronal structure and function, Ecological considerations and environmental/evolutionary constraints
4	Jan. 23, 25, 27	Ecological considerations and environmental/evolutionary constraints, Neuroethological techniques and model systems
5	Jan. 30, Feb. 1, 3	Neuroethological techniques and model systems, Sensory coding and feature extraction
6	Feb. 6, 8, 10	Central pattern generation/ Motor patterns
7	Feb. 13, 15, 17	Midterm Lecture Exam (Feb. 13) , Sensorimotor integration
8	Feb. 20-24	Mid-term break (no classes)
9	Feb. 27, Mar. 1, 3	Sensorimotor integration, Initiation, selection and modulation of behaviour
10	Mar. 6, 8, 10	Initiation, selection and modulation of behaviour, Behavioural and neuronal plasticity
11	Mar. 13, 15, 17	Behavioural and neuronal plasticity, Learning and memory
12	Mar. 20, 22, 24	Learning and memory, Neuronal development and maturational plasticity
13	Mar. 27, 29, 31	Neuronal development and maturational plasticity, Neuroecology, Neuroethological applications
14	Apr. 3, 5	Neuroethological applications, Review

Additional readings may be assigned as the course proceeds. These will be noted during the lectures or in the lab manual as appropriate.

Course Lab Schedule

Week	Date	Laboratory Topic	Assignment (grade)	Due date
1	Jan. 5	No lab		
2	Jan. 12	No lab		
3	Jan. 19	Model systems and experimental design	Report 1 (5%)	Jan. 27
4	Jan. 26	Introduction to analyzing neurophysiological data	No assignment	
5	Feb. 2	Sensory coding I		
6	Feb. 9	Sensory coding II		
7	Feb. 16	Tutorial on data analysis and manuscript preparation	Paper - manuscript format (15%)	Mar. 3
8	Feb. 23	Mid-term break (no lab)		
9	Mar. 2	Motor patterns	Report 2 (5%)	Mar. 10
10	Mar. 9	Motor learning	Report 3 (5%)	Mar. 17
11	Mar. 16	Research presentations	Presentation (5%)	
12	Mar. 23	Research presentations	Presentation (5%) Project proposal (15%)	Proposal due Apr. 5
13	Mar. 30	No Lab		

Midterm and Final Examination Scheduling

Midterm and final examinations must be written on the date scheduled.

Final examinations may be scheduled at any time during the examination period (April 10-29, 2023); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures:

<http://students.usask.ca/academics/exams.php>

Length and Mode of Final Examination

The final exam will be 3 hours duration. It is worth 35% of the final grade and will consist of multiple choice, short answer, and essay type questions.

Required Resources

Readings/Textbooks

Zupanc, G. K. H. (2019). **Behavioural Neurobiology: An integrative approach (3rd Ed)**. New York: Oxford University Press. ISBN: 9780198738725. This textbook is **NOT REQUIRED** but provides a valuable resource and is available from the University of Saskatchewan Bookstore: <https://shop.usask.ca/>.

A **Laboratory Manual** for BIOL 430 **IS REQUIRED** and will be available as a download from the course Canvas.

Electronic Resources

The laboratory portion of this course will require a working knowledge of computers and various computer programs, including MS Excel, Word and Powerpoint. Computers will be used extensively to collect and analyze data and prepare reports in the laboratory. Data analysis software (Dataview) will be available on the lab computers once you have logged in and the lab period on Jan. 26 will include a tutorial on how to use the software. You will need to access your University computer account; make sure you know your university NSID and password and how to log on to your account. Further details are in the lab manual.

Downloads

These will be available as appropriate through the course Canvas. The only document that you are required to download and read is the course syllabus. Please note that instructor's Powerpoint slides will be provided to you. You are not required to download or print these slides but may find that doing so is helpful. I will endeavour to have the lecture Powerpoint slides, arranged by lecture topic, posted sometime in advance of the lectures.

Supplementary Resources

From time to time, your instructors may make supplementary material available to you through the course Canvas. This material will not replace the lecture or lab experience and you are encouraged to attend all lectures and take your own notes.

Grading Scheme

Midterm Exam	15
Final Exam	35
Manuscript Assignment	15
Grant Proposal	15
Lab Reports (three X 5% each)	15
Oral Presentation	5
Total	100%

Evaluation Components:

Midterm Exam

- Value:** 15% of final course grade
Date: Feb. 13 (to be written in the lecture period)
Length: 50 minutes
Format: Combination of **multiple choice** and **short answer** questions.
Description: Will include material to the end of the lecture on Feb. 10 (before the Winter midterm break).

Final Exam

- Value:** 35% of final grade
Date: Consult the Final Exam Schedule when it is released
Length: 3 hours
Format: Combination of **multiple choice**, **short answer**, and **long answer** (essay) questions.
Description: The exam is comprehensive in that it will cover all lecture material. However, material delivered since the midterm exam will be emphasized.

Manuscript assignment:

- Value:** 15% of final grade
Date: Due Mar. 2 at 4:00 pm (upload to CANVAS).
Format: Formal, written presentation in PDF format
Description: To be prepared as if for submission to the Journal of Comparative Physiology A: Sensory, Neural, and Behavioral Physiology and following the instructions to authors (<https://www.springer.com/journal/359/submission-guidelines>). Rubric and further details to be provided in Canvas.

Grant Proposal assignment:

- Value:** 15% of final grade
Date: Last day of classes (April 5, 2023) at 4:00 pm (upload to CANVAS)
Format: Formal, written presentation in PDF format.
Description: Use a model system of your choice following consultation with instructors. To be prepared as if for submission to the Discovery Grants Program of the Natural Sciences and Engineering Research Council of Canada (NSERC) using Form 101 (https://www.nserc-crsng.gc.ca/ResearchPortal-PortailDeRecherche/Instructions-Instructions/DG-SD_eng.asp#a2). Does NOT include budgets or budget justification. Rubric and further details to be provided in Canvas and during lecture/lab periods.

Lab Reports (3):

- Value:** 15% of final grade (5% for each report)
Due Date: See Course Schedule for exact dates (upload to CANVAS)
Format: Short reports of 1-2 pages in PDF format
Description: Each student must independently write a report for each of the three lab exercises.
Includes a **short introduction** that addresses the **main topic** of the lab and **answers to specific questions** presented in the manual. These answers may take the form of well-written, **thorough explanations** and may also require appropriate presentation of **figures**. Students are required to know and understand what constitutes plagiarism and the University's Regulations on

Academic Student Misconduct (see below). Each report will be worth 5% of the final grade.

Oral Presentation :

Value: 5% of final grade

Date: See Course Schedule

Format: Powerpoint presentation during scheduled lab period

Description: Present your grant proposal. 10 minutes for presentation, 5 minutes for questions. Students will be assessed on presentation format, clarity and organization, as well as the ability to answer questions.

Submitting Assignments

Each student must independently write a report for each of the three lab exercises. PDF files of the report must be uploaded to the course Canvas site by the date identified in the Course Lab Schedule (no exceptions to this). The lab reports will be graded by the lab instructor who will also watch for plagiarism. Reports will be graded and returned on a schedule such that students will have regular feedback about their work. Grades will be assigned based on the quality of the data presentation, grammar, spelling, scientific writing and other aspects of the report. Additional information about the format of the reports is contained in the lab manual; students must read this carefully. The oral presentation will be evaluated by the course instructor and lab instructor. A rubric and weighting scheme for assessing the presentation will be posted on Canvas. Presenters will be provided with written feedback about their performance. Marks from the midterm exam will be available 7 to 10 days after the exam, well in advance of the last day to withdraw deadline. The manuscript assignment grades will be available within two weeks following the submission deadline.

Late Assignments

Assignments submitted after the deadline will be penalized by a 10% reduction in the mark assigned to the report for each day that the report is late. Students who miss a deadline due to a protracted illness or extenuating personal circumstances are required to contact the lab instructor (an email or phone call to Dr. Gray or Mr. Zhang is adequate) on the day the assignment is due and discuss the reasons why the deadline is being missed. There are no exceptions to this policy; students who fail to proactively advise an instructor that they will miss the deadline will be subject to the 10% per day penalty. Depending on the situation, additional documentation may be requested from the student. Deadline extensions will only be provided when the protracted illness or extenuating personal circumstance is verifiable. Mr. Zhang may consult with Dr. Gray during this verification process. Similar procedures must be followed by a student if they are going to miss giving their scheduled lab presentation.

Criteria That Must Be Met to Pass

Students must attend the labs and write the final exam in order to pass the course. Students who do not write the final exam will be assigned a final course grade of 49%, or lower depending on their performance in other aspects of the course, along with a grade comment of INF (Incomplete Failure). The final grade will be adjusted if a deferred final exam is written (see below).

Attendance Expectations

Students are expected to attend all scheduled lab periods. It is impossible to schedule make-up labs for this course. A student who does not attend a laboratory activity and does not have a valid excuse, will receive a grade of zero for that activity.

Experiential Learning

Experiential learning in this course will be provided through the lab manuscript assignment and research proposal assignment. These will provide the student with experience in scientific communication for dissemination of information (manuscript assignment) and research program development (grant proposal assignment). See above for evaluation.

Recording of the Course

Lectures will be recorded through Panopto onto the course Canvas page and will typically be available later on the day of the lecture. Students should not record the course unless provided with approval from the instructor.

Copyright

Materials posted on Blackboard or distributed in class will be made available in accordance with Canadian copyright laws. Students are reminded of their obligation to also abide by this legislation.

Student Feedback

Students will have an opportunity to provide feedback on the course and the instructor through a formal teaching assessment coordinated by the Department of Biology. This will occur during a regular lecture session (date to be determined).

University of Saskatchewan Grading System

Students in BIOL 430 are reminded that the University has established a grading system to be used in all of its courses. Information on literal descriptors for grading at the University of Saskatchewan (reproduced below) can be found at:

<https://programs.usask.ca/medicine/policies.php#GradingSystem>

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an

offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (<https://governance.usask.ca/student-conduct-appeals/academic-misconduct.php> - [StudentAcademicMisconductRegulations](https://governance.usask.ca/student-conduct-appeals/academic-misconduct.php)) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (<https://governance.usask.ca/student-conduct-appeals/non-academic-misconduct.php>)

For more information on what academic integrity means for students see the Academic Integrity section of the University Library Website at: <https://library.usask.ca/academic-integrity.php>

You are encouraged to complete the Academic Integrity Tutorial to understand the fundamental values of academic integrity and how to be a responsible scholar and member of the USask community - <https://libguides.usask.ca/AcademicIntegrityTutorial>

There are also valuable resources on the Integrity Matters website: <https://academic-integrity.usask.ca/>

Access and Equity Services (AES) for Students

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals at any time. Those students who are registered with AES with mental health disabilities and who anticipate that they may have responses to certain course materials or topics, should discuss course content with their instructors prior to course add / drop dates. In order to access AES programs and supports, students must follow AES policy and procedures. . In order to access AES programs and supports, students must follow AES policy and procedures. For more information or advice, visit <https://students.usask.ca/health/centres/access-equity-services.php>, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Student Supports

Academic Support for Students

Visit the [Learning Hub](#) to learn how the University Library supports undergraduate and graduate students. Attend online or in-person workshops, review online resources or book 1-1 appointments for help with:

- First year experience
- Research
- Study strategies and skills
- Writing
- Math and Statistics

Teaching, Learning and Student Experience

The Teaching, Learning and Student Experience Unit (TLSE) focuses on providing developmental and support services and programs to students and the university community. For more information, see <https://students.usask.ca/>.

College Supports

Students in Arts & Science are encouraged to contact the Undergraduate Student Office and/or the Trish Monture Centre for Success with any questions on how to choose a major; understand program requirements; choose courses; develop strategies to improve grades; understand university policies and procedures; overcome personal barriers; initiate pre-career inquiries; and identify career planning resources. Contact information is available at: [\(http://artsandscience.usask.ca/undergraduate/advising/\)](http://artsandscience.usask.ca/undergraduate/advising/)

Treaty Acknowledgement

As we gather here today, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.