

COURSE SYLLABUS

COURSE TITLE:	BIOL 430 Neurobiology of Behaviour		
COURSE CODE:	21379	TERM:	Winter 2021
COURSE CREDITS:	3.0	DELIVERY:	Lecture & Practicum (Lab)
CLASS SECTION:	02	START DATE:	11 Jan 2021
LECTURE LOCATION:	Not applicable	LAB LOCATION:	Not applicable
LECTURE TIME:	8:30 to 9:20 am MWF via PAWS/Canvas	LAB TIME:	1:30-5:20 pm on Th via PAWS/Canvas
WEBSITE:			

Course Description

Neuroethology is the study of how activity in an animal's nervous system 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. Initial course material may be somewhat similar to material covered in Biol 472 (Animal Behaviour) but will quickly deviate as we explore the physiological mechanisms that underlie behaviour.

Lectures will cover specific themes as outlined below, with the intent of maintaining continuity within the overall field of neuroethology. The laboratory component will emphasize practical aspects of the lecture material and will deviate slightly from laboratories in other courses in that the students will provide much of the initiative for the formulation of hypotheses and designing the appropriate experiments. Students will also gain experience with assimilating information from primary literature sources as they pertain to the analysis and interpretation of experimental data. Primary sources will also be used for the preparation of a report and seminar describing a particular model neuroethological system.

Prerequisite(s): BIOL 317 or NEUR 350; or permission of instructor.

Treaty Acknowledgement

As we engage in Remote Teaching and Learning, we would like to acknowledge that the Saskatoon campus of the University of Saskatchewan is 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. We would also like to recognize that some may be attending this course from other traditional Indigenous lands. We ask that you take a moment to make your own Land Acknowledgement to the peoples of those lands. In doing so, we are actively participating in reconciliation as we navigate our time in this course, learning and supporting each other.

Remote Learning Context

This year we are offering the BIOL 430 course using remote delivery tools. The entire course has been redesigned for this, including the laboratories. The University of Saskatchewan has created a number of resources for us to use as we teach and learn in the remote environment. We have linked to many of these resources in the BIOL 430 Canvas. Please take the time to peruse these links. You will continue to interact with other students, the professors and lab teaching personnel with various online course tools. If you have any questions about how to do something, please feel free to ask one of the instructors.

Learning Outcomes

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

1. have an in depth understanding of the 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. 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

Note: 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> More information on University policies on course delivery, examinations and assessment of student learning can be found at: <http://policies.usask.ca/policies/academic-affairs/academic-courses.php>

Course Overview

The course normally consists of 50 minutes of face-to-face lectures on the MWF schedule. Lecture topics will range from fundamental properties of neural structure and function, through to sensory detection and integration for production of behaviour and culminating in the neural basis of learning and memory. The course will also include topics on applied neuroethology, including bio-robotics and holistic assays of environmental contaminants. For remote offering this year, lecture material will be presented through synchronous Webex lectures during the scheduled times (MWF 8:30 – 9:20). PowerPoint slides of the lectures will be posted on the course Canvas in advance of each scheduled lecture and lectures will be recorded. During lectures, you will have the opportunity to ask questions through the Webex chat line or, if you are feeling brave, unmuting your audio. These questions, and my answers will be part of the lecture recording and thus available for offline review. Lecture topics are listed in the Course Schedules below.

Lectures will be complemented by lab exercises. The experiments will provide a practical illustration of some of the major 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; groups assigned randomly) to analyze sets of experimental data. The group work can be done asynchronously on a schedule determined by your group. However, each lab period will include a synchronous (live) meeting with a lab teaching assistant (TA) and other students. You are expected to have reviewed any material posted for each lab period and actively participate in the synchronous meeting with your TA. You will hone your scientific writing and oral communication skills through the preparation of lab reports and class presentations based on your experimental results. Each student will be responsible for completing three lab reports and giving one 10-minute oral presentation during a synchronous lab meeting. More information about the lab report format will be provided in the first lab period on January 21, 2021. The schedule for the oral presentations will be determined by a random draw at the beginning of the term. Participation in the synchronous lab discussions will be monitored and form part of your overall course grade assessment. A course discussion board in Canvas will be used to provide you with another opportunity to ask questions about the experimental data being analyzed for each report. The discussion board will be monitored by the instructors (TA and/or professor). The TA will also be available to answer questions “live” in the discussion board for two hours each week. The discussion boards will be monitored by the instructors until 4 pm on Tuesday of the weeks when a lab report is due. “Last-minute” questions will not be answered by the instructors, but the discussion boards will be open so that other students may be able to answer these questions. Lab reports 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 deadlines for lab report 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. 11, 13, 15	Introduction to the course, History of Neuroethology
2	Jan. 18, 20, 22	Review of neuronal structure and function
3	Jan. 25, 27, 29	Ecological considerations and environmental/evolutionary constraints
4	Feb. 1, 3, 5	Neuroethological techniques and model systems
5	Feb. 8, 10, 12	Sensory coding and feature extraction
6	Feb. 15 – 19	Mid-term break (no classes)
7	Feb. 22, 24, 26	Central pattern generation/ Motor patterns, Midterm Exam
8	Mar. 1, 3, 5	Sensorimotor integration
9	Mar. 8, 10, 12	Initiation, selection and modulation of behaviour
10	Mar. 15, 17, 19	Behavioural and neuronal plasticity
11	Mar. 22, 24, 26	Learning and memory
12	Mar. 29, 31, Apr. 2	Neuronal development and maturational plasticity
13	Apr. 5, 7, 9	Neuroecology, Neuroethological applications: (e.g. toxicology, biorobotics)
14	Apr. 12	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

<u>Week</u>	<u>Date</u>	<u>Laboratory Topic</u>	<u>Assignment (grade)</u>	<u>Due date</u>
1	Jan. 14	No lab		
2	Jan. 21	Model systems and experimental design	Report (5%)	Jan. 29
3	Jan. 28	Introduction to analyzing neurophysiological data	No assignment	
4	Feb. 4	Sensory coding I		
5	Feb. 11	Sensory coding II		
6	Feb. 18	Mid-term break (no lab)		
7	Feb. 25	Tutorial on data analysis and manuscript preparation	Paper - manuscript format (15%)	Mar. 11
8	Mar. 4	Motor patterns	Report (5%)	Mar. 19
9	Mar. 11	Motor learning	Report (5%)	Mar. 26
10	Mar. 18	Research presentations	Presentation (5%)	
11	Mar. 25	Research presentations	Presentation (5%) Project proposal (25%)	Proposal due Apr. 13
12	Apr. 1	No lab		
13	Apr. 8	No Lab		

Instructors:

Contact Information:

Dr. Jack Gray e-mail: jack.gray@usask.ca or Webex or phone 306-717-9686 for text messages (emergency only).

Mr. Sinan Zhang e-mail: sinan.zhang@usask.ca or Webex or phone 306-250-4560 (lab instructor) for text messages (emergency only).

Communicating with your instructors: Your instructors are routinely available by email or text. A one-on-one Webex meeting can also be scheduled if needed. However, all questions about course content must be asked either during the synchronous lectures or via the 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. We may also request that you ask a question via the Canvas Discussion board.

Instructor Profiles & Other Information: Dr. Gray is a professor in the Department of Biology and currently also serves as the Vice-Dean Research, Scholarly and Artistic Work for the College of Arts and Science. 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 integrate with motor centres to control locust collision avoidance behaviours. Mr. Zhang is responsible for coordinating all aspects of the laboratories for BIOL 430.

Required Resources

Recommended Textbook

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

Laboratory Manual for BIOL 430 (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. 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 (one)	5
Total	100%

Evaluation of Student Performance

Midterm Exam

- Value:** 15% of final course grade
Date: Feb. 26 (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. 12 (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.11 at start of lab
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 13, 2021)
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.

Lab Reports:

Value: 15% of final grade

Due Date: See Course Schedule for exact dates

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. The report must be uploaded to Canvas by the assigned date. 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 via Webex.

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/Feedback to Students

Each student must independently write a report for each of the three lab exercises. PDF files of the report must be submitted 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/Missed Lab Deadlines

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.

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.

Criteria That Must Be Met to Pass

Students must 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).

Midterm and Final Examination Scheduling

Midterm and final examinations must be written on the date scheduled. They will be synchronous and online (details will be provided). Final course examinations may be scheduled at any time during the examination period (April 14-30, 2021); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write the midterm exam through no fault of his or her own for medical, compassionate or other valid reasons, documentation must be provided. Note: students should consult the laboratory manual for information specific to missed laboratories. Students who miss the final exam must contact the College of Arts & Science and apply for a deferred final exam. Deferred exams may utilize a different format than the regular exam, at the sole discretion of the course instructors. Students are encouraged to review all University examination policies and procedures:

<http://policies.usask.ca/policies/academic-affairs/academic-courses.php>

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:

<http://students.usask.ca/current/academics/grades/grading-system.php>

Exceptional (90-100) A superior performance with consistent evidence of

- a comprehensive, incisive grasp of the subject matter;
- an ability to make insightful critical evaluation of the material given;
- an exceptional capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Excellent (80-90) An excellent performance with strong evidence of

- a comprehensive grasp of the subject matter;
- an ability to make sound critical evaluation of the material given;

- a very good capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Good (70-79) A good performance with evidence of

- a substantial knowledge of the subject matter;
- a good understanding of the relevant issues and a good familiarity with the relevant literature and techniques;
- some capacity for original, creative and/or logical thinking;
- a good ability to organize, to analyze and to examine the subject material in a critical and constructive manner.

Satisfactory (60-69) A generally satisfactory and intellectually adequate performance with evidence of

- an acceptable basic grasp of the subject material;
- a fair understanding of the relevant issues;
- a general familiarity with the relevant literature and techniques;
- an ability to develop solutions to moderately difficult problems related to the subject material;
- a moderate ability to examine the material in a critical and analytical manner.

Minimal Pass (50-59) A barely acceptable performance with evidence of

- a familiarity with the subject material;
- some evidence that analytical skills have been developed;
- some understanding of relevant issues;
- some familiarity with the relevant literature and techniques;
- attempts to solve moderately difficult problems related to the subject material and to examine the material in a critical and analytical manner which are only partially successful.

Failure <50 An unacceptable performance

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.

For more information on what academic integrity means for students see the Student Conduct & Appeals section of the University Secretary Website at:

<http://www.usask.ca/secretariat/index.php>

All students should read and be familiar with the Regulations on Academic Student Misconduct as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals available on the University Secretary Website.

Important Note: Additional information about student misconduct specific to BIOL 430 is found in the laboratory manual. BIOL 430 students are required to read and understand the information about misconduct that is presented in the laboratory manual.

Examinations through Access and Equity Services (AES)

Students who have disabilities (learning, medical, physical, or mental wellness) 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. In

order to access AES programs and supports, students must follow AES policy and procedures. For more information, check <https://students.usask.ca/health/centres/access-equity-services.php> or contact AES at 1-306-966-7273 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. Students who are in need of accommodation for other aspects of BIOL 430 must present the appropriate letter from AES to the course instructors. Accommodation for the midterm and final exam must be made through regular AES procedures.