1. **Course:** ZOOL 595, Evolutionary Perspectives in Neurobiology - Winter 2021

   Lecture 01: TR 09:30 - 10:45 - Online

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Email</th>
<th>Phone</th>
<th>Office</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Willem Wildering</td>
<td><a href="mailto:wilderin@ucalgary.ca">wilderin@ucalgary.ca</a></td>
<td>220-5283</td>
<td>BI 462</td>
<td>by appointment only</td>
</tr>
</tbody>
</table>

**Online Delivery Details:**

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

The course will be delivered in online format only through the use of the Zoom platform. Lectures will be recorded and posted on the course D2L site within 48 hours after their delivery. Student presentations will be recorded and made available to each presenter and, with their permission, to the rest of the class within 48 hours of their delivery.

**Course Site:**

D2L: ZOOL 595 L01-(Winter 2021)-Evolutionary Perspectives in Neurobiology

**Note:** Students must use their U of C account for all course correspondence.

2. **Requisites:**

   See section 3.5.C in the Faculty of Science section of the online Calendar.

   **Prerequisite(s):**
   Zoology 461.

   **Antirequisite(s):**
   Credit for Zoology 595 and Neuroscience 541 will not be allowed.

3. **Grading:**

   The University policy on grading and related matters is described in F.1 and F.2 of the online University Calendar.

   In determining the overall grade in the course the following weights will be used:

<table>
<thead>
<tr>
<th>Component(s)</th>
<th>Weighting</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Line Student presentation (30 min)</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Final report (written)</td>
<td>35%</td>
<td>April 15, 11:55 pm D2L Dropbox closure time</td>
</tr>
<tr>
<td>Participation</td>
<td>35%</td>
<td></td>
</tr>
</tbody>
</table>

   There will not be a final exam scheduled by the Registrar's office.

   Each course participant presents a seminar on a topic commensurate with the course's goal. Participation will be graded on the basis of on line (conference) class participation and questions about student presentations submitted to the course coordinator by email one day prior to each presentation.

   Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.
The conversion between a percentage grade and letter grade is as follows.

<table>
<thead>
<tr>
<th>Grade</th>
<th>A+</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum % Required</td>
<td>96 %</td>
<td>91 %</td>
<td>86 %</td>
<td>82 %</td>
<td>78 %</td>
<td>74 %</td>
<td>70 %</td>
<td>65 %</td>
<td>60 %</td>
<td>55 %</td>
<td>50 %</td>
</tr>
</tbody>
</table>

The above conversion table indicates percentage cutoffs for each letter grade. The final percentage will be calculated as the weighted sum of the point scores for each of the three grading components. No rounding of percent scores will be applied in the conversion to final letter grade.

4. **Missed Components Of Term Work:**

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out-of-class activities for this course.

6. **Course Materials:**

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC ELearning online website.

7. **Examination Policy:**

No aids are allowed on tests or examinations.

Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section E.2 of the University Calendar.
10. **Human & Living Organism Studies Statements:**

Students will not participate as subjects or researchers in human studies.

See also Section E.5 of the University Calendar.

**STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS.** Students taking laboratory and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with Section SC.4.1 of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See Section I.3 of the University Calendar.

   a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections I.1 and I.2 of the University Calendar.

   b. **Final Exam:** The student shall submit the request to Enrolment Services. See Section I.3 of the University Calendar.

12. **Other Important Information For Students:**

   a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).

   b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.

   c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at 403-220-2208. The complete University of Calgary policy on sexual violence can be viewed at [https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf](https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf).

   d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional Code of Conduct and promote academic integrity in upholding the University of Calgary’s reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor’s consent; submitting or presenting work as if it were the student’s own work; submitting or presenting work in one course which has also been submitted in another course without the instructor’s permission; borrowing experimental values from others without the instructor’s approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

   [Student Handbook on Academic Integrity](https://www.ucalgary.ca/education/student-handbook-on-academic-integrity)
Additional information is available on the Student Success Centre Academic Integrity page

e. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at procedure-for-accommodations-for-students-with-disabilities.pdf.

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head, Undergraduate of the Department of Biological Sciences, Heather Addy by email addy@ucalgary.ca or phone 403 220-6979. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See Section E.4 of the University Calendar.

f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see Legal Services website.

g. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: ombuds@ucalgary.ca.

h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction (USRI) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or non-academic misconduct, in addition to any other remedies available at law.

**LEARNING OUTCOMES**

This is a lecture/seminar course based on topics selected to present an overview of the organization and function of nervous system with a particular focus on its evolution of the nervous system. The course explores form, function and performance of invertebrate and vertebrate neurons and nervous systems through examination of physical, biochemical, metabolic, (neuro)physiological and behavioral constraints and trade-offs.

The course will cover a range of topics that may include; mitochondrial function and dysfunction, integration/regulation of energy demand and supply, plasticity of the nervous system, metabolic cost of learning and information processing, the economics of cell size, reliability and robustness of nervous system functions, and neural circuit organization. Other topics will be identified during the course in consultation with all participants on the basis of their interests and learning needs. References to key concepts will be given in advance and all students are expected to gain some familiarity and understanding of the subject prior to the relevant class. Seminars will be presented by students, faculty and guest lecturers. The course adopts problem-oriented, collaborative learning methods, emphasizing student initiative, in-class participation and problem solving skills.

**Tentative 2021 Lecture Schedule**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture 1</td>
<td>Introduction to the course</td>
</tr>
<tr>
<td>Lecture 2</td>
<td>Evolutionary origins of neurons and nervous systems</td>
</tr>
<tr>
<td>Lecture 3</td>
<td>Does being smart come at cost?</td>
</tr>
<tr>
<td>Lecture 4</td>
<td>Neuroenergetics I: energy budget of the nervous system</td>
</tr>
<tr>
<td>Lecture 5</td>
<td>Glutaminergic synapses I: molecular foundations of learning and memory</td>
</tr>
<tr>
<td>Lecture 7</td>
<td>Neuroenergetics II: economy of nervous system function and structure.</td>
</tr>
<tr>
<td>Lecture 8</td>
<td>Biophysical determinants of nervous system and sensory performance</td>
</tr>
<tr>
<td>Lecture 9</td>
<td>Primer to functional diversity ion channels</td>
</tr>
<tr>
<td>Lecture 11</td>
<td>Guest lecture on topic to be determined</td>
</tr>
<tr>
<td>Lecture 12-24</td>
<td>Student presentations on topics commensurate with course theme.</td>
</tr>
</tbody>
</table>

Note: topics of lectures may be varied without prior notice depending on instructional needs of class participants

**Course Outcomes:**

- Have knowledge of and be able to describe current understanding of the evolutionary origin of neurons and nervous systems
- Describe and explain the adaptive significance of general trends in the evolution of nervous systems
- Explain how biological, physical and chemical parameters constrain form and function of neurons and nervous systems and apply this knowledge to the appraisal of physiological and biochemical adaptations observed in nervous systems across the animal kingdom
- Advance understanding of neurophysiology and this knowledge to identification and critical examination of relevant research literature
- Generate their own opinion on an appropriate topic in comparative neurobiology and be able to articulate and defend their view in speech and writing applying proper scientific methods and standards