

Department of Biology Course Outline

SC/BIO4370 "Neurobiology" 3.0
FALL 2015

Course Description

An analysis of recent advances in neurobiology, particularly information processing and storage in nervous systems and the biochemical basis of learning, memory and behaviour. The neurobiology of addiction, diseases of the nervous system and regeneration are also discussed.
Three lecture hours. One term.

Prerequisites

Prerequisites: SC/BIOL 2020 4.00; SC/BIOL 2021 4.00; SC/BIOL 3060 4.00.
Course Credit Exclusion: AS/HH/SC/KINE 4512 3.00

Course Instructors and Contact Information

Course Director: Dr. Georg Zoidl, Life Science Building, Office 323A, gzoidl@yorku.ca
Office Hours: arrange by email citing course ID

Schedule

Mondays/Wednesdays 8:00 – 9:30 am (LSB105)

Evaluation

The final grade for the course will be based on the following items weighted as indicated:

Midterm Examination (Oct. 21, 2015, in class)	45%
Final Examination (Fall Exam Session):	55%

The **Midterm Exam** will be held in class on Oct 21. It will cover the content of weeks 1-5. The **Final Exam** will cover the entire lecture component of the course. Both exams will consist of 40 questions. 30 questions will be multiple-choice questions and the remaining 10 questions will be questions, which may include labelling of figures. Students will have 1.5 min to answer each question (40 x 1.5 min = 60min total). Each exam question will be designed to have a single correct answer. Questions will be discussed and explained in the classroom for all students after the exam to intensify and deepen the learning objectives of this course. Due to the restricted access to my office at LSB, this will be the only opportunity to discuss these questions face to face.

Grading: The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5, etc.). Tests will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 90, B+ = 75 to 79, etc.)

(For a full description of York grading system see the York University Undergraduate Calendar - http://calendars.registrar.yorku.ca/pdfs/ug2004cal/calug04_5_acadinfo.pdf)

Note: Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles. If an adjustment needs to be made, this will be done at the end of term.

Students may take a limited number of courses for degree credit on an ungraded (pass/fail) basis. For full information on this option see http://www.registrar.yorku.ca/pdf/passfail_option.pdf

Posting of Grades: Grades for tests will be posted on the course website as soon as they are available. Please do not ask when they will be available as the answer will inevitably be "as soon as possible".

Missed Tests

Midterm: If you miss the midterm exam for medical reasons (only valid excuse), the make-up exam will be scheduled in the week following the class exam. This make-up exam is ONLY offered once. The exact location and time will be posted.

Attending Physicians form (available at http://www.registrar.yorku.ca/pdf/petitions/attending_physician_statement.pdf) should be submitted to the course director within one week.

Final: For a missed final, you must provide a completed Attending Physician's form (available at http://www.registrar.yorku.ca/pdf/petitions/attending_physician_statement.pdf) and a Deferred Standing Agreement Form. This is the ONLY form of documentation, which is acceptable to qualify for a deferred final exam.

Tests in Alternative Exams:

Students with an up-to-date letter of accommodation from the Counselling and Development Centre, which allows them to sit exams as part of the Registrar's Office Alternative Exams scheme, are responsible for scheduling their own exams (<http://www.yorku.ca/altexams/>). To maintain the integrity of the exam, any sitting in alternative exams must be scheduled for the same day as the remainder of the class. Please note that the alternative exams facility now requires *15 business days notice*. If a student fails to make a booking in sufficient time, they will have the option of sitting the exam under the same conditions as the other students in the class or receiving an F for the exam. An additional version of the examination will not be set to accommodate a tardy student. It is recommended that every student books the date of the mid-term immediately.

Important Dates

The sessional dates can be found at: <http://www.registrar.yorku.ca/enrol/dates/fw12.htm>
For additional important dates such as holidays, drop date, etc. refer to the "Important Dates" section of the Registrar's Website at <http://www.yorku.ca/yorkweb/cs.htm>

Resources

Lecture contents, MCQ test questions and links to videos will be posted at: <https://moodle.yorku.ca>

Suggested Texts:

1) Purves, D, Augustine, G.J., Fitzpatrick, D., Hall, W.C., LaMantia, A-S, McNamara, J.O. & White, L.E. **Neuroscience** (5th edition) Sunderland, MA: Sinauer Associates Inc.
ISBN-13: 978-0878936465

2) Purves, D, Brannon, E.M., Cabeza, R., Huettel, A.A., LaBar, K.S., Platt, M.L. & Woldorff, M.G. **Principles of Cognitive Neuroscience** Sunderland, MA: Sinauer Associates Inc.
ISBN-13: 978-0878935734

The suggested textbooks will be supplemented with other advanced material via the lecture when appropriate. For students interested in additional information the following textbooks are recommended.

Principles of Neurobiology, Liqun Luo, Taylor & Francis Ltd. (12. August 2015)
ISBN-13: 978-0815344940

Fundamental Neuroscience, 4th Edition, Editor(s): Squire & Berg & Bloom & du Lac & Ghosh & Spitzer, Release Date: 06 Nov 2012, Imprint: Academic Press, ISBN: 9780123858702.

These textbooks are ideal for advanced undergraduate as well as graduate students in neuroscience and neurobiology, edited and authored by some of the foremost leaders in the field, with comprehensive coverage of all areas of neuroscience.

Please note that a considerable number of other excellent textbooks from various publishers exist and

interested students are welcomed to explore these options. Feel free to consult with your course director.

The Librarian at YorkU has been informed about the suggested textbooks and copies of the books mentioned above are hold at the Library.

Learning Outcomes

Upon successful completion of SC/BIOL 4370 3.0, students should be able to:

- Describe the structural and cellular components of the nervous system
- Describe fundamental processes that generate, shape and maintain nervous systems
- Describe cellular signalling and neuronal circuits
- Explain fundamental processes in signal transduction (e.g. Membranes and Membrane Potentials, The Action Potential, Voltage-dependent Membrane Permeability)
- Explain the functions of Ion Channels, Electrical and Chemical Synapses
- Explain the functions of Signal Transduction Pathways
- Explain the major concepts of Sensory Neuroscience in the areas of Visual System, Auditory System, Somatosensory System and the Chemical Senses
- Describe the major concepts and components of the Motor Nervous System including circuits in Brain Stem, Spinal Cord, Basal Ganglia and Cerebellum
- Explain Complex Brain Functions, including the role of Association Cortices, Learning and Memory formation from Cells to Systems, Emotion and Social Cognition and Speech and Language
- Use the process of scientific inquiry to make effective decisions/arguments about real-world topics related to the nervous system
- Compare state of the art technologies to investigate the Nervous System in Health and Disease

Course Content

Expanded Course Description

As individuals, we can identify colours we have seen, recall places we have visited or recognize familiar faces. We are able to perform simple or complex tasks as individuals or as teams in social networks. Day by day, our nervous system reliably enables us to respond to our environment executing adequate reactions and behaviours. This is facilitated through highly complex processes that occur when nerve cells, called neurons and supporting glia cells, communicate in our brains. For this purpose, neuronal networks exist with an enormous complexity based on approximately 10^{11} neurons providing 10^{14} chemical synapses. Understanding how communication within these networks is built, maintained and protected over a lifetime is one of the most important questions in Neurobiology. This Neurobiology course will provide students with state-of-the art knowledge about how the brain operates from the level of molecules to cells, up to complex functions such as perception, learning and memory, which requires an understanding of interactions among large groups of neurons. Examples of human neurological disease conditions will be discussed whenever appropriate to exemplify the consequences of deficiencies in the nervous system.

Tentative Course Schedule – Please consult the up-to-date schedule on the course website.

		Suggested Readings
Sept 14 and 16	<u>Introduction to Neurobiology</u> - Cellular Components - Basics: Cellular Signaling - Neuronal Circuits - Neuroanatomy	Purves Neurosc.- Chapter 1, Purves Neurosc.- Appendix A, Purves Princ Cog Neuro.- Chapter 1,
Sept 21 and 23	<u>Neurodevelopment</u> - Neurogenesis - Cell migration	Purves Neurosc.- Chapter 22, Purves Neurosc.- Chapter 23, Purves Neurosc.- Chapter 24,

	<ul style="list-style-type: none"> - Cell differentiation - Synaptogenesis - Neural cell death - Synaptic rearrangement 	
Sept 28 and 30	<u>Signal Transduction I</u> <ul style="list-style-type: none"> - Membrane Physiology - The Action Potential - Voltage-dependent Membrane Permeability - Ion Channels - Electrical and Chemical Synapses 	Purves Neurosc.- Chapter 5, Purves Neurosc.- Chapter 2, Purves Neurosc.- Chapter 3, Purves Neurosc.- Chapter 4, Purves Neurosc.- Chapter 6,
Oct 5 and 7	<u>Signal Transduction II</u> <ul style="list-style-type: none"> -Neurotransmitter Systems - Molecular Signaling - Synaptic Plasticity 	Purves Neurosc.- Chapter 7, Purves Neurosc.- Chapter 8,
Oct 12 and Oct 14	<u>Sensory Neuroscience 1:</u> <ul style="list-style-type: none"> - Vision: The Eye - Central Visual Pathways - Visual Perception 	Purves Neurosc.- Chapter 11, Purves Neurosc.- Chapter 12, Purves Princ Cog Neuro.- Chapter 5
Oct 19	<u>Repetition of key themes and questions</u>	<u>Review of all material relevant for Midterm Exam</u>
Oct 21	Midterm Exam (45%) Will be held in class (LSB 105) from 8-9 am	All material covered up to and including Oct 9. Q/A session to follow immediately after Exam in the classroom
Oct 26 and Oct 28	<u>Sensory Neuroscience 2</u> <ul style="list-style-type: none"> - The Auditory System - Auditory Perception - The Somatic Sensory System (Touch and Proprioception) - The Chemical Senses (Olfaction) 	Purves Neurosc.- Chapter 13, Purves Princ Cog Neuro.- Chapter 6, Purves Neurosc.- Chapter 9, Purves Neurosc.- Chapter 15, Purves Princ Cog Neuro.- Chapter 7
Nov 2 and Nov 4	<u>Motor Neuroscience</u> <ul style="list-style-type: none"> - Lower Motor Neuron Circuits - Brainstem and Spinal Cord - The Basal Ganglia - The Cerebellum 	Purves Neurosc.- Chapter 16, Purves Neurosc.- Chapter 17, Purves Neurosc.- Chapter 18, Purves Neurosc.- Chapter 19
Nov 11 and Nov 13	<u>Complex Brain Functions 1</u> <ul style="list-style-type: none"> - Association Cortices - Memory: from Cells to Systems 	Purves Neurosc.- Chapter 26, Purves Neurosc.- Chapter 31, Purves Princ Cog Neuro.- Unit V
Nov 9 and Nov 11	<u>Complex Brain Functions 2</u> <ul style="list-style-type: none"> - Emotion and Social Cognition - Speech and Language 	Purves Neurosc.- Chapter 29, Purves Princ Cog Neuro.- Unit VI Purves Neurosc.- Chapter 27, Purves Princ Cog Neuro.- Unit VII
Nov 16 and Nov 18	<u>Complex Brain Functions continued</u>	
Nov 23 and Nov 25	Frontiers in Neuroscience	
Nov. 30	<u>Repetition of key themes and questions</u>	All material covered in course
Final Exam Period (Dec. 7-23)	Final Exam (55%)	All material covered in course. Q/A session to follow immediately after Exam in the classroom

Experiential Education and E-Learning

E-Learning components are: Moodle Website, online MCQs and supplemental videos

Other Information

In order to be fair and consistent with regards to the entire class, individual grades are not negotiable. I cannot provide “extra credit” assignments. Marks will not be “rounded” or “bell-curved”. Contact the Course Director about marks ONLY if there is a clear error in your grade (calculation, clerical, etc.) within ONE week of the test score being made available to you.

Course Policies

E-mail Policies and etiquette

I will try to respond to email within two working days, but this is not always possible. I may also answer your question in the next class meeting if appropriate. Questions and answers that I deem of interest to the entire class will be posted on the appropriate discussion board or sent via course announcements if urgent.

Emails that do not meet the requirements below will not be answered:

- o Use your @yorku.ca email address when emailing instructors and others within the university. Email from other sources may be filtered out and not reach the intended recipient.

- o SUBJECT LINE - Include the course code and brief indication of topic.

- o Lecture email example: BIO4370 – question regarding synapse

The course section is critical to ensure the appropriate instructor receives your message.

- o **Include your NAME and STUDENT NUMBER at the end of each email.**

- Remember, you are in a professional environment and thus all your written correspondence, including emails, should be professional. This means full sentences, proper grammar, NO text message lingo.

Missed Midterm Tests or Final Exam

Midterm tests:

- You **MUST email your course director** within TWO days (48 hours) of missing the test (the sooner the better).

- Valid and appropriately detailed **documentation** supporting the events (typically medical or emergency related) preventing your attendance **must be submitted to the First Year Biology Office (LSB 102) within SEVEN (7) days** of the missed test. Documentation should cover the date of the missed test.

- o **Medical (illness) related: You MUST see a Physician within 24 hours of the missed test – ideally on the same day - so that the Physician can confirm you are too ill to attend the test based on medical examination. Valid documentation for medical situations** consists of an “Attending Physician’s Statement” from the registrar petitions package

http://www.registrar.yorku.ca/pdf/petitions/petition_package.pdf or

letter/document of similar detail. **A note that simply says you were seen in the clinic will not be accepted.**

- o Death of an immediate family member: death certificate or letter from the funeral director

- o Contact your instructor to determine the appropriate documentation required for other circumstances.

- If appropriate documentation is NOT provided within seven (7) days, a zero will be earned on the missed midterm.

- NOT all situations will be accommodated, meaning that a zero will be earned on the missed test.

- o Circumstances not accommodated include, but are not limited to, schedule confusion, sleeping in, missing the bus, personal endeavours (including a job), and busy lives.

- Where appropriate and possible, makeup tests will be scheduled. These may differ in format from the original test (*i.e.*, include more short/long answer questions).

Missed Final exams:

- **All students** who miss the final examination must petition if they are seeking deferred standing. No student will be granted deferred standing by the instructor via a Deferred Standing Agreement Form (DSA). Students will have to seek deferred standing by submitting a petition to their home faculty. It will be the Petition Committee's decision whether deferred standing is granted and, if deferred standing is granted, this committee will also set the deadline for writing the deferred examination.
- See "Deferred Standing Guidelines for Final Exam Only" on the course Moodle site for further details.
- The format of the make-up final exam for this course is identical to the regular final exam.

Forum Code of Conduct:

Students are encouraged to participate in the online Moodle forums to discuss course concepts, organize study groups, and ask questions relating to Biology. The discussion on the forums has typically been polite and respectful, and we hope this will continue. Students are expected to follow the code of conduct when using the Moodle forums:

- i. Check to see if your question has already been posted. (You can search the forums – you don't have to read each post!) If your question hasn't already been asked, please post in the most appropriate area.
- ii. Use a clear, informative subject line. Try to be as specific as possible.
- iii. Post comments appropriate to the particular discussion. Off-topic posts may be moved or deleted.
- iv. Be respectful. Posts containing personal insults/ attacks/ intimidation/ profanity will be deleted. (It is also worth remembering that your instructors read forum posts!)
- v. Post only material relevant to BIOL4370. Other posts will be deleted.
- vi. While it is appropriate to engage in debate/ discourse on biological topics, such discussions should be respectful and evidence-based. Evidence should be from trusted sources – consult with the library if you are not sure! (See: <http://www.yorku.ca/webclass/module4a.html>)
- vii. Any posts which appear to violate our code of conduct may be edited, moved or deleted at the discretion of instructors/moderators. If posts give indications of violations of academic honesty or the York University student code of conduct, further action will be taken.

Recording Lectures:

Photographs or video recordings of any portion of the lectures (including slides) are PROHIBITED. Images and material presented are subject to Canadian copyright law.

Audio recordings are permitted provided they are used ONLY as a personal study aid, and are NOT sold, passed on to others or posted online. Remember the lectures are the intellectual property of the professor and cannot be distributed without permission.

University Policies

Academic Honesty and Integrity

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (<http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards.

There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve students' research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website at - <http://www.yorku.ca/academicintegrity/>

Access/Disability

York University is committed to principles of respect, inclusion and equality of all persons with disabilities across campus. The University provides services for students with disabilities (including physical, medical, learning and psychiatric disabilities) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Students in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with disabilities services and discussing your needs

with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

Additional information is available at the following websites:

Counselling & Disability Services - <http://cds.info.yorku.ca/>

Counselling & Disability Services at Glendon - <http://www.glendon.yorku.ca/counselling/personal.html>

York Accessibility Hub - <http://accessibilityhub.info.yorku.ca/>

Ethics Review Process

York students are subject to the York University *Policy for the Ethics Review Process for Research Involving Human Participants*. In particular, students proposing to undertake research involving human participants (e.g., interviewing the director of a company or government agency, having students complete a questionnaire, etc.) are required to submit an *Application for Ethical Approval of Research Involving Human Participants* at least one month before you plan to begin the research. If you are in doubt as to whether this requirement applies to you, contact your Course Director immediately.

Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete an Examination Accommodation Form, which can be obtained from Student Client Services, Student Services Centre or online at

http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf (PDF)

Student Conduct in Academic Situations

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at - <http://secretariat-policies.info.yorku.ca/policies/disruptive-and-or-harassing-behaviour-in-academic-situations-senate-policy/>