

NROC64: Sensorimotor Systems

I) Course information

Course number: NROC64H3 S

Fridays: 10 am - 12 pm

Place: HW 216

Prerequisites: (BIOB30H &) NROB60H, exclusion (but not equivalent): PSY290H

II) Instructor:

Dr. Matthias Niemeier
1265 Military Trail SW550
e-mail: psyb51@utsc.utoronto.ca
Office Hours: Fridays, 12-1 pm.

III) Teaching Assistants:

Jiaqing Chen, Adam Frost & Lawrence Guo

IV) Blurb

A focus on the mechanisms by which the nervous system processes sensory information and controls movement. The topics include sensory transduction and the physiology for sensory systems (visual, somatosensory, auditory, vestibular). Both spinal and central mechanisms of motor control are also covered.

V) Course readings (required)

Textbook

Title: Neurophysiology. A Conceptual Approach

Authors: R. Carpenter & B. Reddi

Publisher: Hodder Arnold

ISBN: 978-1-4441-13517-6

Additional readings

There will be additional readings. These readings are selected chapters from textbooks, and scientific articles. The latter are mainly research articles that report on a piece of scientific work. The idea behind these readings is that you have a chance to practice reading scientific articles. Being able to do so is an absolute must in many professional areas, inside and outside the university. Because this is a skill there is no other way to learn it but to practice.

VI) Web pages

Course Web Site: BlackBoard

Here you will find the syllabus, and announcements. Also, I will put the lecture slides on that page.

Please check on a regular basis for announcements.

VII) Evaluation

5% Quizzes

Format: 10 true/false questions during lectures 2-12, top 9 quizzes will be counted

| | |
|----------------------------|--|
| 15% Mid-term test 1 | Format: short answer questions. 1 hour. |
| 15% Mid-term test 2 | See mid-term 1 |
| 10% Thought paper 1 | Written assignment, 2 pages, double-spaced |
| 10% Thought paper 2 | See t-paper 1 |
| 45% Final Term test | 2 1/2 hours. Same format as the mid-terms. |

Quizzes are meant to encourage you to read and prepare the material for a given lecture ahead of time and properly prepare the facts for the respective lecture. Given this objective, it follows that there is no opportunity to make up for missed quizzes and also that the material tested in the quizzes comes from the readings for the respective week. Quizzes will consist of 10 yes/no or true/false questions about reading material of the respective lecture. Quizzes will take the first 5-10 min of each lecture. If you have scores for more than 9 quizzes I'll pick your top 9 scores.

The **mid-term tests** and the **final exam** will be equivalent in format and will have short-answer questions only. There will be no multiple-choice questions. Short answer questions are more suitable for measuring conceptual understanding of material, beyond memorizing and recognizing facts.

Material on the exams will include lecture material and text readings. Although the topics covered will overlap, different things may be emphasized in class than in the book or other readings. I recommend reading all the materials and I do urge you to attend all classes. If you miss a class, please make sure to have someone take notes for you. Lectures will not be recorded, and please do not tape the lectures.

It is important that students can demonstrate their intellectual command of the subject matter of this course *in its entirety* at the end of the term. Consequently, it is essential that the final exam provide a comprehensive (cumulative) assessment of the course. Given the stress that cumulative final exams produce, students will have the opportunity to take two term tests to gain an interim assessment of their ongoing command of the course material. Both term tests will be one hour long and will be held outside of class. The first term test (15%) will cover Lectures 1 to 4. The second term test (15%) will cover Lectures 5 to 8. The final exam (45%) will cover the course in its entirety (Lectures 1-12) and will be two and a half hours long. About 60% of the questions will cover Part III; the other 30% of the questions will provide equal coverage of Parts I and II. Each question will concern an idea from the lectures or readings and require a written response.

Summary:

- The first midterm (15%) will cover Part I (Lectures 1-4).
 - The second midterm (15%) will cover Part II (Lectures 5-8).
 - A cumulative final exam (45%) will cover all Parts (Lectures 1-12)
- = 10% [Part I] + 10% [Part II] + 25% [Part III] = 45%.

However, if your performance on the final exam with respect to Part I or Part II is greater than your performance on the respective term test, then I will let your performance on that part of the final exam assume a weight of 25% and your term test grade will not count. In other words, if you can improve from the term test to the final exam, then the term test will be nothing but a practice test. However, there is

one condition: a midterm grade needs to be 40% or better for this rule to apply. That is, it will be imperative to prepare for the midterms.

Here the formalized rules:

Mid-term 1 = MID1

Mid-term 2 = MID2

Final Part I = FIN1

Final Part II = FIN2

Final Part III = FIN3

If FIN1 better than MID1 **and** if MID1 = 40% or better, then FIN1 weighs 25%, MID1 weighs 0% of total grade.

If MID1 better than FIN1 **or** if MID1 less than 40%, then MID1 weighs 15%, FIN1 weighs 10% of total grade.

If FIN2 better than MID2 **and** if MID2 = 40% or better, then FIN2 weighs 25%, MID2 weighs 0% of total grade.

If MID2 better than FIN2 **or** if MID2 less than 40%, then MID2 weighs 15%, FIN2 weighs 10% of total grade.

FIN3 always weighs 25%.

Missing a mid-term. Under exceptional circumstances students may miss a mid-term test. All students citing a documented reason for missed term work are instructed to bring their documentation to Course Coordinator, Ainsley Lawson in SW427C for tracking purposes. Valid reasons are: a verified illness, a serious family emergency or religious observances (invalid reasons: vacations, time conflicts with other courses, or with work schedules). In most instances you will need to provide documentation for your valid reason. For example, with respect to absences due to illness, you will need to provide a valid UTSC Medical Certificate. It is your responsibility to make sure that medical certificates are

- filled out completely and sufficiently,
- filled out by an expert (medical doctor, counselor etc. – see top of the certificate)
- filled out on the day of the exam,
- submitted to Ainsley within 3 business days of the mid-term.

There will be no make-up term tests. For midterms that are missed for a valid reason the respective other midterm and the final grade will be re-weighted proportionally (weights of 18.75% and 56.25%, respectively). There will be no option to improve midterm grades through final grades. That is, a missed MID1 or MID2 cannot be replaced by a FIN1 or FIN2 grade, respectively.

There will be no extra-credit opportunities. The only way that students can earn credit in this class is through quizzes, thought papers, mid-term term tests and the final exam. I will not, *under any circumstances*, accept academic work from students for extra credit. There will be no exceptions to this rule.

Term Test Policies & Procedures. The Registrar typically finalizes the mid-term test schedule sometime during the first few weeks of class. As soon as we are provided the schedule for the term test dates, times, and locations, we will post this information on the Course Blackboard.

Final Exam Policies & Procedures. The scheduling of final exams and the granting of petitions to defer final exams are matters that fall entirely within the jurisdiction of the Registrar's Office. If you have any concerns relating to your final exam attendance, please contact the Registrar.

Thought papers. There will be 2 written assignments, called 'thought papers'. Each of them will be 2 pages long, double-spaced. The idea is to write about one of your own ideas about one research paper. Format is as follows

- 1 paragraph Introduction beginning with a 2-3 sentence long summary of the article (perhaps preceded by a more general statement about the concept that is investigated etc. – 'bigger picture') about one research article (see marked below). The Introduction needs to end with a thesis statement.
- It follows about 1, 2, 3 paragraphs on your own thought about the article. Focus on one thought only.
- Conclusions: 1 paragraph. Summarize what you've been talking about

More information about the t-papers will be posted on BlackBoard. This includes a document on how to write the written assignment and 2 sample papers. Submission is by Turnitin. Late submissions mean a deduction of 10% of the thought paper grade per late day. Please make sure you write a genuine paper. We will feed the papers into Turnitin.

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com website.

Difficulties with the course: Please talk to me if you are having difficulties with the course. The earlier the better. I will try my best and be happy to help. ***Please note, that as per university policy it is not possible to negotiate better grades for other reasons than merit.***

VIII) Schedule

This schedule is subject to changes as we go along, please see intranet for updates. Bear = chapter from Bear textbook, Carp = chapter from Carpenter textbook, AR = additional reading(s)

| Lecture | Title | Readings |
|--|--|--|
| <i>----- Part I: Senses -----</i> | | |
| Lecture 1 | Introduction, Vision 1 | Carp7: optics, accommodation, acuity |
| Lecture 2 | Vision 2 | Carp7: retina, visual pathway; Asari2012: p.1581-1583 (not "Adaptation") |
| Lecture 3 | Vision 3 | Carp7: visual cortex; Goodale1992 |
| Lecture 4 | Skin, proprioception, vestibular system; Multisensory perception | Carp4; Carp5; Wallace2004 |
| <i>---- Part II: Muscles & sensorimotor systems ----</i> | | |

| | | |
|---|--|---|
| Lecture 5 | Muscle physiology; Motor systems | Bear13 (muscle physiology only); Carp9: p.189-191 (not "Direct feedback") |
| Lecture 6 | Motor systems cont'd | Carp9: p.191-end; Hermosillo2011 |
| Lecture 7 | Local motor control | Carp10 |
| Lecture 8 | Oculomotor system, VOR | Tutis Vilis' webpage; Goldberg2000 |
| <i>----- Part III: Sensorimotor systems -----</i> | | |
| Lecture 9 | Spatial stability | Wurtz2011 |
| Lecture 10 | Posture | Carp11; Karnath2000 |
| Lecture 11 | Higher motor functions, cerebellum, BG | Carp12 |
| Lecture 12 | Pointing, reaching and grasping; joint actions | Vesia2012 |

Additional readings:

Asari H, Meister M (2012). Divergence of visual channels in the inner retina. *Nat Neurosci* 15:1581-9.

Goldberg ME (2000). Control of gaze. In: Kandell & Schwartz. *Principles of Neuroscience*. MIT

Goodale MA, Milner AD (1992). Separate visual pathways for perception and action. *Trends Neurosci*, 15(1):20-5.

Hermosillo R, Ritterband-Rosenbaum A, van Donkelaar P (2011). Predicting future sensorimotor states influences current temporal decision making. *J Neurosci* 31:10019-10022.

Karnath HO, Ferber S, Dichgans J (2000). The origin of contraversive pushing: evidence for a second graviceptive system in humans. *Neurology*, 14, 55(9):1298-304.

Vesia M, Crawford JD (2012). Specialization of reach function in human posterior parietal cortex. *Exp Brain Res*, 221(1):1-18.

Wallace MT, Perrault TJ Jr, Hairston WD, Stein BE (2004). Visual experience is necessary for the development of multisensory integration. *J Neurosci*, 24(43):9580-4.

Wurtz RH, McAlonan K, Cavanaugh J, Berman RA (2011). Thalamic pathways for active vision. *Trends Cogn Sci*, 15(4):177-84.

IX) AccessAbility Statement

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with

you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in SW302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca.

X) Academic Integrity Statement

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to: IN PAPERS AND ASSIGNMENTS: Using someone else's ideas or words without appropriate acknowledgement. Submitting your own work in more than one course without the permission of the instructor. Making up sources or facts. Obtaining or providing unauthorized assistance on any assignment. ON TESTS AND EXAMS: Using or possessing unauthorized aids. Looking at someone else's answers during an exam or test. Misrepresenting your identity. IN ACADEMIC WORK: Falsifying institutional documents or grades. Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes. All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <http://www.utoronto.ca/academicintegrity/resourcesforstudents.html>).

XI) webOption

No online section will be available.

XII) Course Policies

For other academic regulations please also refer to the UTSC calendar.