

NROC64: Sensory and Motor Systems

I) Course information

Course number: NROC64H3 S

Fridays: 12 - 3 pm
Place: SW 319

Prerequisites: BIOB30H & NROB60H

II) Instructor:

Dr. Matthias Niemeier
1265 Military Trail SW569
phone: 416-287-7466
e-mail: niemeier@utsc.utoronto.ca I will respond within two working days.
Office Hours: Fridays, 3-4 pm.

III) Teaching Assistants:

Jiaqing Chen, Adam Frost & Ada Le

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 sensory physiology for each of the sensory systems (olfactory, visual, somatosensory, auditory, gustatory) and models of sensory processing. Both spinal and central mechanisms of motor control are also covered.

V) Course readings (required)

Textbook 1

Title: Neuroscience. Exploring the Brain, 3rd Edition
Authors: M. F. Bear, B. W. Connors & M. A. Paradiso
Publisher: Lippincott, Williams & Wilkins
ISBN: 978-0-7817-6003-4

Required Chapters from Textbook 2 can be purchased from the UofT Bookstore

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 which are scientific articles, mostly 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.	7 best quizzes out of 10 possible ones.
35% Mid-term test.	Format: short answer questions. Two hours.
10% Thought paper 1.	Written assignment, one page, double-spaced
10% Thought paper 2.	Written assignment, one page, double-spaced
40% Final Term test.	Two hours. Same format as the mid-term.

Quizzes are meant to entice you to read and prepare the material for a given lecture ahead of time and prepare the facts for the lecture. Obviously that is the best strategy to learn for a course. Quizzes will typically consist of 10 yes/no questions about reading material of the respective lecture. Quizzes will take place during lectures. There won't be an opportunity to write make-up quizzes if you come too late or miss a lecture but there will be 10 chances to write quizzes whereas you need only 7 in total. On the other hand, if you have more than 7 quizzes I'll pick your top seven scores.

The **mid-term test** and **final exam** will be similar in format and will have short-answer questions only. There will be no multiple-choice questions. I have decided to focus on short answer questions because they are much better at measuring conceptual understanding of the material above and beyond memorizing and recognizing facts. Furthermore, short-answer questions will help you work on your written communication skills. I will ask similar practice questions in class for you to get an intuition of what these questions will be about and whether you are able to answer them. In addition, I highly recommend to form **study groups** and test one another with similar questions. I cannot stress enough how helpful it is to meet with other students and practice for exams! Very often I have heard that students felt they 'kind of' knew a topic/concept or got the gist of it but when they were asked to explain they couldn't do it. Or they feel they implied the correct answer but it wasn't clear to me or our TAs. If problems with SAQs show up during a study group meeting, great: you know what needs a bit more work, a visit of my office hours might be good too; let's work together to make sure you are doing well on the exams!

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. Therefore, 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 taped.

Missing the mid-term: If you miss the mid-term exam you will be asked to provide documentation for why you missed it, and I will have to insist on receiving your documentation within one week of the mid-term because only then I can properly arrange for a make-up test. Documentation has to meet usual standards, e.g., for medical reasons I will ask for the official UTSC medical certificate form. Also, I will ask forms to be filled in by experts. That is, for medical reasons you will need an M.D. to fill in your form, for psychological reasons you will need an M.D., a clinical psychologist or counsellor etc. ***The format of make-up test will be similar to the mid-term but because in the meantime there was more time to study I will include a question about the next lecture as well to be fair to everyone.*** Should you miss the make-up test, I will need timely submitted documentation for the reason

as well. In that case I will arrange for a 30-min oral exam to give you an opportunity to make up for the missed tests.

If you miss the final exam, you are asked to petition to write the test through the Registrar's office, usually one term later.

Written assignments. There will be 2 written assignments, called 'thought papers'. Each of them will be 2 pages long, double-spaced. The idea is that 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 the intranet. This includes a document on how to write the written assignment and 2 sample papers. Deadlines are Feb 1 and March 22 at 23:59, respectively. Submission is by email to my account: niemeier@utsc.utoronto.ca. Late submissions mean a deduction of 10% per late day. Please make sure you write a genuine article. We will feed the papers into Turn It In.

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 am 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)

Wk	Dates	Topic	Chapters	Quiz
1	11/01	Welcome & Introduction, Chemical senses	Bear8, AR1	-
2	18/01	The Eye, Visual Pathways	Bear9, Bear10, AR2	Quiz 1 on Bear9
3	25/01	Central visual system	Bear10, AR3	Q. 2 on Bear10
4	01/02	The auditory system, The vestibular system	Bear11, AR4	Q. 3 on Bear11
	01/02	Thought paper 1 due at 23:59	AR3	
5	08/02	The somatic sensory system	Bear12, AR5	Q. 4 on Bear12
6	15/02	Multisensory perception & spatial constancy	AR6	Q. 5 on AR 6a
7	01/03	Mid-term in class	Bear8-12, AR1-6	-
8	08/03	Local control of movement	Carp10, Bear13, AR7	Q. 6 on Carp10 & Bear13
	~11/03	Make-up mid-term	Bear8-12, Carp9, AR1-7	-
9	15/03	Motor systems	Carp9, AR8	Q. 7 on Carp10

				& Bear13
10	22/03	Posture; Oculomotor system	Carp10+11, AR9a, AR9b	Q. 8 on Carp10+11, AR9a
	22/03	Thought paper 2 due at 23:59	AR8	
11	29/03	Higher motor control, Reaching & grasping	Carp12, AR10	Q. 9 on AR 3
12	05/04	Attention & consciousness	Bear21, AR11	Q.10 on Bear21
TBA		Final exam	biased	

Additional readings (AR):

- 1) Nelson G, Chandrashekar J, Hoon MA, Feng L, Zhao G, Ryba NJ, Zuker CS (2002). An amino-acid taste receptor. *Nature* 416:199-202.
- 2) Asari H, Meister M (2012). Divergence of visual channels in the inner retina. *Nat Neurosci* 15:1581-9.
- 3) Nestor A, Tarr MJ (2008). Gender recognition of human faces using color. *Psychol Sci* 19:1242-6.
- 4) Mammano F, Ashmore JF (1993). Reverse transduction measured in the isolated cochlea by laser Michelson interferometry. *Nature* 365, 838-41.
- 5) Blankenburg F, Ruff CC, Deichmann R, Rees G, Driver J (2006). The cutaneous rabbit illusion affects human primary sensory cortex somatotopically. *PLoS Biology* 4(3):e69.
- 6a) Macaluso E, Driver J (2005). Multisensory spatial interactions: a window onto functional integration in the human brain. *Trends Neurosci* 28:264-271.
- 6b) Stein BE, Stanford TR (2008). Multisensory integration: current issues from the perspective of the single neuron. *Nat Rev Neurosci* 9:255-266.
- 6c) Wurtz RH (2008). Neuronal mechanisms of visual stability. *Vision Res* 48:2070-2089.
- 7) tbd
- 8) Hermosillo R, Ritterband-Rosenbaum A, van Donkelaar P (2011). Predicting future sensorimotor states influences current temporal decision making. *J Neurosci* 31:10019-10022.
- 9a) Goldberg ME (2000). Control of gaze. In: *Kandell & Schwartz. Principles of Neuroscience*. MIT
- 9b) Lynch JC (2009). Oculomotor control: Anatomical pathways. *Encyc Neurosci*. 17-23.
- 10) Batista AP, Buneo CA, Snyder LH, Andersen RA (1999). Reach plans in eye-centered coordinates. *Science* 285:257-260.
- 11) Blanke O, Mohr C, Michel CM, Pascual-Leone A, Brugger P, Seeck M, Landis T, Thut G (2005). Linking out-of-body experience and self processing to mental own-body imagery at the temporoparietal junction. *J Neurosci* 25:550-557.

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 for NROC64 2012.

XII) Course Policies

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