

NROC64S COURSE SYLLABUS: WINTER 2002

SENSORY AND MOTOR SYSTEMS

Course Details

Instructor:

Professor N.W. Milgram
Room S-637
287-7402
Office hours: M 14:00-16:00
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Teaching Assistants:

Christina Siwak (christina.siwak@utoronto.ca)
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Classrooms And Scheduled Times:

Lectures:

Monday, Wednesday and Friday at 10:00 Room H305

Tutorials

Monday 2:00 Room H310
Monday 4:00 Room H309

Course Description

This course covers the neurobiology of sensory and motor systems. The goal is to understand how the external world is encoded (sensory coding), recognized (perception) and acted upon (motor control). The course will start with a general discussion of neural coding and representation. We will then move on to vision and will discuss image formation, visual transduction, retinal coding and CNS processing.

We will then cover the other main sensory systems. These include the auditory system, somatosensory system (touch, thermosensitivity, kinesthesia,) olfactory system and gustatory system.

The last topic will be motor control. We will first look at muscle contraction, and the associated peripheral and spinal control mechanisms. We will then focus on the brain motor system and how this is involved in planning and triggering motor sequences.

Course Materials

Tests will be based on lecture notes and assigned readings. The readings will be primarily Scientific American articles that relate to topics covered in this course and can be discussed in the tutorials.

Powerpoint slides used in the lectures and the instructors lecture notes will be placed on the internet course site. The URL is <http://www.utsc.utoronto.ca/~milgram/nroc64/>

Tutorials

Tutorials will meet weekly and will be used to both discuss lecture material and assigned readings and to organize and carry out group projects. There will be two group projects, one before reading week and the other after. Each will be worth 10% of the final grade.

Grading

Grades will be based on two midterms (February 6th and March 15th) worth 20% each (40% in total), a comprehensive final exam worth 40%, and on tutorials, worth 20%.

The exam questions will consist of multiple choice, fill in the blank, true false, matching and short answer questions.

ASSIGNED READINGS

- Andersen, J.L., Schjerling, P., & Saltin, B. (2000). Muscles, genes and athletic performance. *Scientific American* (September) 283, 48-55.
- Borg, E., & Counter, A. (1989). The middle-ear muscles. *Scientific American* (August), 261, 74-81.
- Englert, B-G. Scully, M.O., & Walther, H. The duality in matter and light. *Scientific American* (December), 270, pp 86-92.
- Englert, B., Scully, M.O., & Walther, H. (1994). The duality in matter and light. *Scientific American* (December), 271, 86-93.
- Freeman, W.J. (1991). The physiology of perception. *Scientific American* (February), 264, 78-87.
- Glickstein, M. (2000). How are visual areas of the brain connected to motor areas for the sensory guidance of movement? *Trends in Neurosciences*, 23, 613-617.
- Grillner, S. (1996) Neural networks for vertebrate locomotion. *Scientific American* (January), 274, 64-69.
- Hudspeth, A.J. (1983). The hair cells of the inner ear. *Scientific American* (January), 248, 54-64.
- Konishi, M. (1993). Listening with two ears. *Scientific American*
- Logothetis, N.K. (1999). Vision: a window on consciousness. *Scientific American* (November), 279, 69-75.
- Melzack, R. (1990). The tragedy of needless pain. *Scientific American* (February), 262, 27-33.
- Ramachandran, V.S. (1992). Blind spots. *Scientific American*, (May), 266, pp 86-91.
- Rapoport, J.L. (1989). The biology of obsessions and compulsions. *Scientific American* (March), 260, 82-89.
- Smith, D.V., & Margolskee R.F., (2001). Making Sense of Taste. *Scientific American* (March) 284, 32-39.
- Sun, H., & Nathans, J. (2001). The challenge of macular degeneration. *Scientific American*, 285, Number 4 (October) 68-75.
- Weissmann, G. (1991). Aspirin. *Scientific American* (January), 264, 84-91.
- Zeki, S. (1992). The visual image in mind and brain. *Scientific American*, (September) 267, 68-78.

COURSE SCHEDULE

Date	Topic	Assigned Reading
1- Jan 8	Introduction Sensory Codes and Representations	Ramachandran
10	NO CLASS	Englert Scully and Walther
12	NO CLASS	
2- Jan 15	Vision: The Visual Stimulus, Structure of the Eye	Sun and Nathans
17	Vision: Formation of Retinal Images	
19	Vision: Transduction Mechanisms	
3- Jan 22	Vision: Retinal Coding	Zeki
24	Vision: Visual Pathways in CNS	
26	Vision: Coding in VI	
4- Jan 29	Vision: Representations of Objects and Space	Logothetis
31	Audition: Physical Properties of Sound; Peripheral Mechanisms in Audition	
Feb 1	Peripheral Mechanisms in Audition – the Cochlea	
5- Feb 4	Peripheral Mechanisms in Audition - Transduction	Hudspeth
6	First Midterm Exam	
8	Audition: The Auditory Nerve	Borg and Counter
6-Feb 11	Anatomy of Brain Auditory System	
13	Cortical Processing of Sound	Konishi
15	Somatosensory Systems: Introduction and Historical Background	Weisman
	Reading Week (Feb 19- 23)	
7- Feb 25	Peripheral Coding of the Somatosensory system	Melzack
27	Somatosensory System anatomy	
Mar-1	Cortical Processing - Somatosensory Plasticity	
8- Mar 4	Pain	Smith and Margolskee
Mar 6	Chemical sensory systems: Taste	
Mar 8	Chemical sensory systems: Taste	
9- Mar 11	Olfaction: Olfactory Transduction	Freeman
Mar 13	Central Nervous System Processing Odors	
Mar 15	Second Midterm Exam	
10-Mar 18	Movement: Organization of Motor Control	Anderson et al.
Mar 20	Control of Muscle Contraction	
Mar 22	The Muscle Spindle System	Grillner
11-Mar 25	Preprogrammed Response Sequences	
Mar 27	The Cerebellum	Glickstein
Mar 29	Efferent Pathways	
12- Apr 1	Premotor Networks and Motor Cortex	
Apr-3	Basal Ganglia and Cortical Processing Networks	Rapoport
Apr-5	Motor Plans and Images	
Apr-6	Wrap-up	