

NROC64S COURSE SYLLABUS: WINTER 2006

SENSORY AND MOTOR SYSTEMS

COURSE DETAILS

Instructor:

Professor C. de Rivera

Room: S418C

Office hours: Monday 1:00 – 2:00

Wednesday 12:00 – 1:00

Or by appointment

Email: cderivera@utsc.utoronto.ca

Teaching Assistant:

Pria Nippak

Room: S418C

Office hours: Tuesday 11:00 – 12:00

Email: pria.nippak@utoronto.ca

Classrooms and Scheduled Times:

Lectures:

Monday 11:00 - 1:00 SW319

Wednesday 11:00 - 12:00 SW309

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. The next topic will be vision. We start with an analysis of retinal processes, which include image formation, visual transduction and retinal coding. This is followed by a discussion of CNS processing – the transformation of neural codes to visual perception.

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

Students with diverse learning styles and needs who have a disability/health consideration that may require special accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. Tina Doyle, the UTSC AccessAbility Manager 416 287-7560 is available

by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner you let us know about your needs, the quicker we can assist you in achieving your learning goals in this course.

Course Materials

Tests will be based on lecture notes and assigned readings. The readings will be Scientific American articles and textbook chapters that relate to topics covered in this course. Powerpoint slides used in the lectures will be posted on the intranet.

Grading

Grades will be based on two midterms (February 6 and March 22) worth 25% each (50% in total) and a comprehensive final exam worth 50%.

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

Missed Tests

Makeup exams will only be considered with a note from a physician, otherwise a "0" will be recorded for that exam. Please use only the medical note available for download at www.utsc.utoronto.ca/~registrar/.

Texts

We will be using 5 chapters from the Purves text you used in NROB60 and NROC61. A copy of the text is available on short-term loan.

Purves et al., **Neuroscience** 3rd edition

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.
- Bower, J.M., & Parsons, L.M. (2003). Rethinking the lesser brain. *Scientific American* (August), 289, 50-57.
- Catania, K.C. (2002). The nose takes a starring role. *Scientific American* (July), 287, 54-60.
- Dahm, T. (2004). Dying to see. *Scientific American* (October), 29, 83-89.
- Freeman, W.J. (1991). The physiology of perception. *Scientific American* (February), 264, 78-87.
- Freeman, W.J.(1991)The physiology of perception. *Scientific American* (Feb)., 78-85
- Grillner, S. (1996) Neural networks for vertebrate locomotion. *Scientific American* (January), 274, 64-69.
- Livingstone, M.S. (1985). Art, illusion and the visual system. *Scientific American*, 258, 78-85.

- 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* (Feb), 262, 27-33.
- Melzack, R. (1992). Phantom limbs. *Scientific American* (April), 120-126.
- Nicolelis, M.A.L., & Chapin, J.K. Controlling robots with the mind. (2002), *Scientific American*, 287 46-53.
- Ramachandran, V.S. and Hubbard, EM (2004). Hearing colors, tasting shapes. *Scientific American*, (May), 288, 53-59.
- Ramachandran, V.S. (1992). Blind spots. *Scientific American* (May), 266, 86-91.
- Smith, D.V., & Margolske 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*, (October), 285, 68-75.
- Suga, N. (1990). Biosonar and neural computation in bats. *Scientific American* (June), 262, 60-71.
- Weinberger, N.W. (2004). Music and the brain. *Scientific American* (Nov), 291, 88-95.

COURSE SCHEDULE

Week	Date	Topics	Assigned Reading	Textbook
1	Jan 9	Introduction; Sensory Codes and Representations	Ramachandran	
	Jan 11	Vision: The Visual Stimulus	Dahm	
2	Jan 16	Vision: Structure of the Eye; Formation of Retinal Images	Sun and Nathans	Chapter 10
	Jan 18	Vision: Transduction Mechanisms		
3	Jan 23	Vision: Retinal Coding; Visual Pathways in CNS	Livingstone	Chapter 11
	Jan 25	Vision: Representations of Objects and Space	Logotheitis; Ramachandran and Hubbard	
4	Jan 30	Audition: Sound - Peripheral Mechanisms		Chapter 12
	Feb 1	Peripheral Mechanisms in Audition – the Cochlea; transduction mechanisms	Borg and Counter	
5	Feb 6	First Midterm Exam		
	Feb 8	Audition: The Auditory Nerve	Suga	
6	Feb 13	Anatomy of Brain Auditory System; Cortical Mechanisms	Weinberger	
	Feb 15	Somatosensory Systems: Introduction and Historical Background	Catania	Chapter 8
	Feb 20-24	Reading Week: No Classes		
7	Feb 27	Peripheral Coding of the Somatosensory system - Somatosensory System anatomy	Melzack (1990)	
	Mar 1	Cortical Processing - Somatosensory Plasticity	Melzack (1992)	
8	Mar 6	Olfaction 1		Chapter 14
	Mar 8	Olfaction 2		
9	Mar 13	Central Nervous System Processing Odors	Freeman	
	Mar 15	Taste	Smith and Margolskee	
10	Mar 20	Movement: Organization of Motor Control: Control of Muscle contraction	Andersen et al.	
	Mar 22	Second Midterm Exam		
	Mar 27	The Muscle Spindle System	Grillner	
	Mar 29	Preprogrammed Response Sequences; The Cerebellum	Bower and Parsons	
12	Apr 3	Premotor Networks and Motor Cortex	Nicolelis and Chaplin	
	Apr 5	Basal Ganglia and Cortical Processing Networks; Motor Plans and Images		