CGS/NSC/PSY 4359 – Cognitive Neuroscience

Fall Term 2013
Monday & Wednesday 5:30 PM – 6:45 PM
Founders Building Room 2.604

Bart Rypma, PhD
4.302 Jonsson Hall
Office Phone: 972-883-4472
email: bart.rypma@utdallas.edu
Office Hour: Wednesday 3:00 PM – 4:00 PM or by appointment

Monroe Turner, Teaching Assistant
2.706 Green Hall
email: monroe.turner@utdallas.edu
Office Hour: Wednesday 4:00 PM – 5:00 PM or by appointment

Prerequisites: Cognitive Psychology PSY/CGS 3361 or Cognitive Science CGS 2301
Corequisites: None
Other restrictions: None

Grading Policy: Grades will be based on your performance on 4 exams. Grading is based on a curve. Criteria may vary based on overall class performance. Grades will be based on the total number of points across the course. Extra credit will be available on all exams. Extra credit will also be given for improvement across the 4 exams.

DON'T MISS AN EXAM! Make-up exams will be given only if: (a) you were seriously ill and have verifiable documentation from a physician, or (b) you were detained the day and time of the exam, or (c) you made arrangements prior to the exam to attend to an urgent family matter (e.g., funeral). In any of these cases, you must notify the professor in advance of the scheduled time of the exam (call and leave a voice-mail message if you can do nothing else). Otherwise, you will receive an F. It is the student's responsibility to make sure that an exam is made up within one week of the scheduled time. Beware, make-up exams are designed to be more comprehensive to compensate for having more study time.

***Faulty Exam Questions*:** Occasionally, we write faulty exam questions. If you encounter such a question, let me know immediately after the exam period. I will consider your arguments before grading the exams, and, if necessary, throw out the question for everyone.

Readings: Gazzaniga, M.S., Ivry, R.B., Mangun, G.R. (2009). *Cognitive Neuroscience: The biology of the mind (3rd Edition)*. NY:W.W. Norton and Co.

Supplemental readings: Kandel, E.R., Schwartz, J.H., Jessel, T.M. (2000). Principles of Neural Science. NY:McGraw-Hill. Note: Supplemental readings from this textbook are considered optional reading.

Other readings as assigned.

Course Description: In this course we will examine how modern "cognitive neuroscientists" are exploring the neural underpinnings of basic and higher cognitive functions (including perception, memory, attention, language, and emotion). We will investigate how the brain-bases of these functions are being uncovered by ingenious observation of clinical populations (including brain-damaged and schizophrenic patients), animal and human electrophysiological techniques, and the powerful new tools of functional neuroimaging.

Learning objectives:

- To understand the intellectual underpinnings and history of the concepts of neuroscience and cognitive psychology
- To develop a working knowledge of the central nervous system and the basic functions that underlie human behavior
- To understand the behavioral and neuroscientific methods that are applied to the study of cognition and brain function.
- To understand the major theories and models of fundamental cognitive processes and current thinking on how such models guide study of the functioning human brain.

Date	Topic
8/26	**Overview**
8/28	**Historical Perspectives** Chapter 1: A brief history of Cognitive Neuroscience
9/2	**NO CLASS – Labor Day**
9/4	**The Central Nervous System** Chapter 2: Cellular mechanisms of cognition Kandel et al. Part II pp. 67-170: Cell and molecular biology of the neuron.
9/9	**Cellular and Molecular Biology of the Neuron** Chapter 2: Cellular mechanisms of cognition Kandel et al. Part II pp. 67-170: Cell and molecular biology of the neuron.
9/11	**Synaptic Transmission I** Chapter 2: Cellular mechanisms of cognition Kandel et al. Part II pp. 67-170: Cell and molecular biology of the neuron. Kandel et al. Chapter 10 pp. 175-185: Overview of synaptic transmission
9/16	**Synaptic Transmission II** Chapter 2: Cellular mechanisms of cognition Kandel et al. Chapter 10 pp. 175-185: Overview of synaptic transmission
9/18	**Neuroanatomy I** Chapter 3 pp. 59-90: Neuroanatomy and development. Kandel et al. Chapter 17 pp. 317-336: The anatomical organization of the central nervous system.
9/23	**Exam I**
9/25	**Methods I** Chapter 4: The methods of cognitive neuroscience Posner, M.I. (2005). Timing the brain: Mental chronometry as a tool in neuroscience. *PLoS Biology*, 3, 204-206.

9/30 **Methods II**
Chapter 4: The methods of cognitive neuroscience
Posner, M.I. (2005). Timing the brain: Mental chronometry as a tool in neuroscience. *PLoS Biology*, 3, 204-206.

10/2 **Methods III**
Chapter 4: The methods of cognitive neuroscience

10/7 **Development I**
Chapter 3 pp. 90-109: Development and plasticity
Kandel et al. Chapter 52 pp. 1017-1040: The induction and patterning of the nervous system

10/9 **Development II**
Chapter 3 pp. 90-109: Development and plasticity
Kandel et al. Chapter 52 pp. 1017-1040: The induction and patterning of the nervous system

10/14 **Perceptual Functions I**
Chapter 5: Sensation and perception

10/16 Exam II

10/21 **Perceptual Functions II**
Chapter 5: Sensation and Perception
Chapter 6: Object Recognition

10/23 **Perceptual Functions III**
Chapter 6: Object Recognition

10/28 **Attention I**
Chapter 12: Attention and consciousness
O'Craven, K.M., Downing, P.E. and Kanwisher, N. (1999). FMRI evidence for objects as the units of attentional selection. Nature, 401, 584-587.

10/30 **Attention II**
Chapter 12: Attention and consciousness
O'Craven, K.M., Downing, P.E. and Kanwisher, N. (1999). FMRI evidence for objects as the units of attentional selection. Nature, 401, 584-587.

11/4 **Language I**
Chapter 10: Language
Marshall, J.C. and Newcombe, F. (1980). The conceptual status of deep dyslexia: An historical perspective. In M. Coltheart, K. Patterson and J.C. Marshall (Eds.) *Deep Dyslexia*. London: Routledge and Paul Kegan.

11/6 **Language II**
Chapter 10: Language
Marshall, J.C. and Newcombe, F. (1980). The conceptual status of deep dyslexia: An historical perspective. In M. Coltheart, K. Patterson and J.C. Marshall (Eds.) *Deep Dyslexia*. London: Routledge and Paul Kegan.

11/11 **Short-term memory I (SFN)**
Chapter 8: Learning and memory
Baddeley, A. (1990). Chs 3 and 4 in *Human memory: Theory and practice*. Needham Heights, MA: Allyn and Bacon. 7
Baddeley, A. (2000). Short-term and working memory. In: E. Tulving and F.I.M. Craik, (Eds.), *The Oxford Handbook of Memory*. New York: Oxford University Press.

11/13 Exam III (SFN)

11/18 **Neuroscience of Working Memory I: Mechanisms of storage**
Chapter 8: Learning and memory
Paulesu, E., Frith, C.D. and Frackowiak, R.S.J. (1993). The neural correlates of the verbal component of working memory. *Nature, 362*, 342-345

11/20 **Neuroscience of Working Memory II: Mechanisms of executive function**
Chapter 13: Cognitive control
D'Esposito, M. (2007). From cognitive to neural models of working memory. *Philosophical Transactions of the Royal Society B, 362*, 761-772.

11/25 NO CLASS – Fall Break

11/27 NO CLASS – Fall Break

12/2 **Neuroscience of Working Memory III: Interactions of storage and executive function.**
Chapter 13: Cognitive Control
Rypma, B., Prabhakaran, V., Desmond, J.E., Glover, G.H. and Gabrieli, J.D.E. (1999). Load-dependent roles of prefrontal cortical regions in the maintenance of working memory. *Neuroimage, 9*, 216-226.
Prabhakaran, V., Narayanan, K., Zhao, Z., Gabrieli, J.D.E. (2000). Integration of diverse information in working memory within the frontal lobe. *Nature-Neuroscience, 3*, 85-90.

12/4 **Higher Cognitive Functions I: The neural basis of reasoning and planning**
Goel, V. and Grafman, J. (1995). Are the frontal lobes implicated in planning functions? Interpreting data from the Tower of Hanoi. *Neuropsychologia, 33*, 954-965.
Baker, S.C., Rogers, R.C., Owen, A.M., Frith, C.D., Dolan, R.J., Frackowiak, R.S.J. and Robbins, T.W. (1996). Neural systems engaged by planning: A PET study of the Tower of London Task. *Neuropsychologia, 34*, 515-526.

12/9 **Higher Cognitive Functions II: The neural basis of problem-solving**
Chase, W.G. and Simon, H.A. The mind's eye in chess.
Nichelli, et al. Brain activity in chess playing. *Nature, 369*, 191.

Prabhakaran V, Rypma B, Gabrieli JD. (2001). Neural substrates of mathematical reasoning: a functional magnetic resonance imaging study of neocortical activation during performance of the necessary arithmetic operations test. *Neuropsychology, 15*, 115-127.

12/11 **Consciousness**

Searle, J.R. (2000). Consciousness. *Annual Review of Neuroscience, 23,* 557-578.
Velmans, M. (2002). How could conscious experience affect brains? *Journal of Consciousness Studies, 9,* 3-29.

12/18 Final Exam (Tentative)

Student Conduct & Discipline
The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Academic Integrity
The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

Email Use
The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

Withdrawal from Class
The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

Student Grievance Procedures
Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

Incomplete Grade Policy
As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.

Disability Services
The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:
The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

Religious Holy Days
The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

These descriptions and timelines are subject to change at the discretion of the Professor.