

## SYLLABUS: INTRODUCTION TO COGNITIVE NEUROSCIENCE)

IB's Office: HNB 316, Best way to contact me: [bieder@usc.edu](mailto:bieder@usc.edu)

Contact hours: By appointment. Email me. You will find me quite responsive.

**Time:** Class meets: Mon, Wed 2:00-3:50 PM. **Room:** HNB 100 (Hedco Auditorium)

We will have a 10-min break at 3 PM.

**Required Text:** *Gazzaniga, M.S., Ivry, R. B., & Mangun, G. R. (2019). Cognitive Neuroscience: The Biology of Mind. Fifth Edition. New York, N.Y.: WWNorton. [ISBN: 978-0-393-603170] [GIM].*

**Journal Articles.** Articles are for background edification and will not be explicitly tested.

**Evaluation:** Evaluation will be based on three midterms (20% each) and a cumulative final examination (40%). All the exams will be multiple choice and will tend to assess conceptual understanding rather than rote memorization. However, there are specific facts and terms that are the intellectual currency in all sciences so those will be tested as well. Approximately 60-70% of the exam will be composed of questions from class lectures/PowerPoints. We will try to have a 4-6 PM review session following the class immediately prior to each exam. I will also distribute a study guide about a week or two prior to each exam.

**If you miss an exam:** There is no definite penalty but a probabilistic one: If you have taken all three midterms and you are near a grade cutoff (e.g., by 3 or 4 points in your average grade), you will get the higher grade. If you miss a midterm, you will get the lower grade. (You have to take the final.) Unless you are running a high A, there is a real possibility that missing an exam will cost you a grade, e.g., from an A- to a B+. We cannot evaluate the adequacy of excuses.

**Extra credit (Class Participation):** (up to 3%) will be awarded for class comments or questions that serve to illuminate the discussion or informed criticism (but not mere attendance). Good answers on those rare occasions when someone is called upon randomly also qualify but poor class decorum, e.g., Irrelevant or distracting behavior (e.g., social networking; texting; viewing non-class related material; talking, etc.) will result in *negative* participation credit.

**Extra credit (Research Participation):** (Up to 3%). For participating in research studies through the Psych Departments SONA subject pool system or a select few other studies. To earn course extra credit, all participation must be accompanied by a "reflection" on the experience (~.75 to 1 page/study). The reflection could include a linking of the study to course concepts, an informed critique of the study, or an informed personal revelation based on course concepts.

**Final Exam:** Thursday, Dec. 12, 2019, 2-4 PM, in HNB 100 (Regular classroom).

**Topics:** Roughly corresponding to weeks. *There will be some reordering/rescheduling of topics and possibilities of additions/subtractions of readings.*

**1. Aug 26: Introduction: Modularity. Cortex. Cortical Development. Broadbent's Flowchart Model of Attention. Memory and Attention.**

\*GIM Chapter 2 (pp. 52-69; Not responsible for detailed maps such as Figs. 2.37 & 2.39).

Cherniak, C. (1994). Component placement optimization in the brain. *Journal of Neuroscience*, 14, 2418-2427. (For background and edification. Not explicitly tested beyond what is discussed in lecture.)

**2. Aug. 28 : Sensation and Perception. Early sensory processing. Subcortical perceptual processing. How to get the world into the head. V1 and Gabor Filtering.**

\*GIM Chapter 5. Sensation & Perception. Skip sections 5.2 (Olfaction), 5.3 (Taste), and 5.8 (Multimodal perception).

**Sept. 2: Labor Day. No Class.**

**3. Sept. 4, 9 & 11. Higher Level Vision I. Object Recognition. RSVP. Temporal parameters. Geons. Nonaccidental Properties. Invariances. Representation of objects. Shape Agnostic D.F.**

\*GIM Object Recognition. Chapter 6.

Hayworth, K. J., & Biederman, I. (2006). Neural evidence for intermediate representations in object recognition. *Vision Research*, 46, 4024-4031.

**4. Sept 16 & 18: Higher Level Vision II: Gabor Filtering; Faces, Prosopagnosia. Subordinate-Level Recognition; Scenes.**

Biederman, I., & Kalocsai, P. (1997). Neurocomputational bases of object and face recognition. *Philosophical Transactions of the Royal Society London: Biological Sciences*, 352, 1203-1219. (Background)

**5. Sept 23: First Midterm (20%).**

**6. Sept 25 & 30: . Attention & Consciousness. Automaticity. Spatial vs. verbal representations.**

\*GIM. Chapter. 7. Attention

Sheinberg, D. L., & Logothetis, N. (1997). The role of temporal cortical areas in perceptual organization. *PNAS*, 94, 3408-3413.

**7. Oct. 2 & 7. Action**

\*GIM. Chapter 8. Action

**8. Oct 9 & 14: Learning and Memory: Clive Wearing. Medial temporal Lobe system.**

\*GIM Chapter 9. Memory.

**9. Oct 16 & 21: Emotion**

\*GIM. Chapter 10. Emotion.

Biederman, I., & Vessel, E. A. (2006). Perceptual pleasure and the brain. *American Scientist*, 94, 247-253.

Amir, O., Biederman, I., Wang, Z., & Xu, X. (2013). Ha Ha vs. Aha! A direct comparison of humor to non-humorous insight for determining the neural correlates of mirth. *Cerebral Cortex*, 62, 35-43.

**10. Oct. 23: 2<sup>nd</sup> Midterm (20%).**

**11. October 28 & 30: Language I. Semantics; Speech Perception.**

**12. Nov 4 & Nov 6: Language II. Syntax. Reading.**

\*GIM. Chapter 11. Language.

Frankland, S. M., & Greene, J. D. (2015). An architecture for encoding sentence meaning in left mid-superior temporal cortex. *PNAS*, Pp. 1-6. (Early Edition.)

**12. Nov 11 & 13: Cognitive Control. Working Memory. Judgment & Decision Making. Avoiding Reasoning Errors.**

\*GIM. Chapter 12. Cognitive Control.

Freedman, D. J., Riesenhuber, M., Poggio, T., & Miller, E. K. (2003). A Comparison of Primate Prefrontal and Inferior Temporal Cortices during Visual Categorization. *Journal of Neuroscience*, 23, 5235–5246.

**13. Nov. 18: Individual Differences I (Cognitive Abilities): Behavioral Genetics. Intelligence**

Bouchard, T., Lykken, D.T., McGue, M., Segal, N. L., & Tellegen, A. (1990). Sources of human psychological differences: The Minnesota study of twins reared apart. *Science*, 250, 223-228.

**14. Nov 20. Individual Differences II: Social values.**

Haidt, J. (2007). The new synthesis in moral psychology. *Science*, 316, 998-1002.

**15. Nov. 25<sup>th</sup>: 3<sup>rd</sup> Midterm (20%)**

**16. Nov. 27: No class.**

**17. Dec 2 & 4 (Last Class): Evolutionary Psychology: Bonding, Love, Sex, Mother-Infant Competition, Murder, Optimal Mating Strategies.**

**Friday, December 13<sup>th</sup>, 2-4 PM, CUMULATIVE FINAL EXAM (40%)**

Students requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP when adequate documentation is filed. Please be sure the letter is delivered to me as early in the semester as possible. Their phone number is (213) 740-0776.