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Psychology 720
Essentials of Cognitive Neuroscience
Fall 2024

This course is intended to provide a broad overview of principles that underlie our understanding of how the structure and function of the brain give rise to cognition and intelligent behavior, and of the methods with which cognitive neuroscience research is carried out. The content covered can be summarized as *neuroscience with direct implications for understanding the neural bases of human behavior*, and will include anatomical, cellular, systems, behavioral, neuropsychological, and computational levels of analysis. The emphasis will be on domains of behavior traditionally covered by cognitive psychology, but with explicit consideration, when applicable, of implications for understanding affect, social behavior, and psychopathology.

The course will be organized under the topics of *Sensation, Perception, Attention, and Action*; *Mental Representation*; and *High-level Cognition*.

Throughout the course, in-depth consideration will be given to the methods of cognitive neuroscience: the assumptions that underlie them; their physical/biological/physiological bases; methods for analyzing the data that they produce; the pragmatics of their use; and the kinds of inference that they can (and cannot) support.

Learning Outcomes:
Upon satisfactory completion of this course, students will be able to:
• describe the anatomical structures, and neurotransmitter systems, associated with the following major classes of cognition: perception, attention, motor control, memory, and cognitive control;
• explain the key neural systems-level principles that underlie these same major classes of cognition;
• critically read and evaluate peer-reviewed publications of cognitive neuroscience experiments, specifically, experiments using invasive electrophysiological recordings (in humans and nonhuman model species), using non-invasive neuroimaging (electroencephalography and functional magnetic resonance imaging), using neurostimulation (transcranial magnetic stimulation and transcranial electrical stimulation), and using neuropsychology
• design, at a conceptual level, experiments using these same methods

Instructor: Brad Postle, 515 Psychology, 608-262-4330, postle@wisc.edu
Office hours by appointment.
With the exception of time-sensitive emergencies, email is the most effective and preferred way for you to contact me.

Format: The format will be lecture, with ample opportunity for discussion and exploration of questions that are of specific interest to students in the class. Assigned readings will come from Postle, B.R. (2020). *Essentials of Cognitive Neuroscience* (2nd ed.,Wiley)* (occasionally supplemented with newly written text intended for the 3rd edition of the book**), and assigned narrated videos linked to https://postlab.psych.wisc.edu/cog-neuro-compendium/ ("CNC video"). Note that *students are expected to have read all of each week's assigned readings, and viewed the assigned videos, **prior to that week's class***. Indeed, there is a **homework assignment for each week**, in which students are to

* Any (modest) royalties earned by the professor will be donated to the Dept. of Psychology, earmarked for programming by the DEI Committee.
** For these, the 'new text' will be posted on the course's canvas page, and will be accompanied by an indication of the section(s) from the 2nd addition that can be skipped.

write a brief paragraph (or more ;-) commenting on that week's assigned content, and posting it as a "Discussion" on canvas. The topic(s) of one's weekly post are up to the student--they might entail asking a question about content that was not understood, or pursuing a topic more deeply than it was treated in the assigned media; they might be a critique the way that a particular topic was presented (either of content or of didactic approach). The critical quality by which posts will be assessed is that they demonstrate substantive engagement with the material. Each week's post is due at 12:00 pm on the Monday preceding the class meeting for which the material being posted about is assigned.

Each class meeting will begin with discussion of that week's assigned content, and will draw on that week's posts. In-class participation is factored into grading. To encourage the participation of all students, during this discussion the professor may periodically pull a name at random from the class roster in order to select a student with whom he will engage about a question. (Randomization without replacement, spanning class meetings.) Lectures will assume an understanding of the reading and will seek to emphasize research that has been published in the past few years. Each lecture will be recorded and posted on course's canvas site.

Coverage: The course is organized around the professor's textbook, and he cherishes every chapter as though it was one of his children. Nonetheless, there is only so much material that one can cover in a single semester, and so three content domains are deemphasized, primarily because this campus (including within this Department) boasts a remarkable wealth of expertise and learning opportunities in each of these areas: semantic memory; language; consciousness. The professor will be happy to engage questions that pertain to these topics during class time (as they relate to the topics explicitly listed in this syllabus) or outside of class.

Grading will be based on canvas discussion posts (20%), class participation (20%), and three section exams (20% each). The exams will be short-answer essay format. Throughout the course, material assigned and presented for a particular week will assume an accumulation of knowledge of all that preceded it. Thus, although the second and third section exams won't test specific material from the first (and so, strictly speaking, won't be "cumulative"), they will both assume a command of all the material from the preceding section(s). If the class-mean final numerical grade is below 90, final letter grades will be assigned relative to final numerical grades as follows: A ≥ 1 SD above mean; AB > mean; B ≥ 1 SD below mean; BC ≥ 1.5 SD below mean; C ≥ 2.5 SD below mean; D ≥ 3 SD below mean; F = <3 SD below mean. If the class-mean final numerical grade is 90 or above, final letter grades will be assigned as follows: A ≥ 95; AB ≥ 92; B ≥ 90; BC ≥ 85; C ≥ 2 SD below mean; D ≥ 3 SD below mean; F = <3 SD below mean.

Guidelines for evaluating class participation:

Outstanding Contributor: Contributions in class reflect exceptional preparation. Ideas offered are always substantive, provide one or more major insights as well as direction for the class. Challenges are well substantiated and persuasively presented. If this person were not a member of the class, the quality of discussion would be diminished markedly. (Outstanding contributors will receive full credit = 10 points.)

Good Contributor: Contributions in class reflect thorough preparation. Ideas offered are usually substantive, provide good insights and sometimes direction for the class. Challenges are well substantiated and often persuasive. If this person were not a member of the class, the quality of discussion would be diminished. (Good contributors will receive 9 out of 10 points.)

Adequate Contributor: Contributions in class reflect satisfactory preparation. Ideas offered are sometimes substantive, provide generally useful insights but seldom offer a new direction for the discussion. Challenges are sometimes presented, fairly well substantiated, and are sometimes persuasive.

If this person were not a member of the class, the quality of discussion would be diminished somewhat. (Adequate contributors will receive 8 out of 10 points.)

Non-Participant: This person says little or nothing in class. Hence, there is not an adequate basis for evaluation. If this person were not a member of the class, the quality of discussion would not be changed. (Non-participants will receive 5 out of 10 points.)

Unsatisfactory Contributor: Contributions in class reflect inadequate preparation. Ideas offered are seldom substantive, provide few if any insights and never offer a constructive direction for the class. Integrative comments and effective challenges are absent. If this person were not a member of the class, valuable airtime would be saved. (Unsatisfactory contributors will receive 0-4 out of 20 points.)

***Please note: A student's class participation grade will be negatively impacted if the professor has the impression that the student has spent an excessive amount of class time engaged in activities unrelated to class (e.g., checking social media, sending emails, etc.).

Class meets Tuesdays, from 9:30am - 12 pm, in room 311 Psychology

Week 1 (9/10) Introduction and historical foundations; principles of anatomy and physiology
Reading: Chpt. 1 & 2, Chpt. 3 pp 34-40; CNC video by Ding

Week 2 (9/17) Sensation and perception of visual signals
Reading: Chpt. 4, Chpt. 3 pp 40-55; CNC video by Romei

Week 3 (9/24) Sensation and perception of auditory and somatosensory signals; Organization of the visual system
Reading: Chpts. 5 and 6, Chpt. 3 pp. 56-60, 78-82; CNC videos by Birn, Alexander, and Baker

Week 4 (10/01) Spatial Cognition and Attention
Reading: Chpt. 7, Chpt. 3 pp. 61-78; CNC videos by Postle (x2), Wig, Saalman, and Slagter

Week 5 (10/08) No class meeting–Annual meeting of the Society for Neuroscience
****nonetheless, the topic for the week is Skeletomotor Control; canvas discussion posts are due, as usual, and this content will be addressed on 10/15****
Reading: Chpt. 8; (poor Chpt. 8 has no associated CNC videos ☹)

Exam 1 *(covers Weeks 1-4;*
2 hours-long, short-answer format, to be taken at a location of your choosing; date and time t.b.a.)

Week 6 (10/15) Oculomotor Control and the Control of Attention
Reading: Chpt. 9; CNC videos by Luna, Noudoost, and Curtis

Week 7 (10/22) Visual object recognition and knowledge
Reading: Chpt. 10; CNC videos by Rogers (x2) and Parvizi

Week 8 (10/29) Neural bases of memory
Reading: Chpt. 11; CNC videos by Corkin, Stark (x2), Lisman, and Murray

Week 9 (11/05) Declarative and semantic long-term memory

Reading: Chpts. 12 and 13; CNC videos by Polyn, Barense, Simons, and Rogers

Week 10 (11/12) Working memory
Reading: Chpt. 14; CNC videos by Serences and Stokes

Exam 2 *(covers Weeks 5-9;*
2 hours-long, short-answer format, to be taken at a location of your choosing; date and time t.b.a.)

Week 11 (11/19) Cognitive control
Reading: Chpt. 15; CNC videos by D'Esposito and Munakata

Week 12 (11/26) Decision making
Reading: Chpt. 16; CNC video by Green

Week 13(12/03) Social behavior
Reading: Chpts. 17; CNC videos by Somerville, van Horn, and Koenigs

Week 14 (12/10) Sleep and Consciousness
Reading: Chpt. 18; CNC video by Robinson

Exam 3 *(covers Weeks 10-14;*
2 hours-long, short-answer format, to be taken at a location of your choosing; date and time t.b.a.)

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ETHICS OF BEING A STUDENT IN THE DEPARTMENT OF PSYCHOLOGY

The members of the faculty of the Department of Psychology at UW-Madison uphold the highest ethical standards of teaching and research. They expect their students to uphold the same standards of ethical conduct. By registering for this course, you are implicitly agreeing to conduct yourself with the utmost integrity throughout the semester.

In the Department of Psychology, acts of academic misconduct are taken very seriously. Such acts diminish the educational experience for all involved – students who commit the acts, classmates who would never consider engaging in such behaviors, and instructors. Academic misconduct includes, but is not limited to, cheating on assignments and exams, stealing exams, sabotaging the work of classmates, submitting fraudulent data, plagiarizing the work of classmates or published and/or online sources, acquiring previously written papers and submitting them (altered or unaltered) for course assignments, collaborating with classmates when such collaboration is not authorized, and assisting fellow students in acts of misconduct. Students who have knowledge that classmates have engaged in academic misconduct should report this to the instructor.

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community

Standards for additional review. For more information, refer to https://conduct.students.wisc.edu/academic-misconduct/.

ACCOMMODATIONS POLICIES

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA."
http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

UW-Madison students who have experienced sexual misconduct (which can include sexual harassment, sexual assault, dating violence and/or stalking) also have the right to request academic accommodations. This right is afforded them under Federal legislation (Title IX). Information about services and resources (including information about how to request accommodations) is available through Survivor Services, a part of University Health Services: https://www.uhs.wisc.edu/survivor-services/ .

DIVERSITY & INCLUSION

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/

COMPLAINTS

Occasionally, a student may have a complaint about a TA or course instructor. If that happens, you should feel free to discuss the matter directly with the TA or instructor. If the complaint is about the TA and you do not feel comfortable discussing it with the individual, you should discuss it with the course instructor. Complaints about mistakes in grading should be resolved with the TA and/or instructor in the great majority of cases. If the complaint is about the instructor (other than ordinary grading questions) and you do not feel comfortable discussing it with the individual, make an appointment to speak to the Associate Chair for Graduate Studies, Professor Shawn Green, cshawn.green@wisc.edu.

If you have concerns about climate or bias in this class, or if you wish to report an incident of bias or hate that has occurred in class, you may contact the Chair of the Department, Professor Allyson Bennett (allyson.j.bennett@wisc.edu) or the Chair of the Psychology Department Climate & Diversity Committee, Martha Alibali (martha.alibali@wisc.edu). You may also use the University's bias incident reporting system, which you can reach at the following link: https://osas.wisc.edu/report-an-issue/bias-or-hate-reporting/.

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CONCERNS ABOUT SEXUAL MISCONDUCT

All students deserve to be safe and respected at UW-Madison. Unfortunately, we know that sexual and relationship violence do happen here. Free, confidential resources are available on and off campus for students impacted by sexual assault, sexual harassment, dating violence, and stalking (regardless of when the violence occurred). You don't have to label your experience to seek help. Friends of survivors can reach out for support too. A list of resources can be found at https://www.uhs.wisc.edu/survivor-resources/

If you wish to speak to someone in the Department of Psychology about your concerns, you may contact the Chair of the Department, Professor Allyson Bennett (allyson.j.bennett@wisc.edu) or the Associate Chair of Graduate Studies, Professor Craig Berridge (berridge@wisc.edu).
Please note that all of these individuals are Responsible Employees (https://compliance.wisc.edu/titleix/mandatory-reporting/#responsible-employees).