



SYLLABUS

PSYCHOLOGY 5612

Introduction to Cognitive Science

Autumn 2023 – Classes #: 23666 (grad) and 23667 (undergrad)

COURSE OVERVIEW

Basic information

Credit hours: 3

Prerequisites: Graduate standing, permission of instructor, or at least 12 credit hours from any of the following areas: computer science, linguistics, neuroscience, philosophy, or psychology

Mode of delivery: In person

Dates: Aug 22 – Dec 8, 2023

Times: Tuesdays and Thursdays from 9:35 to 10:55 am

Classroom: Jennings Hall, Room 160

Instructor: Dr. Alexander Petrov, petrov.11@osu.edu

Instructor's office hours: After class or by appointment

Course Assistant: None

Course description

What is cognition and how does it emerge from the brain? This course introduces you to the exciting interdisciplinary field of cognitive science. Researchers in philosophy, neuroscience, psychology, artificial intelligence, and linguistics realized that they were asking many of the same questions about the nature of the human mind/brain, that they had developed complementary and synergistic methods of investigation, and that the evidence led them to compatible answers to their questions. This course introduces cognitive science through a representative sample of such questions, methods, and answers. It is not a special-topic course for students who seek detailed knowledge in a specific area of cognitive science. We will try not to lose sight of the forest for the trees, but we will take a closer look at a few trees

too because science is in the details. Along the way, we will introduce the constituent disciplines and their respective contributions to the study of cognition.

This course is cross-listed in the Departments of Computer Science and Engineering, Linguistics, Philosophy, and Psychology. It is intended for graduate and advanced undergraduate students in these departments. Interested students from related areas (notably neuroscience) are welcome too.

Course learning outcomes

By the end of this course, **undergraduate** students should be able to:

- Appreciate the interdisciplinary nature of cognitive science, the diversity of viewpoints, the controversies and the areas of nascent consensus.
- Describe the contribution of each of the five constituent disciplines and be familiar with its methods, key concepts, and focus of investigation.
- Be proficient in the *lingua franca* of cognitive science – the language of information processing.
- Explain in detail the definitions of the foundational concepts of *computation* and *representation*, and be able to discuss them from multiple points of view.
- Outline the basic cognitive architecture – how perception, memory, language, motor control, and so forth come together to produce adaptive behavior.
- Know a multitude of specific concepts, theories, and experimental results covered in the course. The lecture plan below lists some relevant keywords.
- Write short (300-word) answers to questions on a variety of topics sampled from diverse areas of cognitive science.

By the end of this course, **graduate** students should be able to:

- Do everything in the above list with proficiency greater than what is expected of undergraduate students.
- Read and discuss research papers from multiple disciplines.
- Write critical essays on topics outside the student's own area of specialization.

COURSE MATERIALS AND TECHNOLOGIES

Required Textbook

Title: ***Cognitive Science: An Introduction to the Science of the Mind***
 Author: **José Luis Bermúdez**
 Pub. Year: **2023**
 Edition: **Fourth** Note: Editions 1 and 2 are **NOT** suitable for this year's course.
 The third edition is serviceable, although it lacks the chapter on Affective science.
 ISBN: 978-1-009-07367-7
 Publisher: Cambridge University Press

Course technology

TECHNOLOGY SUPPORT

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at ocio.osu.edu/help/hours, and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** ocio.osu.edu/help
- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu
- **TDD:** 614-688-8743

TECHNOLOGY SKILLS NEEDED FOR THIS COURSE

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)

REQUIRED EQUIPMENT AND SOFTWARE

- Computer: current Mac (MacOS) or PC (Windows 10) with high-speed internet connection
- Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at go.osu.edu/office365help.

CARMEN ACCESS

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (go.osu.edu/add-device).
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (go.osu.edu/install-duo) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

GRADING AND FACULTY RESPONSE

How your grade is calculated

ASSIGNMENT CATEGORY	POINTS	UNDERGRAD	GRADUATE
Attendance	20 x 1	20	20
Carmen quizzes	25 x 3	75	75
Midterm exam #1 (Sep 26)	100	100	100
Midterm exam #2 (Nov 2)	100	100	100
Final exam (Dec 08)	100	100	100
Reaction papers	3 x 50	Not applicable	150
TOTAL		395	545

See the [Study Guide](#) on Carmen for due dates for the quizzes and reaction papers.

Grading scale

At the end of the semester, your Total points will be converted to a letter grade according to the standard OSU scale. **Specifically, the following conversion brackets will be used. These brackets are absolute. There will be no curving.** Your grade depends exclusively on your own performance throughout the semester, regardless of your classmates' performance. The extra-credit policy is outlined in a separate section below.

GRADE	PERCENTAGES	UNDERGRAD POINTS	GRADUATE POINTS
A	93.0 – 100%	367 – 395	506 – 545
A–	90.0 – 92.9%	355 – 366	490 – 505
B+	87.0 – 89.9%	343 – 354	474 – 489
B	83.1 – 86.9%	328 – 342	452 – 473
B–	80.0 – 83.0%	316 – 326	436 – 451
C+	77.0 – 79.9%	304 – 315	419 – 435
C	73.0 – 76.9%	288 – 303	397 – 418
C–	70.0 – 72.9%	276 – 287	381 – 396
D+	67.0 – 69.9%	264 – 275	365 – 380
D	60.0 – 66.9%	237 – 263	327 – 364
E	0 – 59.9%	0 – 236	0 – 326

Descriptions of major course assignments

ATTENDANCE

Description: Attendance is required, except when the student has a valid excuse according to University policies. Attendance checks will be made on almost every class. Each attendance brings you 1 point for just being in the room. A student can earn up to 20 points for attendance. Note that there are more than 20 classes and thus there will probably be approximately 25 attendance checks. Thus, you can be absent from a few classes and still earn the maximum number (20) of attendance points. You cannot earn more than 20 attendance points.

CARMEN QUIZZES

Description: There is a Carmen quiz associated with each substantive lecture – 25 quizzes in total. They are designed as incentives to stay current with the readings. They also reinforce and test your understanding of the material. Most quizzes consist of short-answer questions, although there are occasional multiple-choice questions. The due dates for each quiz are announced on Carmen. Each quiz is worth 3 points.

Academic integrity and collaboration: You must complete all quizzes yourself. You are not allowed to disclose any quiz questions to any student who has not yet taken the respective quiz. Soliciting or disclosing any information related to the quizzes is a serious violation of the *Code of Student Conduct* (studentconduct.osu.edu). **Only after** both you and your fellow student(s) have completed a given quiz is it OK to compare your answers, but **not before**. Also, you must not rely on automated language tools such as ChatGPT when preparing your answers to the quizzes, except in cases in which ChatGPT is mentioned explicitly in the assignment.

REACTION PAPERS

Description: *This assignment applies to graduate students only; all undergraduates are exempt. If you are an undergraduate student, feel free to skip this entry.* A reading list of **Target articles** is posted on Carmen. Two of them are required for all graduate students: Turing's (1950) seminal article on the Turing Test and Hendrycks, Mazeika, & Woodside's (2023) overview of catastrophic AI risks. The third target article is chosen individually from the list on Carmen. These three articles are the basis for three Reaction papers that each graduate student must submit by the deadlines specified in the *Study Guide* page on Carmen. Each Reaction paper must be 1000-2000 words long and must be double-spaced, properly formatted, and proofread. The format is flexible and sample papers are available on Carmen along with more detailed instructions.

Academic integrity and collaboration: You may discuss your ideas about the target article with other students and with Dr. Petrov. However, the submitted Reaction paper must be your own individual work, reflect your unique thoughts, and be written in your own words. You should also cite all sources that you use, including pictures, quotes, studies, articles, etc. Also, you must not rely on automated language tools such as ChatGPT when preparing your texts.

MIDTERM EXAMS AND FINAL EXAM

Description: Two midterm exams are scheduled for Sep 26 and Nov 2; the Final exam is scheduled for Dec 8. **All exams are closed-book tests that must be taken in person in a proctored environment. Internet-based test-taking formats are not supported.** The three

tests have the same format and contain a mix of multiple-choice questions and short-answer questions. Each test is worth 100 points. They are based on material from the lectures, the textbook, the additional required readings, the instructional videos posted on Carmen, and on certain YouTube videos that are clearly marked in the lecture slides and linked on Carmen. The Final is non-cumulative. **You can miss an exam only in case of a documented emergency or – in extremely rare cases – with prior approval of the instructor.** If you miss an exam, you must schedule a make-up session within one week. Please bring a photo ID, a #2 pencil, and an eraser to the test room.

Academic integrity: Because there have been cases of students using their smart watches to cheat on the test and because it is difficult to differentiate a smart watch from an ordinary one, **all watches must be put in your pockets or bags for the duration of the tests.** Once a test begins, no questions about any test item are allowed. Please do not leave your seat until you are ready to turn your answer sheet in. After you turn it in, leave the test room immediately.

Extra credit

The letter grade in Psych 5612 is designed to **reflect your demonstrated knowledge of cognitive science. It emphasizes scientific content, not work ethics or non-academic circumstances.** The three proctored exams and the various written assignments described above are your primary opportunities for demonstrating your knowledge. Accordingly, extra credit plays a very limited role in our course. It is designed for students who are just below the top edge of a grading bracket and need just a tiny boost to reach the next higher bracket. In such cases, **you may earn up to 5 extra-credit points by writing a 2,000-word essay on a topic chosen by Dr. Petrov** based on your performance on the three exams. Detailed instructions about the extra credit are provided in a separate document on Carmen.

Late assignments

- Late submissions will be accepted but there is 20% penalty for each day post-deadline.
- The due dates for all Carmen quizzes will be announced on Carmen itself. They follow the guidelines outlined above: 9:00 am for pre-quizzes and 10:00 pm for post-quizzes.
- Graduate students, please refer to the *Study Guide* on Carmen for the due dates of the three reaction papers.

Instructor feedback and response time

You can call **614-688-HELP** at any time if you have a technical problem.

- **Email:** Emails will be responded to promptly. The primary communication channel between students and the instructor is via Carmen. This includes Carmen announcements, modules, posts, and other items. For confidential questions (e.g., related to disabilities), please contact Dr. Petrov by email at petrov.11@osu.edu.

FREE SPEECH AND ACADEMIC FREEDOM

The Ohio State University's [Shared Values](#) include a commitment to diversity and innovation. Pursuant to these values, the university promotes a culture of welcoming differences, making connections among people and ideas, and encouraging open-minded exploration, risk-taking, and freedom of expression. As a land-grant institution, the university takes seriously its role in promoting and supporting public discourse. To that end, the university is steadfastly committed to protecting the First Amendment right to free speech and academic freedom on its campus, and to upholding the university's academic motto— "Education for Citizenship."

The principles of [Campus Free Speech](#) at the Ohio State University include:

- The university is committed to maintaining a campus as a marketplace of ideas for all students and all faculty in which *the free exchange of ideas is not to be suppressed* because the ideas put forth are thought by some or even by most members of the institution's community to be offensive, unwise, immoral, indecent, disagreeable, conservative, liberal, traditional, radical, or wrong-headed.
- The university greatly values civility and mutual respect. *Nevertheless, concerns about civility and mutual respect may never be used as a justification for closing off the discussion of ideas*, however offensive, unwise, immoral, indecent, disagreeable, conservative, liberal, traditional, radical, or wrong-headed those ideas may be to some students or faculty.

All classroom activities in this course are based on these values and principles as specified in [Rule 3335-5-01 of the University Bylaws](#).

OTHER COURSE POLICIES

Discussion and communication guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** In all Carmen quizzes and reaction papers, please use good grammar, spelling, and punctuation. The style should be appropriate for a research paper.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always

come across online. Please do not engage other students with negative feedback about them as a person and remember to always rely on the data and to focus on the argument being made, not the person making it. Remember to adhere to the OSU *Code of Student Conduct* at all times - <https://studentconduct.osu.edu/>

- **Citing your sources:** For your contributions in this course, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.
- **Deadlines.** These are the last moment an assignment is accepted without penalty. You should have your assignments turned in advance of a deadline, so that if there are any issues, you can resolve them before the assignment closes. If you submit too close to the deadline, there may not be time to second-check or resolve technical issues.
- **What is said in class stays in class:** Please do not share any course materials or student contributions outside of this class without clear written permission from the student involved AND Dr. Petrov.

Academic integrity policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's *Code of Student Conduct* (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me. Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)
- Eight Cardinal Rules of Academic Integrity (go.osu.edu/cardinal-rules)

Grievances and solving problems

According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, take your case to the department chairperson, college dean or associate dean, and to the provost, in that order. Specific procedures are outlined in Faculty Rule 3335-8-23. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Weather or other short-term closing

Should in-person classes be canceled, the course instructor will notify you as to which alternative methods of teaching will be offered to ensure continuity of instruction for this class. Communication will be via [CarmenCanvas](#) and/or your official university email.

Copyright for instructional materials

The materials used in connection with this course may be subject to copyright protection and are **only** for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on Title IX

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at <http://equity.osu.edu>
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Commitment to a diverse and inclusive learning environment

The Ohio State University affirms the importance and value of diversity of people and ideas. We believe in creating equitable research opportunities for all students and to providing programs and curricula that allow our students to understand critical societal challenges from diverse perspectives and aspire to use research to promote sustainable solutions for all. We are committed to maintaining an inclusive community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among all members; and encourages each individual to strive to reach their own potential. The Ohio State University does not discriminate on the basis of age, ancestry, color, disability, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, race, religion, sex, gender, sexual orientation, pregnancy, protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment.

Religious accommodations

It is Ohio State's policy to reasonably accommodate the sincerely held religious beliefs and practices of all students. The policy permits a student to be absent for up to three days each academic semester for reasons of faith or religious or spiritual belief.

Students planning to use religious beliefs or practices accommodations for course requirements must inform the instructor in writing no later than 14 days after the course begins.

The instructor is then responsible for scheduling an alternative time and date for the course requirement, which may be before or after the original time and date of the course requirement. These alternative accommodations will remain confidential. It is the student's responsibility to ensure that all course assignments are completed.

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life Counseling and Consultation Services (CCS) by visiting ccs.osu.edu or calling (614) 292- 5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at (614) 292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-(800)-273-TALK or at suicidepreventionlifeline.org.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

The University strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process (<http://slds.osu.edu/covid-19-info/covid-related-accommodation-requests/>), managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; 098 Baker Hall, 113 W. 12th Avenue.

COURSE SCHEDULE

#	Date	Topics, Readings, Assignments, Deadlines
1	T 8/22	Intro to the course and the <i>Syllabus</i> . Getting started: What is cognitive science?
2	R 8/24	Naturalistic foundations. A naturalistic account of the mind/brain
3	T 8/29	Brain structure and function
4	R 8/31	Cognitive maps. Representations and metarepresentations
5	T 9/05	Chomsky. Language and micro-worlds. <i>SHRDLU</i>
6	R 9/07	Symbolic computation. Turing machines
7	T 9/12	Turing Test. Mind-body problem, part 1.
8	R 9/14	Mind-body problem, part 2.
9	T 9/19	Computational foundations. Computational sufficiency. Implementation
10	R 9/21	Symbol processing. Good old-fashioned artificial intelligence (GOFAI)
11	T 9/26	Midterm Exam #1. Same room and time.
12	R 9/28	Neurophysiology
13	T 10/03	Synaptic plasticity. Single-layer artificial neural networks.
14	R 10/05	Multi-layer neural networks, part 1
15	T 10/10	Multi-layer neural networks, part 2
--	R 10/12	Autumn break. No classes
16	T 10/17	Large language models (LLMs) and their implications
17	R 10/19	Reinforcement learning. <i>AlphaZero</i>
18	T 10/24	AGI Safety, part 1.
19	R 10/26	AGI Safety, part 2. Neuroimaging.
20	T 10/31	Bayesianism. Neuroeconomics
21	R 11/02	Midterm Exam #2. Same room and time.
22	T 11/07	Dynamical systems theory, part 1
23	R 11/09	Dynamical systems, part 2. Robotics, part 1

#	Date	Topics, Readings, Assignments, Deadlines
24	T 11/14	Robotics, part 2
25	R 11/16	Modules and architectures. ACT-R
26	T 11/21	From cognitive science to affective science
--	R 11/23	Thanksgiving. No classes
27	T 11/28	The philosophy of consciousness.
28	R 11/30	The science of consciousness.
29	T 12/05	Looking ahead: Challenges and opportunities.
FIN	12/08	Final Exam. Same room but starts at 8:00 am!

The *Course Calendar* is subject to change at the discretion of the instructor, depending on the rate of progress through the material, student interest in alternative topics, and/or scheduling constraints. As you see, the exact assignment of topics to dates is still to be determined. **Make sure to monitor the *Study Guide* page on Carmen regularly.** Every effort will be made to keep all exam dates fixed. No exam dates have ever been changed in any of the numerous installments of Psych 5612 I have taught since 2006.

Finally, welcome to the course! I hope you will enjoy the class and learn many fascinating things about how the human mind can occur in the physical universe. I look forward to seeing you on August 22.

-- Alex Petrov

Last updated 2023-10-30