

PSY 637: Human Information Processing Fall 2023 Syllabus

Course Information

Official course number and title: PSY 63700 – Human Information Processing (CRN: 13579)

Class meetings: Tuesdays, 1:30–4:20 pm, in-person in PSYC 3102

Course Brightspace page: <https://purdue.brightspace.com/d2l/home/842254>

Instructor and Contact Information

Dr. Darryl W. Schneider

Email: dws@purdue.edu

Office: PSYC 3174

Office hours: By appointment, in-person or virtual
via Webex (<https://purdue.webex.com/meet/dws>)

Course Description

This graduate course provides an overview of research and theory related to human information processing. The course starts with coverage of foundational work on information processing, then transitions to addressing how information processing is controlled. Each week we will discuss a topic and its assigned readings, with an emphasis on understanding and evaluating theoretical accounts of various experimental findings. The goal of the course is to provide you with knowledge of human information processing that may inform your research and expand your understanding of how the mind works.

Note: Several readings involve cognitive modeling approaches to theory development, some of which are complex. However, this is not a cognitive modeling course, so you are not expected to fully understand all the technical details of the models. Instead, I want you to learn the “gist” of each model—a high-level understanding of how it works and its connection with aspects of information processing.

Classes

Classes will be devoted primarily to lectures and discussions of topics and their assigned readings, which are listed on the course schedule. All readings will be posted as PDF files on Brightspace. (There is no textbook for this course.) You are expected to do the readings in advance, attend class, and participate in class discussions. I typically do what I call “freestyle” lecturing for this course, writing and drawing on the whiteboard while talking about the material, with minimal use of slides. None of that will be posted on Brightspace, making it important to attend class and take notes.

Please be considerate of the instructor and other students during class. If you arrive late or need to leave early, please do so quietly and unobtrusively. Laptops and tablets are allowed only for taking notes. Do not use smartphones or engage in other activities that might distract others.

To facilitate coverage of the readings, **every student must email me one question about the assigned readings by 9:00 am on the morning of the class in which those specific readings will be discussed.** These questions will determine your participation grade. **Participation represents 15% of your final grade**, calculated as follows:

$$\text{Participation grade} = \frac{\text{Number of classes for which questions were submitted}}{\text{Total number of classes with assigned readings}} \times 15\%$$

For example, if you submit questions for 10 of 13 classes, then your participation grade will be 11.5%. If you miss a class for some reason, you will still be expected to submit a question. Questions do not have to be submitted for the first day of class or for days when we have presentations (described later). Your grade does not depend on how “good” your questions are, as long as it is clear to me that you put some thought and effort into your questions.

Attendance Policy

Regular class attendance is strongly recommended. However, please do not come to class if you are sick. If you miss a class for some reason, please make an effort to obtain a copy of another student’s lecture notes. As noted earlier, you will still be expected to submit a question about that day’s assigned reading; thus, the participation component of your grade is not contingent on in-person attendance. Specifics about missed presentation days at the end of the semester are described later in this syllabus.

Exams

There will be three take-home exams during the semester. **Exams represent a total of 60% of your final grade.** The exams are equally weighted, each worth 20%. Each exam will consist of short-answer questions (each question might have multiple parts) for which you will provide typed responses. Exams will be posted on Brightspace at least one week in advance of the due dates indicated on the course schedule. Your answers to the exam questions must be submitted to me by email as a Word document by 5:00 pm on the due date. Late exams will not be accepted without prior written permission from me. A non-submitted exam will get a grade of zero (0%).

You are to complete the exams on your own, without any help from other students. You can refer to the assigned readings or other material to answer the questions, but **you are not allowed to copy and paste text from any source** as part of an answer. **Translation: Your answers must be given in your own words**, reflecting your understanding of the topics, because the purpose of the exams is to assess your understanding. If necessary, you can include copies of tables, figures, or equations as part of an answer, as long as the source is cited. Note that exams might be processed through plagiarism-detection software.

Presentations

Near the end of the semester, every student will be required to give an individual, in-class oral presentation on a journal article related to human information processing. The task is to present a summary of the article (introduction, method, results, and discussion) that educates your fellow students. One way to think about it: A person who has not read the article should know the major aspects of the study after seeing your presentation. The presentation should include PowerPoint slides¹ that highlight key points, illustrate research procedures, display results in figures or

¹If you would like to use presentation software other than PowerPoint, then you need to check with me first as to whether it will work on the classroom computer. Also, the version of PowerPoint on the classroom computer might not display notes onscreen in presenter mode, so if you plan to refer to notes when giving the presentation, please have them written or printed on paper or index cards.

tables, etc. Each presentation will be **10–15 minutes** (points might be deducted for presentations that are too short or too long), followed by a few minutes for questions from the audience.

You are free to choose any article that meets **all** the following criteria:

1. The article must address a topic related to **human information processing**.
2. The article must be published in a **peer-reviewed scientific journal** (no preprints, book chapters, blog entries, or non-peer-reviewed sources).
3. The article must involve one or more **experiments/studies with original data** (no tutorials, meta-analyses, or review articles).
4. The article must be recent (**2014–present**).
5. The article must not be about a study covered in class or chosen by another student; it also cannot be an article that you have co-authored.
6. The article must be submitted to me (by email as a PDF file) no later than **Tuesday, November 14, and it must be approved by me** (to verify it meets these criteria).²

Note that even if an article meets all the criteria, it is possible that the research might not be well-suited for a presentation (e.g., the method might be overly difficult to describe, the results might be complicated, there might be too many experiments to cover, etc.). The onus is on you to determine whether your chosen article is suitable for presentation purposes.

Presentations will take place at the end of the semester, as indicated on the course schedule. If you know in advance that you will be absent from class anytime during that time period, please inform me as soon as possible. The date of your presentation will be announced on Brightspace by Tuesday, November 21. **You must email me your PowerPoint slides at least 30 minutes before class on your presentation day.** (I will send a reply acknowledging receipt of the slides.)

If you miss your scheduled presentation day, a make-up presentation will be allowed at my discretion, provided that: (a) you contact me with the reason for your absence within 24 hours; and (b) you email me your PowerPoint slides, as proof that your presentation was ready. A missed presentation that is not made up will get a grade of zero (0%).

The presentation is worth 20% of your final grade. It will be scored out of a total of 25 points, based on the following criteria:

- Introduction (5 points)
 - The article's reference information (author[s], title, year of publication, and journal name) is provided.
 - Background is given about the research topic, including brief notes about relevant previous research (usually cited in the article's introduction section).
 - The main research question motivating the study, or the issue of interest, is identified and explained.

²If you submit an article that does not meet all the criteria, then it will be rejected and you will have to find an alternative article. Be sure to pay attention to criterion #4 because any article older than 2014 will be rejected.

- Method (5 points)
 - The methodology used in the study (e.g., subjects, apparatus, materials, design, procedure) is clearly and concisely described. It can sometimes be helpful to include figures (either from the article or created by you).
- Results (5 points)
 - The results of the study are clearly and accurately summarized. It is often helpful to include figures or tables (either from the article or created by you), but you need to explain them to the audience. Inferential statistics are optional.
- Discussion (5 points)
 - The results are interpreted appropriately and their implications for the main research question or issue are summarized.
 - Potential limitations of the research are noted.
 - At least one possibility for a relevant follow-up study is suggested (it can come from the article itself or from your brainstorming).
- Peer Evaluation (5 points)
 - The mean rating (out of 5, rounded to the nearest 0.5) given by fellow students on the overall quality of the presentation.

Note that if an article has more than one experiment/study, then your presentation must include relevant information (e.g., method and results) for all experiments/studies; you cannot present only part of the article (e.g., if there are three experiments, you cannot just present the first one).

Potential deductions (with point values) separate from the preceding criteria, at my discretion:

- Presenting an unapproved article (2.5 points)
- Not emailing me your slides before class on your presentation day (1 point)
- Presenting for less than 10 minutes or more than 15 minutes (1–2 points)
- Omitting an experiment/study in the article from the presentation (1–2 points)
- Mediocre or poor visual or oral presentation quality (1–2 points)

All students are expected to attend the presentations and complete peer evaluations (forms will be provided). **Peer evaluations are worth 5% of your final grade**, calculated as follows:

$$\text{Peer evaluation grade} = \frac{\text{Number of presentation days attended}}{\text{Total number of presentation days}} \times 5\%$$

For example, if you do peer evaluations on 1 of 2 presentation days, then your peer evaluation grade will be 2.5%. If you miss a presentation day and you notify me with the reason for your absence within 24 hours, then I might excuse your absence **at my discretion**.

Next is a sample list (not comprehensive) of journals in which you might find suitable articles. Nearly all of these journals are freely accessible online from Purdue's Libraries. Ask a librarian or me if you need assistance locating or downloading an article.

- *Acta Psychologica*
- *Attention, Perception, & Psychophysics*
- *Cognition*
- *Cognitive Science*
- *Journal of Experimental Psychology: General*
- *Journal of Experimental Psychology: Human Perception and Performance*
- *Journal of Experimental Psychology: Learning, Memory, and Cognition*
- *Journal of Memory and Language*
- *Memory & Cognition*
- *Psychological Research*
- *Psychological Science*
- *Psychonomic Bulletin & Review*
- *Quarterly Journal of Experimental Psychology*

Extra Credit

There will be no extra credit opportunities in this course.

Grades

You will be able to track your grades in Brightspace. Final percent grades will be weighted averages of the following course components:

- 15%: Participation (based on questions submitted about the readings)
- 20%: Exam 1
- 20%: Exam 2
- 20%: Exam 3
- 20%: Presentation
- 5%: Peer evaluations of presentations

Final percent grades will be converted to letter grades as follows:

98–100%: A+	88–90%: B+	78–80%: C+	68–70%: D+
92–98%: A	82–88%: B	72–78%: C	62–68%: D
90–92%: A–	80–82%: B–	70–72%: C–	60–62%: D–
			< 60%: F

If your final percent grade falls exactly on a boundary, then you get the higher letter grade (e.g., getting exactly 90% is an A–). At my discretion, I might make an equal-sized, upward adjustment to the final percent grades of all students before the conversion to letter grades.

Academic Integrity and Honor Pledge

For this course, all work that you do is assumed to be your own work. Some specific points:

- Exams: You are not allowed to copy and paste text from any source as part of an answer. If necessary, you can include copies of tables, figures, or equations as part of an answer, as long as the source is cited. No collaboration among students is permitted on exams.
- Presentations: Your presentation must be original (i.e., made by you), not copied from another source, and not made previously for another course. It is okay to use figures or tables from your chosen article or elsewhere in your presentation.

Academic dishonesty (e.g., cheating or plagiarism) will not be tolerated and has serious consequences, which might include a failing or zero grade for a course component or the entire course. Penalties for academic dishonesty will be determined on a case-by-case basis. Incidences of misconduct might also be reported to the Office of Student Rights and Responsibilities. Please see me if you are unsure what constitutes cheating or plagiarism. For more information, including Purdue's regulations governing student conduct, please see:

http://www.purdue.edu/studentregulations/student_conduct/regulations.html

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breeches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information can be submitted anonymously, submitting more information provides a greater opportunity for the university to investigate the concern.

You are encouraged to endorse Purdue's Honor Pledge: "As a Boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together—we are Purdue."

Accessibility

Purdue strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on a disability, please let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center (DRC), which can be reached by email at drc@purdue.edu or by phone at 765-494-1247. Please arrange any DRC accommodations and inform me as soon as possible. If you have a chronic physical or mental health condition that may affect your class attendance, please inform me at the **start** of the semester so that I can make appropriate accommodations.

Mental Health Statement

If you find yourself beginning to feel stressed, anxious, or slightly overwhelmed, try WellTrack: <https://purdue.welltrack.com/>. Sign in to find information and tools, available to you at any time.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell: <https://www.purdue.edu/recwell/fitness-wellness/wellness/one-on-one-coaching/wellness-coaching.php>. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect. If you have questions, please contact Purdue Wellness at evans240@purdue.edu. If you need support and information about options and resources, please contact the Office of the Dean of Students (765-494-1747, Mon–Fri, 8:00 am to 5:00 pm): <https://www.purdue.edu/odos/>

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours. <https://www.purdue.edu/caps/>

Basic Needs Security Statement

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 am – 5 pm, Monday through Friday. In addition, students may submit requests for emergency assistance from the Critical Needs Fund: <https://www.purdue.edu/odos/resources/critical-need-fund.html>

Nondiscrimination Statement

I welcome diversity among the students in my class. I strive to treat all students fairly and professionally, and I aim to foster a classroom environment in which students are not subject to discrimination or sexual harassment. If you ever have concerns about discrimination or sexual harassment in my class, please let me know so that I can address them. For information on Purdue's nondiscrimination policy: https://www.purdue.edu/purdue/ea_eou_statement.php

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Campus Safety and Emergency Preparedness

Purdue University is a very safe campus and there is a low probability that a serious incident will occur here. However, just as we receive a "safety briefing" each time we get on an aircraft, we want to emphasize our emergency procedures for evacuation and shelter-in-place incidents. Our preparedness will be critical if an unexpected event occurs.

Emergency preparedness is your personal responsibility. Purdue University is actively preparing for natural disasters or human-caused incidents with the ultimate goal of maintaining a safe and secure campus. Here are some campus safety and emergency preparedness tips:

- For any emergency, text or call 911.
- There are more than 300 Emergency Telephones (with blue lights) throughout campus that connect directly to the Purdue Police Department (PUPD). If you feel threatened or need help, push the button and you will be connected right away.
- If we hear a fire alarm, we will immediately suspend class, evacuate the building, and proceed outdoors away from the building. Do not use the elevator.
- If we are notified of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement, away from windows and doors.
- If we are notified of a Shelter in Place requirement for a hazardous materials release, we will shelter in our classroom, shutting any open doors and windows.
- If we are notified of a Shelter in Place requirement for an active threat such as a shooting, we will shelter in a room that is securable, preferably without windows.

In the event of a major campus emergency, changes to the syllabus (particularly to the course schedule) may be necessitated by circumstances beyond my control. Changes to the course will

be posted on Brightspace, announced in class, and/or communicated via email. For more information: https://www.purdue.edu/ehps/emergency_preparedness/

How to Succeed in this Course

Some students might find some of the course content to be challenging. However, understanding aspects of human information processing is important for building a solid foundation in cognitive psychology. Here are some tips for being a successful student in PSY 637:

- Attend class, pay attention, take notes, and ask questions if you need clarification.
- Read the assigned readings *before* the class in which they will be discussed. While reading, think about a potential question to submit for the participation component.
- Take time to fully answer the exam questions. **Do not wait until the night before an exam is due to start on the exam.**
- Choose your presentation article carefully and practice your presentation before giving it in class. Do not wait until the night before to prepare your presentation.
- Attend the presentations of other students to gain more insight into recent research.
- Ask me for help (email, appointment, etc.) if you do not understand something. Do not wait until an exam or your presentation is imminent to seek help.

[The course schedule starts on the next page.]

Course Schedule

The assignment of topics and readings to dates is tentative and subject to change. All readings will be posted as PDF files on Brightspace under the relevant topic. The readings for each topic are listed in the order that I recommend reading them (in some cases, the first reading listed provides helpful context for subsequent readings).

Week 1 Introduction / Cognitive Modeling

8/22 Tue Syllabus

- Hintzman, D. L. (1991). Why are formal models useful in psychology? In W. E. Hockley & S. Lewandowsky (Eds.), *Relating theory and data: Essays on human memory in honor of Bennet B. Murdock* (pp. 39–56). Hillsdale, NJ: Erlbaum.
- Farrell, S., & Lewandowsky, S. (2010). Computational models as aids to better reasoning in psychology. *Current Directions in Psychological Science*, 19, 329–335.

Week 2 Information Processing Stages

- 8/29 Tue Donders, F. C. (1969). On the speed of mental processes. *Acta Psychologica*, 30, 412–431. (Original work published in 1868.)
- Sternberg, S. (1969). The discovery of processing stages: Extensions of Donders' method. *Acta Psychologica*, 30, 276–315.
- Miller, J. (1982). Discrete versus continuous stage models of human information processing: In search of partial output. *Journal of Experimental Psychology: Human Perception and Performance*, 8, 273–296.

Week 3 Speed–Accuracy Tradeoff

- 9/5 Tue Pachella, R. G. (1974). The interpretation of reaction time in information processing research. In B. H. Kantowitz (Ed.), *Human information processing: Tutorials in performance and cognition* (pp. 41–82). Hillsdale, NJ: Erlbaum.
- Schneider, D. W., & Anderson, J. R. (2012). Modeling fan effects on the time course of associative recognition. *Cognitive Psychology*, 64, 127–160.

Week 4 Choice Behavior

- 9/12 Tue Ratcliff, R., Smith, P. L., Brown, S. D., & McKoon, G. (2016). Diffusion decision model: Current issues and history. *Trends in Cognitive Sciences*, 20, 260–281.
- Nosofsky, R. M., & Palmeri, T. J. (1997). An exemplar-based random walk model of speeded classification. *Psychological Review*, 104, 266–300.

Week 5	Multi-Alternative Choice Behavior
9/19 Tue	Hick, W. E. (1952). On the rate of gain of information. <i>Quarterly Journal of Experimental Psychology</i> , 4, 11–26.
	Proctor, R. W., & Schneider, D. W. (2018). Hick's law for choice reaction time: A review. <i>Quarterly Journal of Experimental Psychology</i> , 71, 1281–1299.
	Schneider, D. W., & Anderson, J. R. (2011). A memory-based model of Hick's law. <i>Cognitive Psychology</i> , 62, 193–222.
Week 6	Sequential Effects and Post-Error Effects
9/26 Tue	Soetens, E., Boer, L. C., & Hueting, J. E. (1985). Expectancy or automatic facilitation? Separating sequential effects in two-choice reaction time. <i>Journal of Experimental Psychology: Human Perception and Performance</i> , 11, 598–616.
Exam 1 due	Dutilh, G., Vandekerckhove, J., Forstmann, B. U., Keuleers, E., Brysbaert, M., & Wagenmakers, E.-J. (2012). Testing theories of post-error slowing. <i>Attention, Perception, & Psychophysics</i> , 74, 454–465.
	Notebaert, W., Houtman, F., Van Opstal, F., Gevers, W., Fias, W., & Verguts, T. (2009). Post-error slowing: An orienting account. <i>Cognition</i> , 111, 275–279.
Week 7	Congruency Effects (Stroop)
10/3 Tue	Stroop, J. R. (1935). Studies of interference in serial verbal reactions. <i>Journal of Experimental Psychology</i> , 18, 643–662.
	Dunbar, K., & MacLeod, C. M. (1984). A horse race of a different color: Stroop interference patterns with transformed words. <i>Journal of Experimental Psychology: Human Perception and Performance</i> , 10, 622–639.
	Cohen, J. D., Dunbar, K., & McClelland, J. L. (1990). On the control of automatic processes: A parallel distributed processing account of the Stroop effect. <i>Psychological Review</i> , 97, 332–361.
Week 8	
10/10 Tue	No Class (October Break)
Week 9	Congruency Effects (Flanker)
10/17 Tue	Eriksen, B. A., & Eriksen, C. W. (1974). Effects of noise letters upon the identification of a target letter in a nonsearch task. <i>Perception & Psychophysics</i> , 16, 143–149.
	White, C. N., Ratcliff, R., & Starns, J. J. (2011). Diffusion models of the flanker task: Discrete versus gradual attentional selection. <i>Cognitive Psychology</i> , 63, 210–238.

Week 10	Sequential Congruency Effects
10/24 Tue	Botvinick, M. M., Braver, T. S., Barch, T. S., Carter, C. S., & Cohen, J. D. (2001). Conflict monitoring and cognitive control. <i>Psychological Review</i> , 108, 624–652.
	Mayr, U., Awh, E., & Laurey, P. (2003). Conflict adaptation effects in the absence of executive control. <i>Nature Neuroscience</i> , 6, 450–452.
Week 11	Dual-Task Performance and Task Switching
10/31 Tue	Pashler, H. (1994). Dual-task interference in simple tasks: Data and theory. <i>Psychological Bulletin</i> , 116, 220–244.
Exam 2 due	Kiesel, A., Steinhauser, M., Wendt, M., Falkenstein, M., Jost, K., Philipp, A. M., & Koch, I. (2010). Control and interference in task switching—A review. <i>Psychological Bulletin</i> , 136, 849–874.
Week 12	Task Interruption
11/7 Tue	Couffe, C., & Michael, G. A. (2017). Failures due to interruptions or distractions: A review and a new framework. <i>American Journal of Psychology</i> , 130, 163–181.
	Hodgetts, H. M., & Jones, D. M. (2006). Interruption of the Tower of London task: Support for a goal-activation approach. <i>Journal of Experimental Psychology: General</i> , 135, 103–115.
Week 13	Planning
11/14 Tue	Craik, F. I. M., & Bialystok, E. (2006). Planning and task management in older adults: Cooking breakfast. <i>Memory & Cognition</i> , 34, 1236–1249.
Presentation article deadline	Ward, G. (2005). Planning and the executive control of thought and action. In R. Morris & G. Ward (Eds.), <i>The cognitive psychology of planning</i> (pp. 89–110). New York: Psychology Press.
Week 14	Hierarchical Control and Inhibitory Control
11/21 Tue	Logan, G. D., & Crump, M. J. C. (2011). Hierarchical control of cognitive processes: The case for skilled typewriting. In Brian Ross (Ed.), <i>The psychology of learning and motivation</i> (Vol. 54., pp. 1–27). Burlington: Academic Press.
Presentation schedule posted	Verbruggen, F., & Logan, G. D. (2009). Models of response inhibition in the stop-signal and stop-change paradigms. <i>Neuroscience & Biobehavioral Reviews</i> , 33, 647–661.

Week 15	Integrated Views of Human Information Processing
11/28 Tue Exam 3 due	Anderson, J. R., Bothell, D., Byrne, M. D., Douglass, S., Lebiere, C., & Qin, Y. (2004). An integrated theory of the mind. <i>Psychological Review</i> , <i>111</i> , 1036–1060.
Week 16	Presentations
12/5 Tue	Presentations
Week 17	No Final Exam During Finals Week