

# Minds, Brains, & Intelligent Behavior

## An Introduction to Cognitive Science

COGS/PSYC/PHIL 222, Autumn 2017  
Monday & Wednesday, 11am to 12:15 | Hopkins Hall 001

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Professor of Philosophy & Chair, Cognitive Science

### FROM THE COURSE CATALOG

This course will emphasize interdisciplinary approaches to the study of intelligent systems, both natural and artificial. Cognitive science synthesizes research from cognitive psychology, computer science, linguistics, neuroscience, and contemporary philosophy. Special attention will be given to the philosophical foundations of cognitive science, information theory, symbolic and connectionist architectures, the neural basis of cognition, perception, learning and memory, language, action, reasoning, expert systems, and artificial intelligence.

### REQUIRED TEXTS

All required readings are in the course reading packet. It is available for pickup at the mail and copy center in the Class of '37 House at 51 Park Street (behind Paresky and the Frosh Quad).

### GRADING

Grading on all assignments will be anonymous. Please turn in your weekly assignments and exams with only your Williams ID number on it.

Anonymous grading is one way of assuring that our collegiality does not cloud my assessment of your work. One disadvantage to anonymous grading is that the instructor will not know when your work is systematically inadequate and will typically not approach you with concerns. As a result, there is an additional burden of maturity and responsibility on your shoulders. You must elect to visit office hours and to seek out opportunities to improve your writing and research.

#### 1. Weekly assignments

On most Wednesdays you will receive an assignment to be turned in by the beginning of class the following Wednesday. These will sometimes be primarily qualitative and sometimes primarily quantitative. There will be 10 weekly assignments in total.

Weekly assignments will be graded on a 1 to 10 scale, and will be penalized 1 point if not turned in by the beginning of class but still on the Wednesday it is due. They will be penalized 3 points if turned in Thursday, and 7 points if turned in Friday. (Days end at 11:59pm.) Weekly assignments are worth 35% of your final grade.

#### 2. Midterm exam

The in-class midterm will consist of several short essays (which may include quantitative elements) drawn from study material to be distributed in advance of the exam. The midterm is worth 25% of your final grade.

#### 3. Final exam

The final exam will consist of several short essays (which may include quantitative elements) drawn from study material to be distributed in advance of the exam. This exam will emphasize material covered after the midterm. The final exam is worth 30% of your final grade.

#### 4. Participation

Discussion is essential to the vitality of the class and your thoughtful participation is one indicator that you are reading carefully. Thus, participation constitutes 10% of the final grade. Every effort will be made to ensure that the class is a welcoming forum for sharing serious ideas. Being attentive and engaged in class, asking clarificatory questions, and discussing aspects of the course with the instructor during office hours all fall under the heading of participation.

### CLASS RESOURCES

Office Hours, Stetson Hall 503—You may visit individually or in groups. You do not need to have a specific assignment or difficulty in mind in order to come to my office. Wide-ranging conversations about the class, about cognitive science, or about intellectual life at Williams are very welcome. By appointment, or during the following open-door times:

Mondays 2-4  
Tuesdays 2-3  
Wednesdays 2-4

Students with disabilities who may need disability-related classroom accommodations for this course are encouraged to set up an appointment to meet with me as soon as possible and to contact the Dean's Office (at extension 4262) to better insure that accommodations are provided in a timely manner.

*No laptops or food in class*

SCHEDULE OF READINGS

September

- Fri.* 8 No Readings
- 11 Hofstadter, D. (1981) excerpt from *Gödel, Escher, Bach: An Eternal Golden Braid*, Prelude...Ant Fugue; Reflections.
- 13 Turing, A. (1950) Computing Machinery and Intelligence.  
WEEKLY ASSIGNMENT #1 DUE
- 18 Newell, A. and Simon, H. (1963) GPS, a program that simulates human thought.
- 20 Davis, R. et al (1993) What is a Knowledge Representation?  
WEEKLY ASSIGNMENT #2 DUE
- 25 Lehman, J. et al. (2006) A gentle introduction to SOAR, an architecture for human cognition: 2006 update.
- 27 Searle, J. (1983) Minds, Brains, and Programs.  
WEEKLY ASSIGNMENT #3 DUE

October

- 2 Dennett, D. (1984) Cognitive Wheels: The Frame Problem for AI.
- 4 Cruz, J. (draft) Connectionism.  
WEEKLY ASSIGNMENT #4 DUE
- 9 READING PERIOD—NO CLASS
- 11 Goodfellow, I., Bengio, Y., and Courville, A. (2016) from *Deep Learning* Chapter 1: Introduction.  
WEEKLY ASSIGNMENT #5 DUE
- 16 Pinker, S. and Ullman, M. (2002) The past and future of the past tense.  
McClelland, J. and Patterson, K. (2002) 'Words or Rules' cannot exploit the regularity in exceptions.
- 18 McClelland, J. and Patterson, K. (2002) Rules or connections in past-tense inflections: What does the evidence rule out?  
Pinker, S. and Ullman, M. (2002) Combination and structure, not gradedness, is the issue.
- 23 IN CLASS MIDTERM EXAM

25 Gallistel, C. (1998) Symbolic processes in the brain: The case of insect navigation.

30 Roitblat, H. (1995) Comparative approaches to cognitive science.

November

- 1 Brooks, R. (1991) Intelligence without representation.  
WEEKLY ASSIGNMENT #6 DUE
- 6 Resnick, M. (1994) Learning About Life.  
Bedau, M. (2007) Artificial Life.
- 8 Anderson, M. (2005) How to study the mind: An introduction to embodied cognition.  
Chiel, H. and Beer, R. (1997) The brain has a body: adaptive behavior emerges from interactions of nervous system, body and environment.  
WEEKLY ASSIGNMENT #7 DUE
- 13 Thelen, E. (1995) Time-Scale Dynamics and the Development of Embodied Cognition.
- 15 Clark, A. (1997) The Dynamical Challenge  
WEEKLY ASSIGNMENT #8 DUE
- 20 Dennett, D. (1978) Where am I?
- 22 THANKSGIVING BREAK, NO CLASS
- 27 Clark, A., and Chalmers, D. (1998) The Extended Mind.  
Fodor, J. (2009) Where is my mind?
- 29 Hutchins, E. (2010) Enaction, Imagination, and Insight.  
WEEKLY ASSIGNMENT #9 DUE

December

- 4 Nagel, T. (1974) What is it like to be a bat?
- 6 Dennett, D. (1988) Quining Qualia.  
WEEKLY ASSIGNMENT #10 DUE

SCHEDULED FINAL EXAM DURING EXAM PERIOD