

# PSYC\*3280 Course Outline: Fall 2017

## General Information

**Course Title:** Minds, Brains, Machines

**Course Description:**

We seem to have minds and to know certain things about mental processes and events (for example, that we can remember past experiences). We know that we have a brain and we (most of us!) believe that strong versions of dualism (substance dualisms) are false and that there is a link between what goes on mentally and what goes on in the brain. This is the classic mind-brain problem in philosophy: what's the nature of the link? We also know that computers, which are physical symbol systems capable of highly complex, thought-like computation, point the way toward an understanding of how thought in a physical system could be possible. This is good news, in the sense that we seem to be such systems (thinking; physical). So there is an attractive hypothesis on offer: Our mind is like a program implemented by our brain which is in fact a computational device. Mind, brain, machine, all in one. It is the various flavors of this core idea—and its critique—that we will be occupied with in this course. Some of the topics to be discussed: the view that the mind/brain constitute a physical symbol system very much like a digital computer. The view that the mind/brain is a connection machine, which operates according to principles that are (according to some) significantly different from classical computational models (i.e. the physical symbol system model). The view that cognition is best understood in terms of brain science. We shall also look at the implications of current work in robotics when it comes to understanding the mind, at contemporary ideas about cognitive embodiment, worries about the singularity and the idea that you might be able to "upload your mind."

**Credit Weight:** 0.5

**Academic Department:** Psychology

**Semester Offering:** F17

**Class Schedule and Location:** MWF 4:30-5:20 in MINS 300

## Instructor Information

**Instructor Name:** Don Dedrick

**Instructor Email:** [ddedrick@uoguelph.ca](mailto:ddedrick@uoguelph.ca)

**Office location and office hours:** Mackinnon Rm. 329 Monday 2-3; Friday 2-3. By appointment (send an email request).

## Specific Learning Outcomes:

1. Students will understand the basic assumptions and foundational ideas of contemporary cognitive science, especially the idea that the mind is a computational device.
2. Students will be able to apply the concepts of contemporary cognitive science.
3. Student will be able to summarize experimental and theoretical research that has contributed to the way cognitive science understands the mind.
4. Students will comprehend and articulate, in written form, the different ideas about information processing that are used in cognitive science.
5. Students will be able to critically assess the strengths and weaknesses of different information processing models used in cognitive science.
6. Students will be able to develop analytical approaches to contemporary debates in society and popular culture concerning the nature of cognition (e.g. "the singularity", uploading a mind, artificial intelligence, the uses of brain scanning technology, etc.).

## Lecture Content:

Lectures are based on material you can access from the Courselink site for this course. Most weeks there will be a quiz at the start of Friday's class. The quiz functions as a grade component for the course, a way to check comprehension of the week's material, a method for the instructor to highlight important concepts and discussions, and as an opportunity to discuss material with classmates. Quizzes take different formats and are completed in groups. See below for more details.

## Week 0

Friday only

Introduction to the class

Reading: no reading

## Part I Foundational issues

\*Week 1 Sept. 11-15 : thinking as computation? A history of some related ideas

A history of the idea that *thinking is a form of computation* (Reading 1 Cummins) as well as some reflection on what's essential to thinking (Reading 2 Bisson), and on the interdisciplinary nature of the science of the mind (Miller Reading 3).

\*Week 2 Sept. 18-22: the (psychological) argument for a "stored program"

The poverty of the stimulus argument. Behaviourism failed as a general theory of cognition.

One widely accepted reason for this failure, and one which is foundational to much cognitive science (including cognitive psychology and AI), is *the poverty of the stimulus argument*. This argument has the following conclusion: the stimuli available to a cognitive system underdetermines that system's behaviour. That being so, something other than stimuli paired with behaviours will be necessary to explain cognitive systems. This week we will look at three cases where the poverty of the stimulus argument has been invoked: maze following in rats (Reading 4 Tolman), infant cognition (Reading 5 Carey), human language (Reading 6 Chomsky).

Important point: the poverty of the stimulus argument, applied to such cases, is not a solution to a problem, but a way of stating the nature of the problem. It also suggests, in a general way, a certain sort of solution (one that goes beyond the conceptual resources of behaviourism).

Week 3 Sept. 25-29:

\*The levels hypothesis. It is widely, perhaps universally, thought that *cognition needs to be understood at a number of different levels*. Some of these level differences are concerned with issues of scale--neurons vs. neural units vs. neural systems, for example, but others seem to imply more profound differences: our talk about the mind, for instance, is often expressed without any reference to the brain. In a similar way, talk about a computer's program is often discussed independently of the machine that runs the program. What are the relevant levels and how are they related?

Readings for week 4: Reading 7, Reading 8, Reading 9

Week 4 Oct. 2-6.

\*Information processing, representations, and cognitive architecture. We discuss two widely agreed upon claims: that *cognition is information processing and information processing involves representations*. We look at the two main types of architecture that are exploited in cognitive models--physical symbol systems and connectionist networks--as well as some of the disputes that have arisen concerning these architectures.

Readings for Week 5: Reading 10, Reading 11, Reading 12, Reading 13.

Week 5 Oct. 9-13

**Monday: Thanksgiving Holiday**

Continuation of Week 4, Readings as above.

Week 6 Oct. 16-20

**Monday Oct. 16: Midterm in class**

## **PART II Problems for classical computational models of the mind (including connectionism)**

Week 6 Oct. 16-20

W & F: *Do machines understand what they are doing? Is it possible for them to do so? Does it matter? Turing and Searle.*

One of the problems with AI is that you are not allowed to smuggle too much intelligence into your models/machines. In solving this problem by making machine based AI really dumb--Turing showed how to do this--we may create another problem: is it so dumb it doesn't/could never understand anything it's doing? The philosopher John Searle thinks so, and his work, much despised in AI, has also helped to clarify some issues and problems, which we shall discuss. Reading 14 & 15.

Week 7 Oct. 23-27

\*We get almost all our knowledge and understanding of the world, in one way or another, through our bodies. *Human cognition is "embodied."* Are accounts of embodied cognition different than "classical accounts" that see cognition essentially as the manipulation of

informational states in a mind/program? Maybe the robot rather than the CPU is the route to understanding cognition, and a solution to the sort of problem Searle identified. Readings 16, 17 & 18.

### **Part III Implications, present controversy, fun stuff (unless you are Elon Musk).**

#### Week 8

*\*AI then and now.* AI is going through a renaissance. Everyone wants to do it and put it into our phones, fridges, cars, and cats (just kidding). This renaissance is based on the promise that big data leads to big things.... of some sort. Perhaps, but AI has throughout its history made grandiose claims that have come to naught. What does big data amount to, from a theoretical perspective: does it give us insight into the mind that was lacking in earlier incarnations of AI? We will also say a little bit about "little data" here--maybe it's the edge of the real new revolution in understanding human cognition! Readings 19 & 20 & 21.

#### Week 9

*\*The singularity and the coming AI apocalypse.* Elon Musk thinks Skynet is coming unless we do something to prevent it. Readings 22, 23 & 24.

#### Week 10

*\*Uploading your mind.* Suppose that your cognition is a complex set of data structures. Replicating these structures is thus thought by some to be replicating your mind. What are the prospects for doing so, both theoretically and practically? If you think the issues covered in Weeks 3,4,6,7 are relevant to these questions, you are right. Readings 25 & 26

#### Week 11

*\*The Brain.* Maybe it's really all about the brain, and the reduction of cognition to the brain. One hears this sort of thing a lot in popular science writing. Free will, a seeming cognitive phenomenon (to take a much worked-over example) is a myth because, well, there is no place for it in the brain. This kind of thinking takes aim at the levels hypothesis discussed in Week 3. Readings 27,28 & 29.

#### Week 12

TBA

### Course Assignments and Tests:

Assignment or Test	Due Date	Contribution to Final Mark (%)	Learning Outcomes Assessed
Quizzes	In class, most Fridays (see * weeks above)	15%	1,2,3
Midterm	Oct. 16	25%	1,2,3,4,5
Written assignment	Nov. 17	30%	2,3,5,6
Exam	Dec. 4	30%	1,2,3,4,5

#### Additional Notes :

\*There will be 9 quizzes in total. The best 5 will count (5\*3=15%). There are no makeup quizzes. Quizzes are done in groups and they will vary in nature. Students may submit individually, but try to work with a group if you can. Any student that enters the class after a quiz has started will earn a grade of zero on that quiz. Write the names, first and last, of all students in the group on the quiz.

#### Final examination date and time:

##### EXAM - Monday

11:30AM - 01:30PM (2017/12/04)

Room TBA Room TBA

Final exam weighting: 30%

### Course Resources

#### Required Texts:

Available online

#### Recommended Texts related material:

There is a website for the course on courselink, as usual. I will provide information about the course and copies of the PP slides used in class. These will be available before each class. All News about the course will be posted in the News section of the website. That is where I will post any changes or relevant information. All News will be sent to you by email, automatically.

## **Course Policies**

### **Grading Policies**

No late work is accepted without an acceptable reason. If work is accepted there is no penalty. If it is not accepted the grade is Zero. To be clear: there is no daily or weekly penalty. Either work is accepted or it is not. Please contact the instructor as soon as you become aware you will miss a due date, or if you are encountering a problem that might make it difficult for you to complete a requirement.

### **Course Policy on Group Work:**

The quizzes are done in groups. It is hoped contribute to the group discussion of the quizzes, but it is possible to write the quizzes on your own. Any student that enters the class after a quiz has started will earn a grade of zero on that quiz. Any student that shows up just to write the quiz will write the quiz by him/her self.

Course Policy regarding use of electronic devices and recording of lectures:

Electronic recording of classes is expressly forbidden. Laptops are permitted for course related use. Keep your phone in your pocket, purse, knapsack.

## **University Policies**

### **Academic Consideration**

**When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:**

**[Academic Consideration, Appeals and Petitions](#)**

### **Academic Misconduct**

**The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.**

**University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have**

**the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.**

**The Academic Misconduct Policy is detailed in the Undergraduate Calendar:**

**[Academic Misconduct Policy](#)**

### **Accessibility**

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact Students Accessibility Services as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email [accessibility@uoguelph.ca](mailto:accessibility@uoguelph.ca) or see the website: [Student Accessibility Services Website](#)

### **Course Evaluation Information**

Please refer to the Course and Instructor Evaluation Website .

### **Drop date**

The last date to drop one-semester courses, without academic penalty, is Friday November 03. For regulations and procedures for Dropping Courses, see the [Academic Calendar: Current Undergraduate Calendar](#).