

**PSYCO 457: Embodied Cognitive Science**  
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**FULL COURSE INFORMATION IS PROVIDED ON THE WORLD WIDE WEB**  
**[http://www.bcp.psych.ualberta.ca/~mike/Pearl\\_Street/INTD554/](http://www.bcp.psych.ualberta.ca/~mike/Pearl_Street/INTD554/)**

### Course Objectives

The goal of this course is to provide students with a solid working knowledge of cognitive science from a metatheoretical perspective. The metatheoretical theme for the course this year is “synthetic psychology and embodied cognitive science”. Exploring this theme will involve contrasting different approaches to understanding cognition: the analytic tradition versus the synthetic tradition. The primary goal of the course is to introduce the methodology of what is known as “embodied cognitive science”, and to examine how this methodology can be applied to psychology. In embodied cognitive science, builds cognitive agents that interact with a complex environment. One issue that I would like to have percolating throughout the course is the extent to which this embodied approach can be shaped into a discipline that I will call “synthetic psychology”. Another important objective of the course is to provide students with a certain amount of computer literacy, as well as some expertise in building and programming Lego robots. All students will be participating in a robot construction project that will result in new information about cognitive science being provided to others in the form of a web page. No prior experience with working with robots, web pages etc is expected.

**Course Evaluation -- see below and Web Pages for more details:**

Letter Grade For Course	Final Mark (In Percent) To Obtain That Letter Grade
A+	89 - 100
A	85 – 88.9
A-	80 – 84.9
B+	77 – 79.9
B	71 – 76.9
B-	66 – 70.9
C+	61 – 65.9
C	57 – 60.9
C-	52 – 56.9
D+	50 – 51.9
D	48 – 49.9
F	0 – 47.9

<b>Final Paper, due at end of term:</b>	<b>40%</b>
<b>Media Reviews (3 worth 10% each):</b>	<b>30%</b>
<b>Robot Exploration Project:</b>	<b>20%</b>
<b>Class participation:</b>	<b>10%</b>

### Required Texts

Dawson, M.R.W., Dupuis, B., & Wilson, M. (2010) *From Bricks To Brains: The Embodied Cognitive Science of LEGO Robots*. Edmonton, AB: Athabasca University Press.  
 Shapiro, L. (2011). *Embodied Cognition*. New York: Routledge

*Policies about course outlines can be found in Section 23.4(2) of the University Calendar. The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behavior (online at [www.ualberta.ca/secretariat/appeals.htm](http://www.ualberta.ca/secretariat/appeals.htm)) and avoid any behavior which could potentially result in suspicions of cheating, plagiarism, misrepresentations of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.*

**WEEK BY WEEK OUTLINE OF LECTURE TOPICS, Fall 2013**  
**FOR DETAILS, MARGIN NOTES, SLIDES, QUIZ SUPPORT, ETC. SEE:**  
[http://www.bcp.psych.ualberta.ca/~mike/Pearl\\_Street/INTD554/](http://www.bcp.psych.ualberta.ca/~mike/Pearl_Street/INTD554/)

DATE	TOPIC	READING	ACTIVITY	ASSIGNMENT
September 10	<i>Fast, Cheap, And Out Of Control</i>	No Reading		
September 17	Mind Control – Internal or External?	Dawson, Dupuis & Wilson Chapter 1	Discussion of <i>Fast, Cheap, and Out of Control</i>	
September 24	Classical Music and the Classical Mind	Shapiro Chapter 1 Dawson, Dupuis & Wilson Chapter 2	TBA	
October 1	Situated Cognition and Bricolage	Shapiro Chapter 2 Dawson, Dupuis & Wilson Chapter 3	TBA	Media Review #1 Due
October 8	LEGO Design	Shapiro Chapter 3 Dawson, Dupuis & Wilson Chapter 4	Build Vehicle 2	
October 15	Thoughtless Walkers	Shapiro Chapter 4 Dawson, Dupuis & Wilson Chapter 5	Program and Explore Vehicle 2	
October 22	Machina speculatrix	Shapiro Chapter 5 Dawson, Dupuis & Wilson Chapter 6	Build the LEGO Tortoise	
October 29	The Subsumption Architecture	Shapiro Chapter 6 Dawson, Dupuis & Wilson Chapter 7	Program and Explore the LEGO Tortoise	Media Review #2 Due
November 5	Embodiment, Stigmergy, and Swarm Intelligence	Shapiro Chapter 7 Dawson, Dupuis & Wilson Chapter 8	More Tortoise Exploration	
November 19	Totems, Toys – or Tools?	Dawson, Dupuis & Wilson Chapter 9	Group Robot Project	
November 27	Humanoid Situation	No Reading	Group Robot Project	
December 3	Social Robotics	No Reading	Group Robot Project	Media Review #3 Due
December 10				Term Paper due Robot Project due

### DESCRIPTION OF COURSE EVALUATION COMPONENTS

#### Final Paper

Students are required to write a 15 to 20 page paper, with the topic of the paper being selected by the student in consultation with the instructor. In general, the paper should attempt to relate some topic of interest to the student with the themes developed in the course. The final papers are marked on 10 different categories, with 10 possible marks for each category: **Mechanics** (grammar, spelling, vocabulary), **Sophistication** (technical and factual accuracy, grasp of the subject), **Theme**

(relationship of paper to course themes). **Introduction** (statement of purpose, theme, etc.), **Conclusion** (does end of paper relate to beginning?), **Organization** (roadmap paragraph, headings and subheadings), **Originality** (of analysis, interpretation, use of cited material), **Resources** (appropriateness of material cited), **Background** (overall effort put preparing to write the paper), **Effort** (overall effort put into the actual writing of the paper). If students are concerned about their writing, the Sawyer text is an excellent resource.

## Robot Project

Students will work in small groups (2-4 students) to construct, program, and document the behavior of a robot constructed from LEGO Dacta materials available from the instructor. The basics of robot construction will be covered in the course. Usually students take one of the two robot chassis that we cover in the course, and modify its construction and/or its programming. Documentation usually involves photographing modified chassis, and video recording of robot behavior. This kind of documentation is frequently put on the course web page.

In addition to this documentation, student groups will compile a short paper (typically 5 pages long) that describes the robot project – that is, provides an account of the purpose of the project, the robot's construction, the program used to control the robot's behavior, observations of the behavior, and a discussion of the implications. The group will turn in one report, and all members of the group will receive the same grade. The robot project is graded according to the following criteria: **Goal** (e.g., statement of issue of interest), **Architecture** (description of robot that was used), **Program** (account of robot software), **Behavior**. (account of robot's behavior and implications), **Effort And Originality** (overall effort in the project, originality in the report). Each criterion is worth 10 points each, so the total project is given a grade out of 50.

## Class Participation

The general format of many of the course meetings will be a lecture followed by a discussion of course material, readings of the required text, and so on. Part of a student's grade will be based upon their contribution to these class discussions. An important goal of the course is to get students to think about course themes, and part of the thinking process is stimulated by discussing issues with other students who are taking the course.

## Media Reviews

One of the exercises used in this course to encourage students to reflect upon course themes, and to develop their writing, is to have students write short reviews (5 pages) of popular media. The purpose of the review is to consider the work of art in the context of course themes. In other words, each short paper will review one (or more) works of

popular media, and the review will tie the work into the course. Three such reviews will be conducted in the term; the due dates are listed above. Each review will be worth 10% of your final grade.

There are four categories of popular media available for review: non-fiction books, novels, movies, and music. The three reviews that you write in the term must sample from three of these four categories – that is, you are **not permitted** to only review **one type** of medium (e.g., movies) throughout the term. You can choose in a review to focus on one item only, but in some cases one review might cover more than one (e.g., one could review the book, the movie, and the music CD for *I, Robot* in one review). If more than one item is covered in a single review, this still only counts as one review. The current list of acceptable items for review is provided below. If you have strong feelings about reviewing something not in this list, then you can see whether I find it acceptable to add to the list. All of the items listed below are available from the instructor.

Each review is marked using the same general scheme that is applied to the final paper; that is, 10 possible marks each for the following 10 categories: **Mechanics** (grammar, spelling, vocabulary), **Sophistication** (technical and factual accuracy, grasp of the subject), **Theme** (relationship of paper to course themes), **Introduction** (statement of purpose, theme, etc.), **Conclusion** (does end of paper relate to beginning?), **Organization** (roadmap paragraph, headings and subheadings), **Originality** (of analysis, interpretation, use of cited material), **Resources** (appropriateness of material cited), **Background** (overall effort put preparing to write the paper), **Effort** (overall effort put into the actual writing of the paper).

<b>POPULAR MEDIA AVAILABLE FOR REVIEW FOR PSYCO 403 X1 (2008 LIST)</b>			
<b>Non-Fiction Book</b>			
Brooks, R.A. (1999). <i>Cambrian Intelligence: The Early History Of The New AI</i> . Cambridge, MA: MIT Press.	Crichton, M. (1972). <i>The Terminal Man</i> . New York: Ballantine Books	<i>Blade Runner</i> (1982). Directed by Ridley Scott.	The Flaming Lips (2002) <i>Yoshimi Battles The Pink Robots</i> . Warner Brothers Music
Caudill, M. (1992). <i>In Our Own Image : Building an Artificial Person</i> . New York: Oxford University Press.	Crichton, M. (2002). <i>Prey</i> . Toronto: Harper Collins	<i>The Day The Earth Stood Still</i> (1951). Directed by Robert Wise	Our Lady Peace (2001). <i>Spiritual Machines</i> . Sony Music
Holland, J. (1998). <i>Emergence</i> . Reading, MA: Perseus Books.	Dick, P. K. (1968). <i>Do Androids Dream Of Electric Sheep?</i> Del Rey: New York	<i>Fast, Cheap, And Out Of Control</i> (1997). Directed by Errol Morris.	Radiohead (1997) <i>Ok Computer</i> . EMI Music Canada
Kidder, T. (1981). <i>The Soul Of A New Machine</i> . New York: Avon.		<i>Frankenstein</i> (1931). Directed by James Whale.	Steve Reich (1987) <i>Drumming</i> . Elektra/Nonesuch
Kurzweil, R. (1999). <i>The Age Of Spiritual Machines</i> . New York: Penguin	Dick, P. K. (2002). <i>The Simulacra</i> (1st Vintage Books ed.). New York: Vintage Books.	<i>Ghost In The Shell</i> (1995). Directed by Mamoru Oshii (animated).	Steve Reich (1998). <i>Music For 18 Musicians</i> . Nonesuch
LeMay, E., & Pitts, J. A. (2007). <i>Heidegger For Beginners</i> . Danbury, CT: For Beginners LLC	Dick, P. K. (2006). <i>A Scanner Darkly</i> (1st ed.). New York: Pantheon Books.	<i>Imposter</i> (2001). Directed by Gary Fleder	Terry Riley (2000). <i>In C</i> . Conducted by Walter Boudreau with the ensemble of the Societe de Musique Contemporaine du Quebec and the Ensemble Vocal de Montreal. Atma records.
Minsky, M. (1985). <i>The Society Of Mind</i> . New York: Simon & Schuster. (Also available as an interactive CD).	Dick, P. K. (1972). <i>We Can Build You</i> . New York: Daw Books.	<i>I, Robot</i> (2004). Directed by Alex Proyas.	
Moravec, H. (1999). <i>Robot</i> . New York: Oxford University Press	Gibson, W. (1984). <i>Neuromancer</i> . New York: Ace Books	<i>The Matrix</i> . (1999). Directed by the Wachowski brothers.	
Standage, T. (2002). <i>The Turk: The Life And Times Of The Famous 18<sup>th</sup> Century Chess Playing Machine</i> . New York: Walker & Company.	Gibson, W. (1996). <i>Idoru</i> . New York: G.P. Putnam's Sons	<i>Modern Times</i> (1936). Directed by Charles Chaplin	
Stone, B. (2003). <i>Gearheads : the turbulent rise of robotic sports</i> . New York: Simon & Schuster.	Kosinski, J. (1971). <i>Being There</i> . New York: Bantam	<i>Robosapiens</i> (2003).	
Webb, B., & Consi, T.R. (2001). <i>Biorobotics: Methods And Applications</i> . Menlo Park, CA: AAAI Press/MIT Press.	Lem, S. (1987). <i>Solaris</i> (1st Harvest/HBJ ed.). San Diego: Harcourt Brace Jovanovich.	<i>Robots</i> (2005). Directed by Chris Wedge	
Wood, G. (2002). <i>Edison's Eve</i> . New York: Alfred A. Knopf.	Levin, I. (1972). <i>The Stepford Wives</i> . New York: Perennial.	<i>Roving Mars</i> (2006). Directed by George Butler	
	Miller, F., Varley, L., & Costanza, J. (1987). <i>Frank Miller's Ronin</i> . New York, NY: DC Comics.	<i>A Scanner Darkly</i> (2006). Directed by Richard Linklater	
	Vaughan, B. K., & Harris, T. (2005). <i>Ex machina</i> . La Jolla, CA: WildStorm.	<i>Sky Captain And The World Of Tomorrow</i> (2004). Directed by Kerry Conran	
		<i>The Stepford Wives</i> (1974). Directed by Bryan Forbes	
<b>Novel</b>		<i>The Stepford Wives</i> (2004). Directed by Frank Oz	
Asimov, I. (1950). <i>I, Robot</i> . New York: Bantam Spectra	<b>Movie DVD</b>	<i>THX 1138</i> (1970). Directed by George Lucas	
Asimov, I. (1986). <i>Robot dreams</i> (Berkley trade paperback ed.). New York: Berkley Books	2001: <i>A Space Odyssey</i> . (1968). Directed by Stanley Kubrick	<i>Winged Migration</i> (2003). Directed by Jacque Perrin	
Asimov, I. (1954). <i>The Caves Of Steel</i> . Bantam: New York	2010: <i>The Year We Make Contact</i> (1984). Directed by Peter Hyams	<b>Music CD</b>	
Clarke, A.C. (1968). <i>2001: A Space Odyssey</i> . New York: Penguin	<i>Artificial Intelligence</i> (2001). Directed by Steven Spielberg	The Alan Parsons Project (1977) <i>I Robot</i> . Arista Records	