CSE 5531 (Approved): Introduction to Cognitive Science

Course Description

Interdisciplinary survey of the fields of artificial intelligence, linguistics, neuroscience, philosophy of mind, and psychology; various aspects of cognitive perception, representation, and computation.

Prior Course Number: CSE 612
Transcript Abbreviation: Intr Cogn Sci
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Senior, Masters, Doctoral
Course Offerings: Autumn, Spring
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: At least 12 sem-cr-hrs equivalent from at least two of the following four areas: computer science, linguistics, philosophy, and psychology; at most 6 sem-cr-hrs can come from any one area
Exclusions: Not open to students with credit for CSE 612, Ling 612, Phil 612, or Psych 612
Cross-Listings: Cross listed with Psychology, Linguistics, Philosophy

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.0901
Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
BS CSE	BS Computer Science and Engineering
MS CSE	MS Computer Science and Engineering
PhD CSE	PhD Computer Science and Engineering

Course Goals

Master the lingua franca of cognitive science - the language of information processing.
Master specific concepts, theories, and experimental results in cognitive science.
Master multiple definitions of the foundational concepts of computation and representation and be able to discuss them from multiple points of view.

Be competent with the interdisciplinary nature of cognitive science, the diversity of viewpoints, the controversies and the areas of nascent consensus.
Be competent with reading and discussing research papers from multiple disciplines.
Be familiar with brain anatomy and physiology.
Be familiar with the basic cognitive architecture - how perception, memory, language, motor control, and so forth come together to produce adaptive behavior.
Be familiar with the components of a grammar: phonology, morphology, syntax, and semantics.
Be familiar with writing critical essays on topics outside ones area of specialization.
Be exposed to each of the five constituent disciplines and be familiar with its methods, key concepts, and focus of investigation.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction	1.5							
Philosophy: Overview. Nativism vs. empiricism. Mind-body problem. Functionalism. Turing Test. Modularity of mind. Consciousness.	3.0							
Neuroscience: Overview. Brain anatomy. Neuroimaging. Neurophysiology. Synaptic plasticity. Biological basis of learning. Brain damage. Amnesia. Aphasia. Agnosia.	6.0							
Artificial Intelligence: Overview. Turing machines. Physical symbol systems. Heuristic search. Connectionism. Machine Learning.	6.0							
Psychology: Overview. Behaviorism vs. cognitive psychology. Perception and psychophysics. Multiple memory systems. Executive control. High-level cognition.	6.0							
Linguistics: Overview, Components of a grammar. Phonology. Syntax. Compositionality, systematicity, and productivity. Semantics. Language acquisition. Is language innate?	6.0							
Integration: What is representation? Answers from all 5 disciplines. Cognitive architectures. ACT-R. Leabra.	3.0							
Robotics and Embodied Cognition: Overview. Symbol grounding.	1.5							
Advanced Topics	3.0							
Exams	3.0							

Representative Assignments

Write three summary papers from a choice of ten articles.

Grades

Aspect	Percent
Summary papers (3 papers, 8% each)	24%
Attendance and participation	10%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	26%

Representative Textbooks and Other Course Materials

Title	Author
Cognitive Science: An Introduction to the Study of Mind	Friedenberg & Silverman

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
**	a	An ability to apply knowledge of mathematics, science, and engineering.
	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
**	g	An ability to communicate effectively.
***	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
**	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

BS CSE Program Outcomes

Course Contribution		Program Outcome
**	a	an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering;
	b	an ability to design and conduct experiments, as well as to analyze and interpret data;
	c	an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations;
	d	an ability to function on multi-disciplinary teams;
	e	an ability to identify, formulate, and solve engineering problems;
	f	an understanding of professional, ethical, legal, security and social issues and responsibilities;
**	g	an ability to communicate effectively with a range of audiences;
***	h	an ability to analyze the local and global impact of computing on individuals, organizations, and society;
**	i	a recognition of the need for, and an ability to engage in life-long learning and continuing professional development;
	j	a knowledge of contemporary issues;
	k	an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional;
	l	an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
	m	an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
	n	an ability to apply design and development principles in the construction of software systems of varying complexity.

Additional Notes or Comments

Based on original syllabus by Alex Petrov, Psychology.

* Moved cross-listing from General Information to Cross-Listings. --rowland

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