

2017 Spring Course Offerings

Cognitive Science

Director: Professor Barbara Malt



Declaration forms are available at the Office of Interdisciplinary Programs: 31 Williams Hall, Suite 101
For more information visit cogscsci.cas2.lehigh.edu

INTRODUCTORY COURSE

COGS 007-10 Introduction to Cognitive Science CRN 11365 4 credits (SS)

What is a mind? How is the mind related to the brain? Could we make an artificial mind? Issues concerning knowledge representation and intelligence in minds and computers as investigated by psychologists, philosophers, linguists, neuroscientists, and researchers in artificial intelligence.

Professor Malt M, W; 2:35 - 3:50 p.m.

DISCIPLINARY CORE COURSES

COGS, PSYC 176-10 Cognitive Neuroscience CRN 11811 4 credits (NS)

Perception and cognitive neuroscience as the link between mental processes and their biological bases. Visual and auditory perception; the control of action; neuropsychological syndromes of perception, language, memory, and thought; neural network (connectionist) models of mental processes.

Prerequisite: PSYC 1 or COGS 7. May not be taken pass/fail. Prerequisite PSYC 001 or COGS 007. **Professor Carlisle** M, W; 12:45 - 2:00 p.m.

COGS, CSE 327-10 Artificial Intelligence Theory and Practice CRN 11430 3 credits

Introduction to the field of artificial intelligence: Problem solving, knowledge representation, reasoning, planning and machine learning. Use of AI systems or languages. Advanced topics such as natural language processing, vision, robotics, and uncertainty. Prerequisite: CSE 015 or CSE 017 or CSE 018 or CSE 002 Prerequisite (CSE 001 and CSE 002) or CSE 017. CSE 261 is recommended. **Professor Heflin** T, R; 1:10 - 2:25 p.m.

MAJOR ELECTIVES (Additional courses can be petitioned for elective credit)

Artificial Intelligence and Formal Models:

CSE 017-10 Programming and Data Structures 3 credits (MA) Multiple days/time, refer to online listing for details

Algorithmic design and implementation in a high level, object oriented language, such as Java. Classes, subclasses, recursion, searching, sorting, linked lists, trees, stacks, queues.

PHIL, MATH 114-10 Symbolic Logic CRN 11916 4 credits (MA)

A first course in logical theory, introducing the notions of logical consequence and proof, as well as related concepts such as consistency and contingency. Formal systems taught may include: term logic, sentence logic, and predicate logic. **Professor Schmidt** T, R; 10:45 - 12:00 p.m.

CSE, MATH 261-10 Discrete Structures CRN 10652 3 credits

Topics in discrete structures chosen for their applicability to computer science and engineering. Sets, propositions, induction, recursion; combinatorics; binary relations and functions; ordering, lattices and Boolean algebra; graphs and trees; groups and homomorphisms. Various applications.

Professor Huang T, R; 2:35 - 3:50 p.m.

CSE 318-10 Introduction to the Theory of Computation CRN 13491 3 credits

Formal study of theoretical computational models: finite automata, pushdown automata, and Turing machines. Study of formal languages: regular, context-free, and decidable languages. **Professor Monoz-Avila** T, R; 10:45 - 12:00 p.m.

CSE 326-10 Pattern Recognition CRN 12307 3 credits

Bayesian decision theory and the design of parametric and nonparametric classifiers: linear (perceptrons), quadratic, nearest-neighbors, neural nets. Machine learning techniques: boosting, bagging. High-performance machine vision systems: segmentation, contextual analysis, adaptation. Students carry out projects, e.g. on digital libraries and vision-based Turing tests. Credit will not be given for both CSE 326 and CSE 426.

Professor Spletzer T, R; 9:20 - 10:35 a.m.

MATH 329-10 Computability Theory CRN 13868 3-4 credits (MA)

Development of classical computability theory; enumeration, index and recursion theorems, various models of computation and Church's Thesis, uncomputability results, introduction to reducibilities and their degrees (in particular, Turing degrees, or degrees of uncomputability), computable operators and their fixed points. **Professor Lee** M, W, F; 11:10 - 12:00 p.m.

Language, Culture, and Meaning:

PHIL 135 Modern Philosophy CRN 13101 4 credits

Historical survey of selected texts and issues in 17th and 18th century European philosophy with particular emphasis on developments in epistemology and metaphysics. Attention will be given to the relation of the "modern period" to developments in late medieval philosophy and the rise of the experimental sciences. Figures may include Descartes, Leibniz, Locke, Hume, and Kant. **Professor Bearn** T, R; 2:35 – 3:50 p.m.

PHIL 260-10 Making Sense of Words CRN 14167 4 credits (HU)

Issues in the philosophy of language, including analysis of the nature of the relation between the words we use and the world in which we live. We will aim to understand how words make sense and how we make sense of ourselves and the world through words. We will examine such central notions as truth, meaning, and reference, as understood in historically influential philosophical theories of language. Must have completed one HU-designated course in Philosophy at 100-level or higher. **Professor Bickhard** M; 1:10 - 4:00

PSYC, GS 365 Human Development in Cross-Cultural Perspective CRN 13841 4 credits

The formation of mind and personality is shaped in profound ways by the sociocultural contexts within which individuals develop. This course introduces students to basic theoretical and methodological issues and explores important examples of cross-cultural variation and diversity, using comparisons between different societies and between different subcultures within American society. Topics include cognition, language, personality, moral development, socio-emotional development, identity, attachment, and socialization. Materials drawn from anthropology, sociology and education in addition to psychology. **Professor Nicolopoulou** T, R; 10:45 – 12:00 p.m.

Cognition and Neuroscience:

BIOS 276-10 Central Nervous System and Behavior CRN 12841 3 credits (NS)

Neuroanatomy and neurophysiology of animal and human behavior. Feeding, thirst, sleep, emotions, learning, and psychopathology. **Professor Burger** T, R; 9:20 - 10:35

PSYC 396-10 Seminar in Cognitive Neuroscience CRN 12903 4 credits (SS)

This course examines current research and methods in the study of cognitive neuroscience. *PSYC department permission required.* **Professor Carlisle** M, W; 2:35 - 3:50 p.m.

COGS, PSYC 397-10 Music Computing & Psychology CRN 14135 4 credits (SS)

Seminar examining key papers and concepts from the fields of music psychology and music computing. Development of music processing and programming skills is part of the course, enabling a fuller exploration of the intersection of the two fields. We will be addressing questions such as: Why is music cognition important to psychology as a whole? How might computing and psychology combine to widen participation in music, and to what end? *Department Permission Required* **Professor Collins** R; 1:10 - 4:00 p.m.

PSYC 398-10 The Talking World CRN 13872 4 credits (NS)

This course examines the psychology and neuroscience of the everyday activity of speaking. We will examine the components of speaking, from thinking to articulation, within and across individual speakers and languages, using behavioral and neuroscientific evidence. Prerequisite: PSYC 117 or PSYC 176. *Department permission required.* **Professor O'Seaghdha** T, R; 9:20 – 10:35 a.m.

SENIOR THESIS

COGS 301 Senior Project in Cognitive Science: Proposal *Instructor permission required 3 credits*

COGS 399 Senior Project in Cognitive Science: Thesis *Instructor permission required 3 credits*

ADDITIONAL COURSES

COGS 161 Supervised Research *Instructor permission required 2-4 credits*

COGS 361 Independent Research *Instructor permission required 2-4 credits*

COLLATERAL REQUIREMENTS

CSE 002 Fundamentals of Programming 2 credits *Multiple days/time, refer to online listing for details*

Problem-solving and object-oriented programming using Java. Includes laboratory. No prior programming experience needed.

MATH 021 Calculus I 4 credits *Multiple days/time, refer to online listing for details*

GRADUATE-LEVEL

COGS 405 Individual Study in Cognitive Science *Instructor permission required 1-6 credits*

PSYC 406-10 Social Cognition CRN 12904 3 credits

Theory and research on cognitive processes in personality and social functioning. The self, personality consistency and change, causal attributions, social judgment, goals and self-regulation, and mood and emotion. Topics may vary. Must have graduate standing or consent of instructor.

Professor Moskowitz W; 9:10 - 12:00 p.m.

CSE 426-10 Pattern Recognition CRN 12308 3 credits

Bayesian decision theory and the design of parametric and nonparametric classifiers: linear (perceptrons), quadratic, nearest-neighbors, neural nets. Machine learning techniques: boosting, bagging. High-performance machine vision systems: segmentation, contextual analysis, adaptation. Students carry out projects, e.g. on digital libraries and vision-based Turing tests. This course, a version of CSE 326 for graduate students requires advanced assignments. Credit will not be given for both CSE 326 and CSE 426.

Professor Spletzer T, R; 9:20 - 10:35 a.m.