2017 Fall Course Offerings
Cognitive Science Program
Director: Professor Barbara Malt

Declaration forms are available at the Office of Interdisciplinary Programs: 31 Williams Hall, Suite 101 as well as Cognitive Studies Website: cogsci.cas2.lehigh.edu

DISCIPLINARY CORE COURSES

COGS, PSYC 117-10 Cognitive Psychology *41572* *4 credits* (SS)
The architecture and dynamics of the human mind: How we acquire knowledge through perception, represent and activate it in memory, and use it to communicate, make decisions, solve problems, and reason creatively. Prerequisite: PSYC 1 or COGS 7. Optional 1 credit recitation (PSYC 183) may accompany this course (recommended but not required for COGS majors.) May not be taken pass/fail.
Professor O'Seaghdha   T, R; 2:35 - 3:50 p.m.

COGS, PSYC 176-10 Cognitive Neuroscience *44018* *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.
Professor Hupbach   T, R; 1:10 - 2:25 p.m.

MAJOR ELECTIVES
Artificial Intelligence and Formal Models

CSE 017-010 Programming & 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.

CSE 261-010 Discrete Structures 40803 3 credits *(MA)*
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 Skandera** M,W,F; 9:10-10:00 a.m.

CSE 262-011 Programming Languages Multiple Sections *(COGS) Refer to online listing for details*
Use, structure and implementation of several programming languages.

MATH 304-010 Axiomatic Set Theory *43932* *4 credits (MA)*
A development of set theory from axioms; relations and functions; ordinal and cardinal arithmetic; recursion theorem; axiom of choice; independence questions. Consent of instructor required.
Professor Stanley M,W,F; 11:10-12:00 p.m.

CSE 331-010 User Interface Systems and Technique 44190 *3 credits*
Principles and practice of creating effective human-computer interfaces. Design and user evaluation of user interfaces; design and use of interface building tools. Programming projects using a variety of interface building tools to construct and evaluate interfaces.
Professor Baumer M,W; 12:45-2:00 p.m.

CSE 398-013 Natural Language Process 44192 *3 credits*
Wondering how Google translates English into Chinese, how IBM Watson beat humans in Jeopardy and how Grammarly correct your essays? This course introduces you to natural language processing (NLP) that empowers many fascinating applications like the above. The course will study, in both depth and detail, the fundamental statistical models and their computational implementations in NLP. You will learn how to model texts on the level of word, sentence, and paragraph using tools such as trees, graphs, and automata. The following techniques will be covered: text normalization, language model, part-of-speech tagging, hidden Markov model, syntactic and dependency parsing, semantics and word sense; reference resolution, dialog agent, machine translation. Two class projects to design, implement and evaluate classic NLP models will enable the students to have hands-on NLP experience. Programming experience (CSE 17) and probability and statistics (MATH 231 or ECO 045) will be required. Professor Xie T,R; 1:10-2:25 p.m.

CSE 398-015 Deep Learning 44196 *3 credits*
In this course, we will learn the core principles behind neural networks and deep learning.   We will start with simple neural networks with a handful of layers, and then move on to study deep neural networks with tens or even hundreds of layers. We will learn about and compare different neural network architectures including Convolutional Neural Networks, Generative Adversarial Networks, and Recurrent Neural Works. For applications, we will look at handwritten digit recognition, object recognition, computer-aided diagnosis, and natural language understanding. Prerequisites: For undergraduate students, CSE 109 and MATH 231. Professor Huang T,R; 1:10-2:35 p.m.

CSE 252 Computers, the Internet, and Soceity 40746 3 credits (SS) (GCP) Writing Intensive
An interactive exploration of the current and future role of computers, the Internet, and related technologies in changing the standard of living, work environments, society and its ethical values. Privacy, security, depersonalization, responsibility, and professional ethics; the role of computer and Internet technologies in changing education, business modalities, collaboration mechanisms, and everyday life.
Professor Crane T,R; 2:35-3:50 p.m.

PSYC 344-10 Health Care Reasoning and Decision Making 44088 *4 credits (*SS)
Health care professionals diagnose physical and mental illnesses and create treatment plans to improve their patients' health. How do these professionals make decisions related to these important issues? We will explore the literature on how medical and mental health professionals reason and make decisions about health care issues. Topics to be covered include diagnosis, treatment decisions, access to care, and how these reasoning processes are swayed. Consideration will be given to patient decision-making as well. Prerequisite: PSYC 117 or PSYC 176 or COGS 7 or consent of instructor. Department permission required. *Declared HMS minors can register for the HMS side of the courses on their own through the normal registration process but registering through the PSYC side requires departmental approval.* **Professor Marsh**   M, W; 8:45 - 10:00 a.m.

PSYC 398-010 Psychology of Environmental Issues 44007 4 credits (SS)
Environmental problems and solutions begin with the thoughts, feelings, and behaviors of individual people. We will examine Western ways of relating to nature and the beliefs people hold about it, how they reason about environmental issues, and how they perceive environmental risk and make decisions. We will also consider environmental communication and attitude and behavior change, exploring arenas ranging from patterns of consumption and recycling to climate change. Research methods for investigating these issues will be introduced.
Professor Malt T,R; 9:20-10:35 a.m.

Cognition and Neuroscience
ANTH 012-10 Human Evolution and Prehistory *43075 4 credits (*NS)
Introductory biological anthropology and prehistory. Adaptive functions of human culture and its relation to biological evolution. Mechanisms of evolution, non-human primate morphology and behavior, hominid fossil record, cultural beginnings, and survey of world prehistory.
Professor Small   M, W, F; 12:10 - 1:00 p.m.

BIOS 121 Comparative/Integrative Biology for BIOS Minors 42524 3 credits (NS) COGS
Experimental and historical approaches to the analysis of structural and functional properties in organisms. Use of scientific method to study species diversity. Introduction to the analysis of organismal attributes that explain behavioral repertoire and ecological relationships. Prerequisites: BIOS 41 and 42.
Professors Itzkowitz & Cundall   M,W,F; 11:10-12:00 p.m.

BIOS 365-010 Neurobiology of Sensory System 42945 3 credits (NS)
The fundamental features of sensory systems in a diverse array of animals. Focus on how nervous systems detect, compute, and internally represent aspects of the environment from the single cell to whole system level. Special attention to the way sensory processing influences how we think about the biological basis of perception and possible mechanisms for consciousness. Instructor permission required.
Professor Burger T,R; 7:55-9:10 a.m.

BIOS 382-010 Endocrinology of Behavior 40023 3 credits (NS) COGS
Hormonal effects upon animal and human behavior. Emphasis on neuroendocrinology of steroid hormone involvement in reproductive behaviors.
Professor Simon T,R; 10:45-12:00 p.m.

BIOS 385 Synapses, Plasticity & Learning 44010 3 credits (NS)
Communication between neurons. Physiology of synaptic transmission; varying forms of neuronal plasticity; acquisition, encoding, and retrieval of memory.
Professor Haas T,R; 2:35-3:50 p.m.

SENIOR THESIS
COGS 301-10-24 Senior Project in Cognitive Science: Proposal *Multiple CRNs 3 credits*
For students not intending to apply for program Honors. Background reading and preparation of a short written proposal are conducted in the first semester in consultation with a faculty adviser. Consent of program director and project adviser required. *Instructor permission required.*
Professor Malt   section 10 only, CRN 43541

COGS 399-010 Independent Study in Cognitive Science *42260 1-6 credits*
Research during senior year culminating in senior thesis advised by a member of the Cognitive Science faculty. Execution and written report of project proposed and approved in COGS 301. Students must enroll for a total of three credits which may be split between the sections of a primary and secondary adviser. Theses submitted for honors will be evaluated by a committee of at least three cognitive science faculty. Prerequisite: COGS 301 and consent of the program director. **Professor Malt**

ADDITIONAL COURSES
COGS 161 Supervised Research *Multiple CRNs 2-4 credits*
Research under the direct supervision of a faculty member in the cognitive science program. Students must arrange the particular project with a faculty member before enrolling. Prerequisite: consent of the program director. **Professor Malt**   section 10 only, CRN 40437

COGS 195-10 Independent Study *43540 1 credits*
Independent study work under the supervision of a Cognitive Science Faculty member. *Instructor permission required.* **Professor Malt**

COGS 196-011 Independent Study in Cog Sci *43541* *2 credits*
Independent study work under the supervision of a Cognitive Science Faculty member. *Department Permission* **Professor Malt**

COGS 361-10-24 Independent Research *Multiple CRNs* *2-4 credits*
Independent research in cognitive science with a faculty advisor. Students must arrange the particular project with a faculty advisor before enrolling. Prerequisite: consent of the program director. **Professor Malt**   section 10 only, CRN 40436

COGS 395-10 Special Topics in Cognitive Science *43223* *4 credits*
Topics vary from semester to semester. Topics are presented at an advanced level. Previous course work in cognitive psychology and consent of faculty sponsor is required. *Instructor permission required.* **Professor Malt**

COGS 395-11 Special Topics in Cognitive Science *43224* *3 credits*
Topics vary from semester to semester. Topics are presented at an advanced level. Previous course work in cognitive psychology and consent of faculty sponsor is required. *Instructor permission required.* **Professor Malt**

GRADUATE-LEVEL
COGS 405-10-24 Individual Study in Cognitive Science *Multiple CRNs* *1-6 credits*
Study of a topic not covered in regular course offerings. By arrangement with a consulting faculty member. May be repeated for credit. Prerequisite: Consent of the program director. *Instructor permission required.* **Professor Malt**   section 10 only, CRN 41975