Cognitive Science

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The mission of the Cognitive Science Program is to advance the interdisciplinary study of mind, in all its aspects, through research and teaching. The interdisciplinary study of cognition in the fields of psychology, linguistics, computer science, philosophy, anthropology, and neuroscience provides excellent preparation for life in the age of information. The program aims to instill in students a solid grasp of the intellectual problems, frameworks, and methodologies currently available; to provide experience exploring these through guided research; and to foster the desire to create, develop, and disseminate new knowledge. With this foundation, students are well prepared for a wide variety of careers or for further graduate or professional studies in Cognitive Science or any of the contributing disciplines.

We offer an undergraduate major in Cognitive Science, an undergraduate minor, a graduate minor, and a graduate certificate.

A Cognitive Science major is easy to combine with a second major in the humanities, natural sciences, social sciences, or computer science.

B.A. IN COGNITIVE SCIENCE
The B.A. with a major in Cognitive Science requires a minimum of 13 courses. All majors take COGS 007, an introduction to cognitive science. core courses in cognitive psychology, philosophy, artificial intelligence, and cognitive neuroscience, and collaterals in computer science and math. In a second tier, majors complete at least five electives selected from three thematic tracks. A capstone integration occurs in the required two-semester senior thesis (COGS 301 and COGS 399), in which students focus on a topic of their choice spanning at least two cognitive science sub-disciplines.

Collateral Requirements
CSE 001 Breadth of Computing 2
CSE 002 Fundamentals of Programming 2
MATH 021 Calculus I (preferred) 4
or MATH 051 Survey of Calculus I

Introductory Course
COGS 007 Introduction to Cognitive Science 4

Disciplinary Core Courses
COGS/PSYC 117 Cognitive Psychology 4
COGS/PSYC 176 Cognitive Neuroscience 4
COGS/PHIL 250 Philosophy of Mind 4
COGS/CSE 327 Artificial Intelligence Theory and Practice 3

Major Electives
Select a minimum of five of the following, with at least one course from each of the three tracks:

Artificial Intelligence and Formal Models
CSE 017 Programming and Data Structures
CSE 042 Game Design
CSE/MATH 261 Discrete Structures
CSE 262 Programming Languages
CSE 318 Introduction to the Theory of Computation
CSE 326 Pattern Recognition
CSE 335 Topics on Intelligent Decision Support Systems
CSE 337 Reinforcement Learning
CSE 348 AI Game Programming
CSE 360 Introduction to Mobile Robotics
CSE 431 Intelligent Agents (for undergraduate students who qualify)
PHIL/MATH 114 Symbolic Logic
PHIL/MATH 214 Topics in Philosophical Logic
PHIL 265 Philosophy Of Mathematics
PHIL/MATH 303 Mathematical Logic
PHIL/MATH 304 Axiomatic Set Theory
PHIL/MATH 329 Computability Theory

Language, Culture, and Meaning
COGS/ANTH/MLL 140 Introduction to Linguistics

ANTH 376 Culture and the Individual
PHIL 139 Contemporary Philosophy
PHIL 220 Theory Of Knowledge
PHIL 260 Philosophy Of Language
PSYC 307 Higher Order Cognition
PSYC 313 Person Perception
PSYC 314 Social Cognition
PSYC 320 Psychology of Language
PSYC 321 Language Development
PSYC/HMS 344 Health Care Reasoning and Decision-Making
PSYC 351 Children’s Thinking
PSYC 362 Cognition in Practice & Policy
PSYC/GS 365 Human Development in Cross-Cultural Perspective
PSYC 384 Self and Identity
SOC/JOUR 135 Human Communication

Cognition and Neuroscience
COGS/ANTH/MLL 140 Introduction to Linguistics

ANTH 145 Human Evolution
BIOS 121 Biology Core III: Integrative & Comparative Biology
BIOS 276 Central Nervous System and Behavior
BIOS 277 Experimental Neuroscience Laboratory
BIOS 365 Neurobiology of Sensory Systems
BIOS 366 Diseases of the Nervous System
BIOS 382 Endocrinology of Behavior
BIOS 385 Synapses, Plasticity and Learning
PSYC 358 Inside the Infant Mind
PSYC 347 Cognitive Neuroscience of Memory
PSYC 369 Memory Under Construction
PSYC 377 Attention and Attentional Failures

Senior Thesis

1
2
3
COGS 301  Senior Project in Cognitive Science: Proposal
COGS 399  Senior Project in Cognitive Science: Thesis

Total Credits 43-47

1. Additional coursework in mathematics is strongly recommended (particularly CSE 261/MATH 261). Also recommended are the non-major courses ANTH 011, ANTH 012, COGS 140 and PSYC 001 which provide valuable background. These courses may fulfill Social Science Distribution requirements. A lower level Philosophy course is a prerequisite for COGS/PHIL 250.

2. Students intending to take behavioral neuroscience BIOS courses in the Cognition and Neuroscience track need to take the prerequisite sequence CHM 030 or CHM 040, and BIOS 041 with their associated laboratory courses, by the end of the sophomore year.

3. After completing the introductory and the core courses, students pursue their individual interests in their selections of major electives. The required senior thesis provides a capstone integration through an individual research project spanning at least two cognitive science sub-disciplines.

RECOMMENDED TIMING OF COURSES

First Year
- COGS 007 (Spring) CR 4
- CSE 001 2
- CSE 002 2
- MATH 021 or 051 4

Second Year
- COGS 117 CR 4
- COGS 176 4
- 1 major elective 1 3-4

Third Year
- COGS 250 CR 4
- COGS 327 3
- 2 major electives 1 6-8

Fourth Year
- COGS 301 CR 6
- COGS 399 (thesis) & COGS 301 12-16
- 2 major electives 1 6-8

Total Credits: 48-53

1. Students must complete a minimum of five major electives totaling at least 16 credits with at least one course from each of the three tracks.

MINOR IN COGNITIVE SCIENCE

Minor Declaration Form (http://catalog.lehigh.edu/coursesprogramsandcurricula/artsandsciences/cognitivescience/2015-2016Cognitive_Science_Minor_Declaration_Form.pdf)

The undergraduate minor in Cognitive Science requires five courses:

COGS 007 Introduction to Cognitive Science 4

Four additional courses selected from among the major’s core courses and major electives, with at least two of these being Disciplinary Core Courses 12-16

Total Credits 16-20

PROGRAM HONORS

Majors seeking to graduate with honors in cognitive science must have a 3.30 GPA in the major, a 3.30 GPA overall, and complete a high quality senior thesis. Theses submitted for honors will be evaluated by a committee of at least three cognitive science faculty.

FOR GRADUATE STUDENTS

There are two concentrations in Cognitive Science available for post-baccalaureate students: a Graduate Minor and a Graduate Certificate. The minor is intended for students currently enrolled in a degree-granting graduate program at Lehigh University. By contrast, the certificate is intended for non-degree students.

Graduate Minor in Cognitive Science

The minor gives graduate students who are enrolled in Lehigh University degree programs, such as computer science or psychology, an opportunity to develop expertise at the intersection of information processing by humans and intelligent machines. Graduate students investigating mental processes or applications such as artificial intelligence or educational technology are encouraged to participate, with the approval of an advisor in their major program, by contacting the Director of the Cognitive Science Program. On completion of the program, the Director of the Cognitive Science Program will issue a letter to the student certifying that he or she has met the requirements of the minor.

The Graduate Minor requires five graduate level courses.

COGS/PSYC 423 Foundations of Cognitive Science 1 12-16

Computer Science

CSE 348 AI Game Programming
CSE 426 Pattern Recognition
CSE 428 Semantic Web Topics
CSE 431 Intelligent Agents
CSE 435 Topics on Intelligent Decision Support Systems
CSE 447 Data Mining
CSE 460 Mobile Robotics

Psychology

PSYC 402 Developmental Psychology
PSYC 403 Cognitive Psychology
PSYC 406 Social Cognition
PSYC 443 Seminar In Language Acquisition
PSYC 448 Seminar in Psychology of Language
PSYC 464 Naive Realism in Social Judgement
PSYC 476 Seminar In Cognition
PSYC/COGS 478 Ontological Psychology
PSYC 480 Seminar in Cognitive Development

Philosophy 2

PHIL/COGS 250 Philosophy of Mind
PHIL 260 Philosophy Of Language

Sociology and Anthropology

ANTH 376 Culture and the Individual

Total Credits 15-19

1. At least two of the four electives must be taken outside the student’s home department. Special topics courses with a cognitive science emphasis may also count toward the minor, with the approval of the Cognitive Science Program Director. Courses taken toward the minor may also fulfill requirements of the student’s major program, with the approval of the major department.

2. Note: These particular 200-level courses may be taken by graduate students.

Graduate Certificate in Cognitive Science

This concentration is intended for people working in technology-related businesses and other qualified individuals with an interest in cognitive science. The purpose of the certificate program is to provide non-degree post-baccalaureate students an interdisciplinary perspective on human and machine intelligence.

The Graduate Certificate requires four graduate level courses.

COGS 423 Foundations of Cognitive Science 3

Three electives from the list below. 1 9-12

Computer Science
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.

**Attribute/Distribution:** SS
COGS 405 Individual Study in Cognitive Science 1-6 Credits
Study of a topic not covered in regular course offerings. By arrangement with a consulting faculty member. Consent of program director required.
Repeat Status: Course may be repeated.

COGS 423 (PSYC 423) Foundations of Cognitive Science 3 Credits
Survey of fundamental theory and methodologies from artificial intelligence, linguistics, cognitive psychology, philosophy, and neuroscience, as well as salient research problems such as knowledge acquisition and representation, natural language processing, skill acquisition, perception and action, and the philosophical question of intentionality.

COGS 478 (PSYC 478) Ontological Psychology 3 Credits
Principles and constraints for modeling psychological phenomena. Representation; perception; memory; knowing; learning; emotions; consciousness; language; rationality.