

# COMPUTER SCIENCE AND LEARNING SCIENCES PHD

## Degree Requirements

The following requirements are in addition to, or further elaborate upon, those requirements outlined in The Graduate School Policy Guide (<https://catalogs.northwestern.edu/tgs/academic-policies-procedures/>).

### Course Requirements

Students are expected to take courses during the first two years of their graduate career. Every student is required to take courses that fulfill specific requirements for breadth and depth in computer science and learning sciences. Students are also expected to take coursework and continue reading beyond these specific requirements. In particular, students should take coursework that is relevant to their research.

### Learning Sciences Foundational Courses (4 courses)

Course	Title
LRN_SCI 401-0 or COMP_SCI 371-0	Knowledge Representation for the Learning Sciences Knowledge Representation and Reasoning
LRN_SCI 402-0	Social Dimensions of Teaching & Learning
LRN_SCI 403-0	Foundations of the Learning Science
LRN_SCI 426-0	Design of Technological Tools for Thinking and Learning

### Learning Sciences Approved Methods Courses (choose 3 courses)

Course	Title
LRN_SCI 410-0	Quantitative Methods I: Probability and Statistics
LRN_SCI 451-0	Topics in Learning Sciences (Quantitative Methods II regression analysis)
LRN_SCI 451-0	Topics in Learning Sciences (Discourse Analysis)
LRN_SCI 415-0	Field Methods
LRN_SCI 416-0	Advanced Qualitative Methods
LRN_SCI 451-0	Topics in Learning Sciences (Computational Methods)
COMP_SCI 472-0/ LRN_SCI 451-0	Designing & Constructing Models with Multi-Agent Language

### Computer Science Foundational Courses (at least 5 courses)

Students will declare a Computer Science concentration (e.g., Graphics and Interactive Media or Cognitive Systems). Students should take at least 5 courses in CS that are approved for graduate credit (all 300 and 400-level courses, unless specifically listed as ineligible for graduate credit). Students should consult the qualifying procedures for their program to ensure they have the necessary background for their concentration. The requirements for GIM and CogSys are listed below for reference:

#### Graphics and Interactive Media (GIM)

All GIM students are required to demonstrate proficiency in computer science and other core fields of GIM:

- Programming (comparable to CS 111+211+311)
- Theory
  - Fundamental algorithms
  - Computing and complexity theory
- Systems (2 of the following)
  - Operating systems
  - Computer architecture

- Networking
- Programming languages
- Graphics or media
- Cognitive and social systems (any course in AI, cognitive science, social science)

#### Cognitive Systems (CogSys)

By the Qualifying Exam, you should be conversant with the material in the following courses:

Course	Title
COMP_SCI 325-1	Artificial Intelligence Programming
COMP_SCI 337-0	Natural Language Processing
COMP_SCI 338-0	Practicum in Intelligent Information Systems
COMP_SCI 344-0	Design of Computer Problem Solvers
COMP_SCI 348-0	Introduction to Artificial Intelligence
COMP_SCI 349-0	Machine Learning
COMP_SCI 371-0	Knowledge Representation and Reasoning

#### Breadth Courses (3 courses)

Three additional courses are required within years 2 and 3. Any non-required, graduate-level course in any school or department can be used to fulfill the breadth requirement.

#### Other Degree Requirements

- *Second-year qualifying exams*
- *Second-year independent research project*
- *PhD Dissertation*