Cognitive Science (BS)

Cognitive Science is the study of complex information processing in humans and machines and includes the multidisciplinary study of biological and artificial systems. Important components of cognitive science include areas of research such as: cognitive-neuroscience, brain-imaging studies of perceptual and cognitive processing, situated cognition, Human-Computer-Interactions (HCI), computational modeling, and Artificial Intelligence (AI). The field of cognitive science draws from diverse approaches to understanding complex information processing, including research from experimental psychology, neuroscience, linguistics, philosophy, computer science, mathematics, and engineering.

The Cognitive Science program in the School of Behavioral and Brain Sciences at UT Dallas consists of three concentration areas: (1) Psychology/HCI, (2) Cognitive-Neuroscience, and (3) AI/Computational Modeling.

Cognitive Science Majors select the majority of their upper-division coursework from 2 of these 3 concentration areas in order to generate multidisciplinary areas of focus. In addition to providing a sound preparation for graduate work in Cognitive Science and related areas, the Cognitive Science major is an ideal choice for students pursuing careers that combine interests in neuroscience, cognition, mathematics, and computer science. There are exciting career prospects in both industry and academics for the Cognitive Science major.

Cognitive-Neuroscience Careers. Students whose focus area is cognitive-neuroscience will be well prepared for the pursuit of graduate degrees and careers associated with: medicine, clinical neuropsychology, brain-imaging technology, intraoperative neurophysiological monitoring, and evaluation of bionic/prosthetic technology (e.g., cochlear implants and artificial limbs). Students interested in Cognitive-Neuroscience career opportunities typically choose their core coursework from both the specialization areas of Psychology/HCI and Neuroscience.

Human-Computer-Interaction Careers. Students whose focus area is Human-Computer-Interactions (HCI), are prepared for the pursuit of careers in the areas of usability engineering and user-experience (UX) design and development that involve the evaluation and design of human-computer interfaces such as website and software graphical user interfaces (GUIs), smartphone interfaces, and voice-user interfaces (VUIs). Students interested in HCI career opportunities should choose their core coursework from the Psychology/HCI specialization area and include one or more HCI courses.

AI/Computational Modeling Careers. Students whose focus area is AI/computational modeling are prepared for the pursuit of careers associated with the development and evaluation of Artificial Intelligence (AI) technology (e.g., web search engines, speech recognition, robotics, computer vision, and computer games), bionic and prosthetic technology development and evaluation (such as cochlear implant technology), computer-based natural language understanding, data mining, and machine learning as well as the development of computational models to support theory.
development in the behavioral and brain sciences. Students interested in career opportunities in this area should choose their core coursework from the AI/Computational Modeling specialization area.

**Bachelor of Science in Cognitive Science**

*Degree Requirements* [120 semester credit hours]*

*View an Example of Degree Requirements by Semester*

**Faculty**


*Associate Professors:* Gregory Dussor, Francesca Filbey, Daniel Krawczyk, Sven Kroener, Mandy J. Maguire, Christa McIntyre Rodriguez, Jonathan E. Ploski, Theodore Price, Bart Rypma, Lucien (Tres) Thompson, Sven Vanneste

*Assistant Professors:* Chandramallika Basak, Michael Burton, Xiaosi Gu, Kristen Kennedy, Karen Rodrigue, Catherine Thorn, Gagan Wig

*Senior Lecturer:* Rukhsana Sultana

*Affiliated Faculty:* Robert Ackerman, Shayla C. Holub, Heidi Kane, Candice M. Mills, Jackie Nelson, Amy Pinkham, Karen J. Prager, Raúl Rojas, Pamela R. Rollins, John W. Santrock, Noah J. Sasson, Melanie J. Spence, Linda M. Thibodeau, Hanna K. Ulatowska, Marion K. Underwood, Jun Wang, Andrea Warner-Czyz, Anne van Kleeck

I. Core Curriculum Requirements: 42 semester credit hours*

**Communication:** 6 semester credit hours

- **COMM 1311** Survey of Oral and Technology-based Communication
- **RHET 1302** Rhetoric

**Mathematics:** 3 semester credit hours

- **MATH 2417** Calculus \(^1\) or **MATH 2413** Differential Calculus \(^3\) (Note: **MATH 2417** is recommended)

**Life and Physical Sciences:** 6 semester credit hours

Select 6 semester credit hours from Life and Physical Sciences core courses (see CGS advisor for options)

**Language, Philosophy and Culture:** 3 semester credit hours
Choose one course from the following:

- **HUMA 1301** Exploration of the Humanities
- **LIT 2331** Masterpieces of World Literature
- **PHIL 1301** Introduction to Philosophy
- **PHIL 2316** History of Philosophy I
- **PHIL 2317** History of Philosophy II

Creative Arts: 3 semester credit hours

Choose one course from the following:

- **AHST 1303** Survey of Western Art History: Ancient to Medieval
- **AHST 1304** Survey of Western Art History: Renaissance to Modern
- **AHST 2331** Understanding Art
- **ARTS 1301** Exploration of the Arts
- **DANC 1310** Understanding Dance
- **THEA 1310** Understanding Theater
- **FILM 2332** Understanding Film
- **MUSI 1306** Understanding Music

American History: 6 semester credit hours

Choose two courses from the following:

- **HIST 1301** U.S. History Survey to Civil War
- **HIST 1302** U.S. History Survey from Civil War
- **HIST 2301** History of Texas
- **HIST 2330** Themes and Ideas in American History
- **HIST 2332** Civil War and Reconstruction

Government / Political Science: 6 semester credit hours

- **GOVT 2305** American National Government
- **GOVT 2306** State and Local Government

Social and Behavioral Sciences: 3 semester credit hours

- **PSY 2301** Introduction to Psychology
Component Area Option: 6 semester credit hours

- **MATH 2419** Calculus II<sup>3</sup> or **MATH 2414** Integral Calculus<sup>3</sup> (Note: **MATH 2419** is recommended)
- **CGS 2301** Cognitive Science<sup>3</sup>

II. Major Requirements: 48-54 semester credit hours (12 semester credit hours beyond Core Curriculum)

**Major Preparatory Courses**

The following are required for all concentration areas: (24 semester credit hours)

- **CGS 2301** Cognitive Science<sup>3</sup>
- **CS 1337** Computer Science I
- **MATH 2417** Calculus I<sup>3</sup> or **MATH 2413** Differential Calculus<sup>3</sup>
- **MATH 2419** Calculus II<sup>3</sup> or **MATH 2414** Integral Calculus<sup>3</sup>
- **MATH 2418** Linear Algebra
- **PSY 2301** Introduction to Psychology<sup>3</sup>
- **PSY 2317** Statistics for Psychology
  or **CS 3341** Probability and Statistics in Computer Science and Software Engineering

**Additional Preparatory Courses for AI/Computational Modeling Area (6 semester credit hours)**

- **CS 2305** Discrete Mathematics for Computing I
- **CS 2336** Computer Science II

**Major Core Courses required for all concentration areas: 12 semester credit hours**

- **CGS 3361** Cognitive Psychology
- **NSC 3361** Introduction to Neuroscience
- **PSY 3392** Research Design and Analysis
- **CGS 3340** Experimental Projects in Cognitive Science
  or **PSY 3393** Experimental Projects in Psychology

**Major Related Courses: 24 semester credit hours**

Select 4 courses each from 2 of the following 3 Concentration Areas

**Core Courses for Psychology/HCI Concentration Area (select 12 semester credit hours from list**
of courses below)

CGS 3325 Historical Perspectives on Psychology: Mind and Machines since 1600
CGS 4359 Cognitive Neuroscience
CGS 4362 Perception
CGS 4352 Human Computer Interactions I
CGS 4353 Human Computer Interactions II
PSY 3331 Social Psychology
PSY 4343 Abnormal Psychology
PSY 2314 Lifespan Development
PSY 3310 Child Development
PSY 3362 Cognitive Development

Core Courses required for Cognitive-Neuroscience Concentration Area (select 12 semester credit hours from list of courses below)

NSC 4352 Cellular Neuroscience
NSC 4354 Integrative Neuroscience
NSC 4356 Neurophysiology
NSC 4366 Neuroanatomy
NSC 4363 Neuropharmacology
NSC 4367 Developmental Neurobiology
NSC 4359 Cognitive Neuroscience
NSC 4353 Neuroscience Laboratory Methods
NSC 4357 Neurobiology of Learning and Memory
NSC 4362 Molecular Neuroscience
NSC 4371 Neural Plasticity
NSC 4373 Sensory Neuroscience
NSC 4385 Neuropsychology

Core Courses required for AI/Computational Modeling Concentration Area (select 12 semester credit hours from list of courses below)

CS 3341 Probability and Statistics in Computer Science and Software Engineering

CGS 3342 Cognitive and Neural Modeling Laboratory
CGS 4312 Computational Modeling Methods for Language Understanding
CGS 4313 Neural Net Mathematics
CGS 4314 Intelligent Systems Analysis
CGS 4315 Intelligent Systems Design
CS 3345 Data Structures and Introduction to Algorithmic Analysis
CS 4365 Artificial Intelligence
CS 4375 Introduction to Machine Learning
CS 4391 Introduction to Computer Vision
CS 4395 Human Language Technologies

III. Elective Requirements: 24-30 semester credit hours

Free Electives (24 semester credit hours for AI/Computational Modeling Concentration Area; 30 semester credit hours for other two concentrations)

Students are encouraged to explore areas of concentration in Cognitive Science, Psychology, and Neuroscience as well as explore interests outside the field. Be aware that at least 51 semester credit hours of upper-division semester credit hours are required for graduation. In addition, advanced CGS students in good academic standing may request permission from the Cognitive Science Program Head to take graduate Applied Cognition and Neuroscience coursework (ACN prefix) to fulfill some of the elective course requirements.

Incoming freshmen must enroll and complete requirements of BBSU 1100.

Fast Track Baccalaureate/Master's Degrees

UT Dallas undergraduate students with strong academic records who intend to pursue a master's degree in Applied Cognition and Neuroscience at UT Dallas may consider an accelerated undergraduate-graduate plan of study. If accepted into the program, students may take up to 15 semester credit hours of graduate courses that may be used to complete the bachelor's degree and also to satisfy requirements for the Master's degree. Students must maintain a 3.00 grade point average and earn grades of B or better in the graduate courses taken.

Students should apply for Fast Track admission in the semester they reach 90 semester credit hours. To qualify for application, undergraduate students must have completed at least 18 semester credit hours in major core courses at UT Dallas. To be eligible for Fast Track admission, students must have completed at least 90 semester credit hours toward a baccalaureate degree and meet program admission requirements. Apply to the Fast Track program through the Applied Cognition and Neuroscience Program Office. Students should consult with a graduate advisor regarding admissions criteria and plans of study at the beginning of their junior year.

Minor in Cognitive Science: 18 semester credit hours

Students who are not majoring in Cognitive Science may minor in Cognitive Science by completing 18 semester credit hours. Students who take a minor will be expected to meet the normal prerequisites in courses making up the minor, and should maintain a minimum GPA of 2.000 on a 4.00 scale (C average). At least 12 of the 18 semester credit hours required by the minor in Cognitive Science must be upper-division courses from either the Psychology/HCI, Neuroscience, or Computational Modeling/AI specialization areas. In addition, 9 of the 18 semester credit hours required for the minor in Cognitive Science must have a Cognitive Science (CGS), Psychology (PSY), or Neuroscience (NSC) prefix and be upper-division courses. No semester credit hours may be used to satisfy both major and minor requirements; however, free elective semester credit hours or major preparatory classes may be used to satisfy the minor. At least one-third of the semester credit hours for a minor must be taken at UT Dallas.

1. Incoming freshmen must enroll and complete requirements of UNIV 1010 and the corresponding school-related freshman seminar course. Students, including transfer students, who complete their core curriculum at UT Dallas must take UNIV 2020.

2. Curriculum Requirements can be fulfilled by other approved courses from institutions of higher education. The courses listed are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.

3. A required Preparatory course that also fulfills a Core Curriculum requirement. Fourteen semester credit hours (14) are counted in Core Curriculum.

4. Note that either SE 3341 or STAT 3341 may be used as an equivalent course for CS 3341 for all Cognitive Science program requirements as well as all Cognitive Science course prerequisites.

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