School of Behavioral and Brain Sciences

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.
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 I

**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**
One of 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**
One of 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
- **DRAM 1310** Understanding Theater
- **FILM 2332** Understanding Film
- **MUSI 1306** Understanding Music

**American History: 6 semester credit hours**
Two of 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
CGS 2301 Cognitive Science

II. Major Requirements: 60 semester credit hours (15 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
CS 1337 Computer Science I
MATH 2417 Calculus I
MATH 2419 Calculus II (prerequisite: MATH 2417)
MATH 2418 Linear Algebra (prerequisite: MATH 2417)
PSY 2301 Introduction to Psychology
PSY 2317 Statistics for Psychology
or CS 3341 or SE 3341 or STAT 3341 Probability and Statistics in Computer Science and Software Engineering (prerequisite: MATH 2419 and CS 2305)
or STAT 4351 Probability (prerequisite: MATH 2451)

Additional Preparatory Courses for AI/Computational Modeling Area (10 semester credit hours)
CS 2305 Discrete Mathematics for Computing I (prerequisite: MATH 2417)
CS 2336 Computer Science II (prerequisite: CS 1337)
MATH 2451  Multivariable Calculus with Applications (prerequisite: MATH 2419)

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

CGS 3361  Cognitive Psychology
NSC 3361  Behavioral 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 (prerequisite: PSY 2301)
CGS 4362  Perception (prerequisite: CGS 2301 or PSY 2301)
CGS 4352  Human Computer Interactions I
CGS 4353  Human Computer Interactions II (prerequisite: CGS 4342)
CGS 4355  Human Computer Interactions Lab (prerequisite: CGS 4352 or CGS 4353)
PSY 4374  Judgment and Decision Making
PSY 3331  Social Psychology
PSY 4343  Abnormal Psychology
PSY 2314  Lifespan Development
PSY 3310  Child Development
PSY 3362  Cognitive Development (prerequisite: PSY 2134 or PSY 3310)

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

NSC 4352  Cellular Neuroscience (prerequisite: NSC 3361)
NSC 4354  Integrative Neuroscience (prerequisite or corequisite: NSC 3361)
NSC 4356  Neurophysiology (prerequisite: NSC 4352)
NSC 4366  Neuroanatomy (prerequisite: NSC 3361 or BIOL 2311)
NSC 4363  Neuropharmacology (prerequisite: NSC 4352 or NSC 4354)
NSC 4367  Developmental Neurobiology (prerequisite: NSC 4352 or NSC 4354)
NSC 4359  Cognitive Neuroscience (prerequisite PSY 2301)
NSC 4353 Neuroscience Laboratory Methods (prerequisites: NSC 3361 and either NSC 4352 or NSC 4354)
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)

CGS 3342 Cognitive and Neural Modeling Laboratory
CGS 4312 Computational Modeling Methods for Language Understanding
CGS 4313 Neural Net Mathematics (prerequisites: MATH 2451, MATH 2418, and upper-division course in calculus-based probability such as STAT 3341 or STAT 4351)
CGS 4314 Intelligent Systems Analysis (prerequisite: CGS 4313 or instructor consent required)
CGS 4315 Intelligent Systems Design (prerequisite: CGS 4314 or instructor consent required)
CS 3345 Data Structures and Introduction to Algorithmic Analysis (prerequisites: CS 2336 and CS 2305)
CS 4365 Artificial Intelligence (prerequisite: CS 3345)
CS 4375 Introduction to Machine Learning (prerequisites: CS 3345 and CS 3341)
CS 4391 Introduction to Computer Vision (prerequisite: CS 3345)
CS 4395 Human Language Technologies (prerequisites: CS 3345 and CS 3341 or SE 3341 or STAT 3341)

III. Elective Requirements: 18 semester credit hours

Free Electives (3-18 semester credit hours)

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 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.

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. When 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 3.000 grade point average and earn grades of B or better in the graduate courses taken. The Fast Track makes it possible for students to complete upper-division undergraduate education and graduate training in three years. Students must have completed at least 90 semester credit hours toward a baccalaureate degree before beginning Fast Track coursework. Students should apply to admissions one semester before 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. Apply to the Fast Track program through the Cognitive Science Program Office. Students should consult with a graduate advisor regarding admissions criteria and plans of study at the beginning of their junior year.

1. Incoming freshmen must complete and pass UNIV 1010 Freshman Seminar 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.

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