

# Graduate Program in Applied Cognition and Neuroscience

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## Faculty

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## Objectives

The Master of Science in Applied Cognition and Neuroscience (ACN) program is an applied multidisciplinary program which incorporates and integrates methodologies from such diverse fields as psychology, neuroscience, and computer science. The *Cognition and Neuroscience specialization area* provides a flexible multidisciplinary curriculum for studying the mind and brain which is designed to be adaptable to the individual student's interests. Students enrolling in the Cognition and Neuroscience specialization area with backgrounds in psychology and neuroscience will have the opportunity to gain the diverse skills needed to collect and interpret behavioral and neurophysiological data. The *Computational Modeling/Intelligent Systems specialization area* provides advanced training applicable to developing mathematical and computer simulation models of the brain and behavior as well as the development of artificially intelligent systems. The *Human Computer Interaction specialization area* provides excellent preparation for work in areas involving human computer interactions such as usability engineering issues associated with the design and evaluation of user-friendly web-based systems. The *Neurological Diagnosis and Monitoring specialization area* provides advanced training and preparation for using functional brain imaging methodologies such as: EEG, SPECT, PET, and fMRI for both clinical and experimental investigations. All four specialization areas provide excellent preparation for doctoral work in the Cognition and Neuroscience area.

## Career Opportunities in the Applied Cognition and Neuroscience Area

The Master of Science in Applied Cognition and Neuroscience (ACN) program is a multidisciplinary program which should be of interest to business professionals interested in retraining or continuing education and are currently working full-time in a professional-level job. Business professionals in different fields should pursue the appropriate "specialization area" within the ACN degree program. Many courses in the

ACN program are offered periodically as evening courses which meet either once or twice a week.

- Software development professionals whose focus is the development of web sites can acquire advanced training in the design and evaluation of web-site effectiveness using advanced behavioral science methodologies through the Human-Computer Interaction specialization area.
- Psychological counselors, and Education professionals (e.g., high school science teachers, adult literacy educators) will greatly benefit from the basic neuroscience and psychological science courses which are offered by the Cognition and Neuroscience specialization area.
- Medical Health professionals (e.g., MRI Technicians and Radiologists) who are working in the area of brain imaging technology will find the Neurological Diagnosis and Monitoring specialization area to be relevant for improving their knowledge and understanding of functional brain imaging technologies such as: EEG, SPECT, PET, and fMRI.
- Software development professionals interested in the area of the implementation of complex mathematical algorithms in software. Such mathematical algorithms are now widely embedded in a variety of software programs for the purposes of providing “intelligent assistance” to the end-user. Software development professionals interested in continuing education in this area should consider the Intelligent Systems specialization area in the ACN program.

## **Facilities**

In addition, to numerous individual faculty research labs, the Applied Cognition and Neuroscience Program utilizes several facilities which are shared among faculty and graduate students. The Computational Systems Laboratory consists of a network of workstations which are used for computationally intensive models of perceptual, cognitive, and neural processes as well as high-volume data analyses. The Computational can be accessed remotely by graduate students and faculty members. The Neuroscience Laboratory facilities are located in Green Hall and the Multipurpose Building at the Richardson campus as well. The Callier Center for Communication Disorders, located adjacent to the University of Texas Southwestern Medical School, provides access to brain imaging laboratories and speech, hearing, and language laboratories.

## **Admission Requirements**

The University’s general admission requirements are discussed [here](#).

Admission to the Applied Cognition and Neuroscience Program is based on a review of the applicant’s GPA, letters of recommendation, and narrative description of interests and career goals. Both GRE math and verbal scores are required to be considered for admission.

## **Degree Requirements**

The University's general degree requirements are discussed [here](#).

All students in the program are required to regularly review their degree plans with their program advisor. In all areas of specialization students complete 6 hours of approved core courses, 6 hours of approved methods courses, 6 hours of approved advanced elective courses, 12 hours of coursework in an approved specialization area, and 6 hours of internship courses. A grade of "B" is the required passing grade for coursework used to fulfill the core course and methods course requirements of the degree. Coursework used to fulfill the advanced elective requirement may be taken pass/fail. Internship coursework must be taken pass/fail.

#### **Required Core Courses (18 hours)**

- *Select two of the following approved core courses (6 hours).*
  - ACN 6330 Cognitive Science I
  - ACN 6395 Cognitive Psychology
  - ACN 6340 Cellular Neuroscience
  - ACN 7344 Functional Human Neuroanatomy
  - ACN 6346 Systems Neuroscience
  
- *Select at least one approved quantitative methods course approved by the Program Head or from the following approved list of quantitative methods courses (3 hours).*
  - ACN 6312 Research Methods in Behavioral and Brain Sciences – Part I
  - ACN 6313 Research Methods in Behavioral and Brain Sciences – Part II
  - ACN 6351 Quantitative Methods in Neuroscience
  - ACN 6348 Neural Net Mathematics
  - ACN 6347 Intelligent Systems Analysis
  - ACN 6349 Intelligent Systems Design
  
- *Select at least one methods course (3 hours).*
  
- *Select two advanced elective courses:* These courses may be chosen from either the Graduate Program in Human Development and Communication Sciences or the Applied Cognition and Neuroscience Program or the courses may be chosen from outside the School of Behavioral and Brain Sciences with approval from the ACN program head. Advanced elective courses may be taken pass/fail or for a grade.

#### **Area of Specialization (16 hours)**

The following four specialization areas have been approved for the Applied Cognition and Neuroscience program but alternative specialization area proposals may be submitted for consideration to the Applied Cognition and Neuroscience program head.

#### **Cognition and Neuroscience Specialization Area**

Students selecting this specialization area are approved to select any four courses from the ACN program (i.e., courses with the prefix ACN) or the Cognition and Neuroscience Area of the Graduate Program in Human Development and Communication Sciences (i.e., courses with the prefix HCS).

#### **Human-Computer Interactions Specialization Area**

Students selecting this specialization area should take two of the following three courses: ACN 6341 Human Computer Interactions I, ACN 6342 Human Computer Interactions II, and ACN 6343 Human Computer Interactions Lab. Students pursuing the *behavioral sciences track* should additionally take two courses from the Cognition and Neuroscience Specialization Area course selections. Students pursuing the *user-interface development track* should take: CS 5343 Algorithm Analysis and Data Structures and CS 6354 Software Engineering. Note that the prerequisites for CS5343 are: CS5303 Computer Science I (or equivalent) and CS 5333 Discrete Structures. Students specializing in the Human Computer Interactions area should regularly review the Arts and Technology courses offered in the School of Arts and Humanities which have the course prefix ATEC and discuss relevant course offerings with the ACN Program Head.

#### **Computational Modeling/Intelligent Systems Specialization Area**

Students pursuing the *computer simulation modeling track* should take four courses from the Cognition and Neuroscience Specialization Area which include at least one of the following courses: ACN 7335 Computational Neuroscience, ACN 7367 Speech Perception Lab, ACN 7322 Computational Models of Language Understanding. Students pursuing the *mathematical modeling track* will satisfy the advanced elective requirement in this specialization area by taking the sequence: ACN 6346 Neural Net Mathematics, ACN 6347 Intelligent Systems Analysis and ACN 6349 Intelligent Systems Design and one additional course from the Cognition and Neuroscience Specialization Area course selection. Note that STAT 5351, linear algebra, multivariable calculus, and ACN 5314 Cognitive and Neural Modeling Lab are recommended prerequisites for: ACN 6346. The following Computer Science and Electrical Engineering courses are pre-approved electives for students specializing in the Intelligent Systems area who have the appropriate prerequisite background in computer science and/or electrical engineering: CS6320 (Natural Language Processing), CS 6321 (Discourse Processing), CS6364 (Artificial Intelligence), CS6373 (Intelligent Systems), CS6375 (Machine Learning), CS6384 (Computer Vision), EE6362 (Speech Processing), EE6363 Digital Image Processing, EE6364 (Pattern Recognition), and EE 6365 (Adaptive Signal Processing).

#### **Neurological Diagnosis and Monitoring Specialization Area**

Students should take ACN 7344 Functional Human Neuroanatomy and ACN 6346 Systems Neuroscience. Students should also choose at least 2 of the following courses as specialization area electives: ACN 6310 Fundamentals of Functional Brain Imaging, ACN 6373 Intraoperative Monitoring I, ACN 6374 Intraoperative Monitoring II, ACN 7315 Statistical Analysis of Brain Imaging Data, ACN 7329 Functional Brain Imaging

Practica, ACN 6372 Pathophysiology of Disorders of the Nervous System, and ACN 7330 Advanced Functional Brain Imaging.

**Internships (6 hours)**

The internship requirement is satisfied by enrolling in 6 credit hours of ACN 7V71 Industry Internship, ACN 7V72 Research Internship, and/or HCS 8V80 Research in HCS. Students whose immediate post-graduate goals are graduate school and medical school should fulfill the Internship Requirement by taking six credit hours of HCS 8V80 in order to obtain research experience. Students not intending to pursue graduate or medical school training immediately after receiving their ACN masters degree should discuss internship opportunities with the Program Head during their second semester of enrollment in the ACN program.