Course Descriptions

Core Courses

ACN 6330 (HCS 6330) Cognitive Science (3 semester hours) Cognitive and neural processing approaches to understanding perception, attention, memory, thought, and language. (3-0) Y

ACN 7344 (HCS 7344) Functional Human Neuroanatomy (3 semester hours) Function of each major brain system as related to the organization and synaptic connections of their principal nuclei. Function of each system related to the neurological disorders associated with disease or lesions at specific locations. (3-0) T

ACN 6346 (HCS 6346) Systems Neuroscience (3 semester hours) Integrative systems level study of the nervous system. Aspects of neural mechanisms and circuitry underlying regulation of motor behaviors, sensory and perceptual processing, biological homeostasis, and higher cognitive functions. (3-0) Y

ACN 6395 (**HCS 6395) Cognitive Psychology** (3 semester hours) Theory and research on perception, learning, thinking, psycholinguistics, and memory. (3-0) Y

Methods Courses

ACN 6312 (HCS 6312) Research Methods in Behavioral and Brain Sciences - Part I (3 semester hours). Applying, understanding, and interpreting various statistical techniques in behavioral science context. Participants have the opportunity to learn appropriate statistical details for basic descriptive and inferential statistics, the interrelationships among techniques, and computer skills required for data analyses. (3-0) Y

ACN 6313 (HCS 6313) Research Methods in Behavioral and Brain Sciences - Part II (3 semester hours). Topics in general linear modeling including factorial analysis of variance, analysis of covariance, between and within subject designs, and multiple regression. Prerequisite: ACN 6312 or consent of instructor. (3-0) Y

ACN 6351 (HCS 6351) Quantitative Methods in Neuroscience (3 semester hours) Data analysis techniques relevant to neuroscience. Topics may include: fourier/wavelet analysis, differential equations, statistical data analysis methods. May be repeated for credit with permission of the instructor. Prerequisite: ACN 6312 or consent of instructor (3-0) R

ACN 6374 (HCS 6374) Intraoperative Neurophysiological Monitoring II (3 semester hours). The use of recordings of neuro-electric brain potentials and their interpretation for diagnostic purposes and for intraoperative monitoring. (3-0) Y. Prerequisite: ACN 6373 (HCS 6373)

ACN 7322 (HCS 7322) Computational Models of Language Understanding (3 semester hours). Probabilistic methods for natural language understanding. Use of the MATLAB computer language for instantiating specific knowledge-based computational theories of natural language understanding. Emphasizes creative applications of these research methodologies. Prerequisites: Computer Programming Experience is

recommended but not required. (3-0) T

ACN 5314 (HCS 5314) Cognitive and Neural Modeling Lab (3 semester hours) Auto-associative, associative, competitive learning, recurrent, and back-propagation artificial neural network algorithms in a "hands-on" micro-computer laboratory environment using special simulation software. Applications to perceptual, cognitive, computational, and neuroscience problems. Emphasizes creative applications of these research methodologies. Prerequisites: Linear Algebra and Computer Programming Experience is recommended but not required. (3-0) T

ACN 6343 Human Computer Interactions Lab (3 semester hours) Provides students with resources to learn and perform hands-on lab-based techniques such as usability testing and cognitive walkthroughs. Emphasizes creative applications of these research methodologies as well as the development of critical thinking skills in a usability engineering context. (3-0) T

ACN 7345 (HCS 7345) Neuroanatomy Laboratory (3 semester hours). Laboratory experience with neural tracing techniques employed in neuroscience research. Prerequisite: HCS 7344 or consent of instructor. (3-0) T

ACN 7378 (HCS 7378) Advanced Neurophysiology Methods (3 semester hours). Hands-on experience with deeply anesthetized and reduced in vitro brainslice or dissociated cell preparations widely used in neuroscientific research. Prerequisite: ACN 6340 and consent of instructor. (3-0) R

ACN 7367 (HCN 7367) Speech Perception Laboratory (3 semester hours) Introduction to the field of speech processing by computer, with primary application to research techniques in the study of speech perception. (0-9) T

ACN 7335 Computational Neuroscience (3 semester hours) Introduction to state-of-the-art computer methods for simulation of biologically realistic neuronal dynamics. Students must demonstrate some degree of computer skills. (3-0) R

ACN 6342 Human Computer Interactions II (3 semester hours) Detailed exploration of human-computer interaction (HCI) through readings in journal articles and research reports. Practical experience in methodology typically used in the design of usable systems. (3-0) T

ACN 6348 (HCS 6348) Neural Net Mathematics (3 semester hours). Vector calculus and vector calculus-based probability theory with artificial neural network modeling applications. Emphasizes development of advanced analytic skills and mathematical reasoning abilities. Intended to provide mathematics preparation for ACN 6347 and ACN 6349. Prerequisites: *Either:* (1) Linear algebra, multivariable calculus, STAT 5351, ACN 5314, *or* (ii) consent of instructor. (3-0) T

ACN 6347 (HCS 6347) Intelligent Systems Analysis (3 semester hours). Mathematical tools for investigating the asymptotic behavior of both artificially intelligent deterministic and stochastic nonlinear dynamical systems. Topics include: artificial neural network architectures, Lyapunov stability theory, nonlinear optimization theory, stochastic approximation theory, and the Gibbs Sampler. Emphasizes development of advanced analytic skills and mathematical reasoning abilities. Prerequisites: HCS 6348 or consent of instructor (or equivalent). (3-0) T

ACN 6349 Intelligent Systems Design (3 semester hours). Mathematical tools for the design and evaluation of artificially intelligent deterministic and stochastic nonlinear dynamical systems. Markov random fields and asymptotic statistical theory for statistical

model building and model evaluation. Emphasizes development of advanced analytic skills and mathematical reasoning abilities. Prerequisites: HCS 6347 or consent of instructor. (3-0) T

Elective and Specialization Area Courses

Note that the following list only represents a subset of the possible approved elective and specialization area courses. Students in the Applied Cognition and Neuroscience program should select their elective and specialization area coursework in consultation with their faculty advisor or the ACN Program Head. All courses with an HCS (Human Development and Communication Sciences) prefix area are automatically approved elective courses. Coursework outside the School of Behavioral and Brain Sciences may also be approved as an appropriate elective course if special permission from the ACN Program Head is obtained.

ACN 6340 (HCS 6340) Cellular Neuroscience (3 semester hours) Basic neural biology and physiology and principles of synaptic transmission. (3-0) Y
ACN 7343 (HCS 7343) Neuropharmacology (3 semester hours) Biology of neurotransmission in the central nervous system. Includes ionotropic and metabotropic coupling of all known classes of receptors to both their cellular and systemic effects. Clinical efficacy, side effects, and other issues related to drug use and abuse are covered. Prerequisite: ACN 6340 or ACN 6346. (3-0) T
ACN 6373 (HCS 6373) Intraoperative Neurophysiological Monitoring I (3 semester hours). The anatomical and physiological basis for the use of electrophysiological techniques in intraoperative neurophysiologic monitoring and in diagnosis of disorders affecting the nervous system. (3-0) Y
ACN 6341 Human Computer Interactions I (3 semester hours) Methods and principles of human-computer interaction (HCI) , user-centered design (UCD) , and useability evaluation. Provides broad overview of HCI and how HCI informs UCD processes throughout product development lifecycle. (3-0) T
ACN 6V81 Special Topics in Applied Cognition and Neuroscience (1-9 semester hours) Topics vary from semester to semester. May be repeated for credit as topics vary. ([1-9]-0) S
ACN 6332 (HCS 6332) Perception (3 semester hours) Psychophysical, neurophysiological, and computational foundations of sensation and perception. Basic senses of vision, audition, chemoreception, and tactile processing, with emphasis on understanding the processes that take us from neurons to perception and action. (3-0) R
ACN 6333 Memory (HCS 6333) (3 semester hours) Theoretical frameworks for knowledge acquisition and representation. Includes information processing and neuropsychological perspectives. (3-0) T
ACN 6334 Attention (HCS 6334) (3 semester hours) Theory and evidence on the study of attention especially in human vision and audition. Includes perceptual learning, information processing, and neuropsychological approaches. (3-0) R

Internship

ACN 7V71 Industry Internship May be repeated for credit. This course may only be taken pass/fail. ([1-6]-0) S
ACN 7V72 Research Internship May be repeated for credit. This course may only be taken pass/fail. ([1-6]-0) S