Applied Cognition and Neuroscience

**ACN 5314 (HCS 5314)** Computational Modeling Methods in the Behavioral and Brain Sciences (3 semester hours) Computational Neuroscience, Cognitive Neural Modeling, and Mathematical Psychology modeling methodologies are introduced through the use of computer-based simulation modeling experiments. Emphasizes creative applications of these research methodologies. Prerequisites: Linear Algebra and Computer Programming Experience are recommended but not required. (3-0) T

**ACN 6160** Neurobiology (1 semester hour) A self-paced course providing the neurobiological foundation for the study of speech-language pathology. This course may only be taken pass/fail. (Open to COMD students only.) (1-0) R

**ACN 6310 (HCS 6310)** Fundamentals of Functional Brain Imaging (3 semester hours) This course covers topics such as principles of tracer techniques, neuroimaging instrumentation, safety issues, brain physiology (perfusion, metabolism, and receptor function), image processing and analysis, fundamentals of SPECT, PET and fMRI, and critical evaluation of the functional neuroimaging literature. (3-0) Y

**ACN 6312 (HCS 6312, PSYC 6312)** Research Methods in Behavioral and Brain Sciences - Part I (3 semester hours) This course focuses on applying, understanding, and interpreting various statistical techniques in a behavioral science context. Students learn the framework for hypothesis testing, basic descriptive (e.g., measures of central tendency, variability and shape) and inferential (e.g., z, t, correlation, ordinary least squares regression, and ANOVA) statistics. The course provides students with an understanding of the interrelationships among statistical techniques, and computer skills required for data analyses. Students without the necessary background knowledge of basic statistics and experimental design will be required to take **PSY 3392** before registering for **ACN 6312**. (3-0) Y

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

**ACN 6316 (HCS 6316, PSYC 6316)** Research Methods in Behavioral and Brain Sciences - Part III (3 semester hours) Applying, understanding, and interpreting various advanced multivariate statistical techniques in brain and behavioral science contexts. Includes principal component analyses, simple and multiple correspondence analyses, partial least square methods, multi-table analyses, discriminant analyses, and structural equation modeling. (May be repeated for credit) (3-0) R

**ACN 6319 (HCS 6319, PSYC 6319)** Scientific Writing (3 semester hours) Scientific writing of articles for publication. (3-0) Y

**ACN 6322 (HCS 6322)** Computational Modeling Methods for 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. Prerequisite: Computer Programming Experience is recommended but not required. (3-0) T
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACN 6330 (HCS 6330, PSYC 6330)</td>
<td>Cognitive Science</td>
<td>3</td>
<td>Cognitive, computational, and neural processing approaches to understanding perception, memory, thought, language and emotion. (3-0) Y</td>
</tr>
<tr>
<td>ACN 6331 (HCS 6331, PSYC 6331)</td>
<td>Cognitive Development</td>
<td>3</td>
<td>Survey of cognitive development theories and research in a variety of domains including perception, memory, language, and problem solving. (3-0) Y</td>
</tr>
<tr>
<td>ACN 6332 (HCS 6332, PSYC 6332)</td>
<td>Perception</td>
<td>3</td>
<td>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</td>
</tr>
<tr>
<td>ACN 6333 (HCS 6333, PSYC 6333)</td>
<td>Memory</td>
<td>3</td>
<td>Research and theory on the acquisition, representation, and retrieval of information by the mind/brain. Includes information processing and neuropsychological perspectives. (3-0) T</td>
</tr>
<tr>
<td>ACN 6334 (HCS 6334)</td>
<td>Attention</td>
<td>3</td>
<td>Theory and evidence on the study of attention especially in human vision and audition. Includes perceptual learning, information processing, neuropsychological approaches. (3-0) R</td>
</tr>
<tr>
<td>ACN 6338 (HCS 6338, PSYC 6338)</td>
<td>Functional Neuroanatomy</td>
<td>3</td>
<td>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</td>
</tr>
<tr>
<td>ACN 6339 (HCS 6339, PSYC 6339)</td>
<td>Psycholinguistics</td>
<td>3</td>
<td>Classic and current research in psycholinguistics. Includes concepts from linguistics, the biological bases of speech and language processing, and child language acquisition. (3-0) R</td>
</tr>
<tr>
<td>ACN 6340 (HCS 6340)</td>
<td>Cellular Neuroscience</td>
<td>3</td>
<td>Basic neural biology and physiology and principles of synaptic transmission. (3-0) Y</td>
</tr>
<tr>
<td>ACN 6341</td>
<td>Human Computer Interactions I</td>
<td>3</td>
<td>Methods and principles of human-computer interaction (HCI), user-centered design (UCD), and use ability evaluation. Provides broad overview of HCI and how HCI informs UCD processes throughout product development life cycle. (3-0) T</td>
</tr>
<tr>
<td>ACN 6342</td>
<td>Human Computer Interactions II</td>
<td>3</td>
<td>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</td>
</tr>
<tr>
<td>ACN 6343</td>
<td>Human Computer Interactions Lab</td>
<td>3</td>
<td>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. (0-3) T</td>
</tr>
</tbody>
</table>
behaviors, sensory and perceptual processing, biological homeostasis, and higher cognitive functions. (3-0) Y

**ACN 6347 (HCS 6347)** Intelligent Systems Analysis (3 semester hours) Mathematical tools for investigating the asymptotic behavior of both deterministic and stochastic nonlinear dynamical systems. Topics include: artificial neural network architectures, Lyapunov stability theory, nonlinear optimization theory, stochastic approximation theory, and Monte Carlo Markov Chain methods such as the Metropolis-Hastings algorithm. Emphasizes development of advanced analytic skills and mathematical reasoning abilities. Prerequisite: ACN/HCS 6348 (or equivalent) or consent of instructor. (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/HCS 6347 and ACN/HCS 6349. Prerequisites: Either: (1) Linear algebra, multivariable calculus, STAT 5351 or equivalent, ACN/HCS 5314, or (2) consent of instructor. (3-0) T

**ACN 6349 (HCS 6349)** Intelligent Systems Design (3 semester hours) Probabilistic and statistical modeling tools for the design and evaluation of artificially intelligent deterministic and stochastic nonlinear dynamical systems for the purpose of building computational models in the fields of neuroscience, psychology, and artificial intelligence. Topics include probabilistic interpretations of nonlinear dynamical system models and asymptotic mathematical statistical theory for parameter estimation, model selection, specification analysis, and hypothesis testing. Prerequisite: ACN/HCS 6347 or consent of instructor. (3-0) T

**ACN 6355 (HCS 6355, PSYC 6355)** Judgment and Decision Making (3 semester hours) This course examines human inferences, judgments, decisions, and the processes by which we arrive at them. It will focus on the fact that our social judgments are not based on the laws of probability and chance, but on other cognitive processes that may have serious shortcomings in important inferential and decision making tasks. We will also see that these processes, while ecologically efficient, systematic and often predictable, are imperfect in today's data-rich environment. (3-0) T

**ACN 6363 (HCS 6363)** Text Comprehension Seminar (3 semester hours) Current readings in the field of text comprehension and memory. May be repeated for credit with instructor's permission. (3-0) T

**ACN 6367 (HCS 6367, PSYC 6367)** Speech Perception (3 semester hours) Current topics and theories in speech perception. Topics include the acoustic correlates of speech sounds and the problem of invariance, the perception of speech under adverse conditions, the effects of hearing impairment, and models of speech perception. (3-0) T

**ACN 6368 (HCS 6368, PSYC 6368)** Language Development (3 semester hours) Advanced study of normal oral language development. The goals of this course are to consider the developmental trajectories of the different components of language; to consider the varied and critical roles of language in human development; to understand the impact of culture, different languages, child factors and the environment on development; and to be introduced to the theoretical perspectives driving research and thinking in this area of inquiry. (3-0) Y

**ACN 6372 (HCS 6372)** The Neuroscience of Pain (3 semester hours) A systems-oriented course covering the anatomical and physiologic basis of pain. The course emphasizes the similarities and differences between the different forms of pain and describes the basic features of neural processing of pain signals in the
spinal cord and brain, the anatomy and the function of the descending systems that can control
transmission of pain signals, and peripheral and central sensitization. The physiological and molecular
basis for treatment of pain is discussed. (3-0) Y

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 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. Prerequisite: ACN/HCS 6373. (3-0) Y

ACN 6388 (HCS 6388) MATLAB for Brain Sciences (3 semester hours) Introduction to MATLAB computer
programming. Covers the use of the MATLAB programming language for the purpose of stimulus
generation, behavioral data analysis, statistical analyses, and generation of publication quality figures. (3-0) R

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

ACN 6399 (HCS 6399, PSYC 6399) Research Ethics and Scientific Integrity (3 semester hours) An interactive,
intensive course designed to cover critical issues related to human subjects, animal welfare, research
design, accountability of scientific actions and fraud. Course designed for individuals intending research
careers in academia or industry. (3-0) Y

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 7324 (COMD 7324, AUD 7324) Seminar in Cochlear Implants and Technology for Persons with Hearing
Impairments (3 semester hours) Overview of prosthetic alternatives to conventional amplification for
individuals with severe-to-profound hearing loss. Topics include candidacy determination, technology,
programming/fitting of devices, aural (re)habilitation, and awareness of controversial areas related to
cochlear implantation. (3-0) Y

ACN 7330 (HCS 7330) Advanced Functional Brain Imaging (3 semester hours) This course explores more in-
depth topics such as neuroimaging detection systems, clinical applications of functional neuroimaging,
experimental design, statistical techniques in image analysis and reviews of pertinent literature using
functional brain imaging to illuminate various cognitive and perceptual processes, such as language,
memory, hearing and vision. (3-0) R

ACN 7335 (HCS 7333) Computational Neuroscience (3 semester hours) Introduction to state-of-the-art
computer methods for simulation of biologically realistic neuronal dynamics. Students must demonstrate
computer skills. (3-0) R

ACN 7343 (HCS 7343) Neuropharmacology (3 semester hours) Biology of neurotransmission in the central
nervous system. Includes ionotrophic 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/HCS 6340 or ACN/HCS 6346. (3-0) T
**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 7v71** Industry Internship (1-6 semester hours) May be repeated for credit. This course may only be taken pass/fail. ([1-6]-0) S

**ACN 7v72** Research Internship (1-6 semester hours) May be repeated for credit. This course may only be taken pass/fail. ([1-6]-0) S