BRAIN AND COGNITIVE SCIENCES

Course 9, 6-9

Department Contact

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Departmental Description

Students majoring in brain and cognitive sciences aspire to answer fundamental questions concerning intelligent processes, brain organization, and the neural and computational processes that underlie behavior. MIT's department focuses on four themes: molecular and cellular neuroscience, systems neuroscience, cognitive science, and computation. Several members of the department's faculty are affiliated with two major research centers: the Picower Institute for Learning and Memory and the McGovern Institute for Brain Research. Individuals majoring in brain and cognitive sciences will often pursue careers in the sciences, computer fields, health professions, law, and education.

Description of Course 9

The undergraduate program begins with foundational courses in a broad range of subjects, including computer science and programming, neural computation, and probability and statistics. The second and third tiers allow for increased focus and deeper exploration through course offerings in areas such as cellular neurobiology, psycholinguistics, and genetic engineering.

Description of Course 6-9

The Course 6-9 curriculum provides flexibility to accommodate students with a wide diversity of interests in this area. This includes topics from neuroengineering (reverse engineering circuits in the brain and developing brain interfaces) to biologically-inspired approaches to artificial intelligence.

Introductory Classes

* Indicates a class for course 9

^ Indicates a class for course 6-9

9.00* **Introduction to Psychological Science**
A survey of the scientific study of human nature, including how the mind works, and how the brain supports the mind. Topics include the mental and neural bases of perception, emotion, learning, memory, cognition, child development, personality, psychopathology, and social interaction. Consideration of how such knowledge relates to debates about nature and nurture, free will, consciousness, human differences, self, and society.

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9.01*^ **Introduction to Neuroscience**
Introduction to the mammalian nervous system, with emphasis on the structure and function of the human brain. Topics include the function of nerve cells, sensory systems, control of movement, learning and memory, and diseases of the brain.

9.07^ **Statistics for Brain and Cognitive Science**
Provides students with the basic tools for analyzing experimental data, properly interpreting statistical reports in the literature, and reasoning under uncertain situations. Topics organized around three key theories: probability, statistical, and the linear model. Probability theory covers axioms of probability, discrete and continuous probability models, law of large numbers, and the Central Limit Theorem. Statistical theory covers estimation, likelihood theory, Bayesian methods, bootstrap and other Monte Carlo methods, as well as hypothesis testing, confidence intervals, elementary design of experiments principles and goodness-of-fit. The linear model theory covers the simple regression model and the analysis of variance. Places equal emphasis on theory, data analyses, and simulation studies.

9.40* **Introduction to Neural Computation**
Introduces quantitative approaches to understanding brain and cognitive functions. Topics include mathematical description of neurons, the response of neurons to sensory stimuli, simple neuronal networks, statistical inference and decision making. Also covers foundational quantitative tools of data analysis in neuroscience: correlation, convolution, spectral analysis, principal components analysis. Mathematical concepts include simple differential equations and linear algebra.

6.100A^ **Introduction to Computer Science Programming in Python**
Introduction to computer science and programming for students with little or no programming experience. Students develop skills to program and use computational techniques to solve problems. Topics include the notion of computation, Python, simple algorithms and data structures, testing and debugging, and algorithmic complexity.

Course 9-Friendly UROP Areas

- McGovern Institute for Brain Research
- The Picower Institute for Learning and Memory
- Center for Brains, Minds, and Machines
- Harvard-MIT Health Sciences and Technology (HST)
- Stanley Center for Psychiatric Research at Broad Institute

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Career Industry Examples

Pharmaceutical Scientist	Senior Research Scientist	Project Manager
Data Scientist	Research Technician	Senior Business Analyst
Clinical Research Coordinator	Management Consultant	Analyst
Computational Modeling and Machine Intelligence Scientist	Software Developer	Computational Neuroscientist

Sample Employers

Gavornik Lab Navigant

Athenahealth Google Shamanuti Skincare

5am Solutions Goldin Associates Northeast Dermatology Associates

Brain Power LLC Journal of Medical Insights Teach for America