Specialization in Computational Neuroscience, in CS Ph.D.

4 CS core classes from list, each from a different area, with at least a B, and average GPA of 3.5:

	Area	Core Courses
1	Algorithms and data structures	CS-260 (old ICS-260)
2	Computer architecture, design	CS-250A (old ICS-241A)
3	System software	CS-241 (old ICS-211)
4	Artificial intelligence	CS-271 (old ICS-270A)
5	Networks and distributed systems	CS-232, CS-230 (old ICS 243A,242)
6	Database systems	CS-222 (old ICS-214A)
7	Principles of scientific computing	CS-206, CS-211A (old ICS 282,285)

Plus:
ICS-200 (formerly ICS-202), CS-282 (formerly ICS-276B) , CS-283 (formerly ICS-276C)

Plus electives:
three classes chosen by student and approved by committee, from the following set:
CS: CS-221 (old ICS-207), CS-273A (old ICS-273A), CS-274A (old ICS-274A), CS-275 (old ICS-275A), CS-276 (old ICS-275B), CS-284A (old ICS-277A), CS-284B (old ICS-277B), CS-284C (old ICS-277C), CS-285 (old ICS-278), CS-299 (old ICS-299)
Cognitive Science (School of Soc Sci): 203A,B,C, 235M, 236, 254; 260A,B, 265A,B,C
Neurobiology & Behavior (School of Bio Sci): 208A,B, 239, 250, 253, 259
Anatomy & Neurobiology (Med School): 202B; 206B
or substitute electives approved by committee

Notes:
In CS, 221=Information Retrieval; 273A=ML; 274A=Probability; 275=Constraint Networks; 276=Belief Networks; 284A=Algorithms for Molec Bio; 284B=Probabilistic Modeling of Biol Data; 284C=Computational Systems Bio; 285=DataMining; 282=Models of the brain; 283=Cognitive & Computational Neurosci, 299=directed research, 298 = thesis research.
In Cog Sci, 203A=discrete math & probability; 203B=statistics; 203C=Experimental design; 235M=Matlab programming; 236=multivariate time series analysis; 254=human information processing; 260AB=Cognitive neuroscience; 265ABC= fMRI;
In Neuro&Beh, 208AB=Systems neuroscience; 239=functional imaging; 250=Basal ganglia; 253=sensory cortex; 259=Cortical plasticity;
In Anat&Neuro, 202B=Introductory neuroanatomy; 206B=Spec topics neuroanat

Affiliated faculty:
Pierre Baldi, Richard Granger, Eric Mjolsness, Dennis Kibler, Padhraic Smyth, Max Welling

Sample curricula, for illustrative purposes only:
Y1: CS 200, CS 260, CS 271, CS 282, CS 283, CS 222, CS 206
Y2: CS 232, CS 274A, CS 285, Cog Sci 260A, 260B; CS 299
Y3: CS 299; Neuro 208A, 208B, 250, 253; Anat 202B
Y4: CS 298
or:
Y1: CS200, CS 260, CS 271, CS 282, CS 283, CS 299
Y2: CS 206, CS 250A, CS 274A, Cog Sci 260A, 260B, CS 299
Y3: CS 299; Neuro 208A, 208B; Cog Sci 265A, 265B, 265C
Y4: CS 298

References for computational neuroscience specialization in CS Ph.D.

KSJ Ch 1,2
Introduction to neurobiology
Neurons, synapses, axons, dendrites
Local circuits

KSJ Ch 8,9,10
Intro to neurophysiology
Electrical and chemical transmission
Excitation,inhibition,modulation

St Ch 8,9, Sw
Intro to neuroanatomy
Telencephalic circuits
Allometry

Sh Ch 8-12
Paleocortex, neocortex
Basal ganglia
Thalamocortical loops
Corticostriatal loops

Mc Ch 1-7, Haykin, Kanerva
Intro to Neural Networks
Delta rule
Extended delta rule
Backpropagation
Competitive networks
Recurrent networks

RM Ch 9-11; Hy Ch 6-7; Dia Ch 2; Kahre
Principal components analysis
Independent components
Statistical and vector analyses
Linear algebra
Information theory

KSJ: Kandel, Schwartz and Jessell. Principles of Neural Science, McGraw-Hill, 2000.
St: Striedter. Principles of Brain Evolution, Sinauer, 2004.
Mc: McLeod, Plunkett, Rolls. Intro to Connectionist Modeling
Sh: Shepherd. Synaptic Organization of the Brain
RM: Rumelhart, McClelland. Parallel Distributed Processing
Dia: Diamantaras, Kung, Principal Component Newtorks, Wiley, 1996.
Sw: Swanson. Brain Architectures: Understanding the basic plan. Oxford U Press, 2003.
Hy: Hyvarinen, Karhunen, Oja: Independent Components Analysis. Wiley, 2001.
Haykin: Neural Networks, Prentice-Hall, 1999.
Kanerva: Sparse Distributed Memory, MIT Press, 1990.
Kahre: The mathematical theory of information, Kluwer, 2002.