

The Computational Brain

BIO 4583

<u>Instructor</u>	David B. Jaffe, Ph.D.
<u>Office</u>	SB 3.01.25
<u>Office hours</u>	TR 3-4 PM or by appointment
<u>Email</u>	david.jaffe@utsa.edu
<u>Phone</u>	210 458 5843
<u>Webct</u>	http://webct.utsa.edu
<u>Text:</u>	The Computational Brain P. Churchland and T. Sejnowski MIT Press
<u>Prerequisites:</u>	BIO 3433 – Neurobiology or equivalent
<u>Grading:</u>	6 regular exams - Lowest grade dropped (100%) No final exam

No make-up exams and no extra credit available for this course.

Summary:

The brain responds to the environment by integrating sensory information and calculating motor output. How then do groups of neurons allow the organism to sense the world around it, decide, and respond appropriately? What are the underlying mechanisms whereby networks of neurons represent and reproduce information during learning and memory retrieval?

The Computational Brain is aimed at introducing the undergraduate student into the emerging field of computational neuroscience. The course begins with an overview of the nervous system with respect to computations, a primer on artificial neural networks, how they are constructed, their practical limitations, and how they relate to physiological neural networks. Next, synaptic plasticity and contemporary models of learning and memory are to be discussed. Finally, the course examines computation within a number of sensory systems, concepts of sensorimotor integration, and motor programs and output.

Tentative Schedule (All Exam dates are **NOT** tentative)

	Date	Topic	Chapter
January	12	Intro and overview of the course	
	14	Top down computational view	2
	16	of the nervous system	2
	19	<i>MLK Holiday</i>	
	21	Overview of the nervous system (Cont'd)	2
	23	Exam 1	
	26	Hebbian synapses	5
February	28	Synaptic plasticity: LTPs	5
	30	STPD	5
	2	Intrinsic plasticity	5
	4	Neurogenesis and morphogenesis	
	6	Exam 2	
	9	Linear Associators	3
	11	Neural networks primer: perceptrons	3
	13	Hopfield nets and Boltzmann machines	3
	16	Recurrent networks	3
	18	NetTalk et al.	3
	20	Exam 3	
	23	LeechNet	6/Lockery Review
	25	LeechNet	6/Lockery Review
March	27	Vestibular Occular Reflex (VOR)	6
	2	Vestibular Occular Reflex (VOR)	6
	4	Vestibular Occular Reflex (VOR)	6
	6	Exam 4	
	9-13	<i>Spring Break</i>	
	16	Overview of the visual system	4
	18	Retina	4
	20	Representation	4
	23	Time	4
	25	The retina revisited	4
April	27	Exam 5	
	30	Survey	
	1	Sound localization	Carr Review
	3	Sound localization	Carr Review
	6	Olfactory computation	Laurent Review
	8	Olfactory computation	Laurent Review
	10	Place cells	McNaughton Review
	20	Grid cells	Moser Review
	22	Exam 6	