

MCB 161: Circuit, Systems & Behavioral Neuroscience. (MWF lecture + required discussion, 4 units)

Required textbook: Kandel et al., Principles of Neural Science, 5<sup>th</sup> Ed. One chapter will be assigned for each lecture.

Grading: 25% Midterm 1, 25% Midterm 2, 50% Final Exam.

1	Introduction. Anatomy of CNS and PNS. Goals of systems neuroscience.
	<b>Vision</b>
2	Retina, receptive fields, computation of local contrast
3	Retinal computation of motion
4	Central vision to V1: local feature detectors
5	Extrastriate cortex: object and face cells, motion
6	Quantitative approaches to vision: reverse correlation, LNP models, population coding.
	<b>Somatic sensation</b>
7	Touch: Pathways, maps, place coding and texture/form coding in S1
8	Pain and Temperature: Pathways and coding
9	Common circuit motifs and computation. Includes lateral inhibition, recurrent excitation, feedforward inhibition.
10	Canonical cortical circuits
	<b>Chemical senses</b>
11	Taste & olfactory pathways: circuits for innate vs. learned behavior
12	Olfaction: gain control
13	Olfaction: pheromones
	<b>MIDTERM 1</b>
	<b>Auditory system</b>
14	Cochlea, hair cells, and auditory transduction
15	Molecular mechanisms for mechanotransduction
16	Sound localization: circuits and computation
17	Central auditory processing
18	Bat echolocation
19	Vestibular system
	<b>Motor Systems</b>
20	Spinal cord, motor neurons, control of muscle force
21	Voluntary control of movement: M1 and motor pathways
22	Central Pattern Generators
23	Basal Ganglia. Parkinson's and Huntington's Disease.
24	Cerebellum, coordination and motor learning.
25	Hypothalamus and autonomic nervous system
	<b>MIDTERM 2</b>
	<b>Neurobiology of Learning</b>
26	Memory systems of the brain. Working memory. Cortical plasticity and

	critical periods
27	Cortical plasticity II (mechanisms, restoring plasticity in adults)
28	Hippocampal learning I (space)
29	Hippocampal learning II (memory)
30	Sensorimotor learning: Bird song learning I
31	Sensorimotor learning: Bird song learning II
	<b>Higher functions</b>
32	Emotion and mood: dopamine and serotonin
33	Amygdala and fear
34	Reward and drugs of abuse
35	Sleep and brain state
36	Higher functions: value, decision, attention
37	Brain Evolution
38	Review, principles, challenges