Neuroscience PhD Program Course Curriculum and Course List

Updated August 2021

COURSE REQUIREMENTS

1. Foundational courses. Students must take three foundational courses across three broad areas: (A) Cellular, Molecular, and Developmental Neuroscience; (B) Circuits, Systems, and Computational Neuroscience; and (C) Cognition, Brain, and Behavior. Students can either take one graduate level course from each category, or three graduate level courses chosen from two areas plus a selected advanced undergraduate course from the third area. Foundation courses are listed below, and they must be three or more units. They are taken in Years 1-2.

2. Additional elective courses. In addition, students must take one elective course. This can be either a graduate-level seminar or a graduate-level lecture course and can be 1 unit or more. This is typically taken in Years 3 or 4. The elective can be chosen from any relevant graduate-level class in any department. Commonly chosen electives are listed below.

3. Training in statistics and quantitative methods. All students must complete a one-semester course on statistical analysis or quantitative methods. This course is chosen from a large number of appropriate classes at Berkeley and can be completed at any time prior to the semester of graduation. Applied Statistics for Neuroscience (Neurosc 299) can fulfill this requirement. Students with prior appropriate coursework or whose thesis research uses substantial quantitative methods can use that prior experience to fulfill this requirement, subject to approval by the Head Graduate Adviser.

Students must also take the required Neurosc 290A, 290B, 291, and 294).

Neuroscience-Related Course List

This course list is accurate as of August 2020. While we try to keep it up to date, courses are often added, dropped, or changed by departments. Please check https://classes.berkeley.edu/ for complete course listings for the upcoming semester.

Courses that Satisfy Foundational Requirements

(R) = Recommended intensive survey courses. These are not required but are suitable for a comprehensive survey of a field within Neuroscience.
(U) = Undergraduate class that will only satisfy distribution requirement if student takes three graduate classes in the other two areas.

CATEGORY A. CELLULAR, MOLECULAR AND DEVELOPMENTAL NEUROSCIENCE

(U) MCB 160. Cellular and molecular neurobiology. Comprehensive introductory survey of cellular and molecular neuroscience, including cellular neurophysiology, ion channel function, synaptic function and plasticity, sensory transduction, and brain development. Includes introduction to molecular basis of neurological disease. Analysis from the levels of molecules to cells to simple circuits. Every Fall. Bateup, Bautista, Isacoff.

(U) MCB 166. Biophysical neurobiology. Electrochemistry and ion transport phenomena, equivalent circuits, excitability, action potentials, voltage clamp and the Hodgkin-Huxley model. Biophysical properties of ion channels. Statistical and electrophysiological models of synaptic transmission, Quantitative models for dendritic structure and neuronal morphogenesis. Sensory transduction, cellular networks as computational devices, information processing and transfer. Every Fall. Elul, Alan Miller.

MCB 230. Advanced cell biology. Every Spring. Hockemeyer, Rape, Bilder.

(R) MCB C261/NEUROSC C261. Molecular and Cellular Neuroscience. This course covers molecular and cellular aspects of cellular excitability (including membrane potential, action potential generation/propagation, and ion channel structure and function), synaptic transmission and plasticity, and sensory systems. Primary reading material will be research papers. We will provide references to textbook chapters for background and review. This will be an interactive course in which you will be expected to be an active participant. Every Fall. Brohawn, Kramer

MCB 231: Advanced Stem Cell and Developmental Biology. Principles of animal development in vertebrates and invertebrates. Induction, localization, patterning mutants, axis formation, regional gene expression, and cell interactions. 3 hrs lecture plus 1 hr weekly reading/discussion section. Every Spring. Weisblat, Harland, Roelink.

MCB 240. Advanced Genetic Analysis. Genetic analysis as applied to eukaryotic organisms, including yeast, nematodes, Drosophila, mice and humans. Isolation and analysis of mutations, gene mapping, suppressor analysis, chromosome structure, control of gene expression, and developmental genetics. Every Spring.

CATEGORY B. CIRCUITS, SYSTEMS, AND COMPUTATIONAL NEUROSCIENCE COURSES

(R) MCB C262/NEUROSC C262: Advanced Topics in Systems Neuroscience. Survey of current research problems in circuit- and systems-level neuroscience. Sensory and motor systems, circuit-level computation, memory systems. Three hours per week, mixed lecture and seminar format. Every Spring. Yang Dan, Feldman.

(U) IB 139: The Neurobiology of Stress. This course adopts a broad-based approach to explore the concepts of stress, health, and disease, with a particular focus on current primary literature. The course will cover multiple dimensions in the study of stress, which employ genetic, epigenetic, molecular, cellular, physiological, and cognitive approaches, especially in the context of endocrine and neuroscience research. We will analyze the individual response to stress, how genetic and environmental factors play a role in it, how it translates to physiological and mental health and well-being vs. pathological conditions, and put that in a public health perspective. Every Fall. Kaufer.

MCB 236. Advanced Mammalian Physiology. Principles of mammalian (primarily human) physiology emphasizing physical, chemical, molecular, and cellular bases of functional biology. Covers general cellular physiology and elementary neurophysiology; cell and endocrine regulation; autonomic nervous system regulation; skeletal, smooth, and cardiac muscle; cardiovascular physiology; respiration; renal physiology; gastrointestinal physiology. Three hours of lecture and two hours of discussion per week. Every Fall. Lumpkin, Bautista, and Lishko.

NEUROSC 290: Computing with high-dimensional vectors. This seminar will introduce an emerging computing framework that is based on using high-dimensional vectors to represent and manipulate symbols, data structures, and functions. This framework, commonly known as both Hyperdimensional Computing or Vector Symbolic Architectures (VSAs), originated at the intersection of symbolic and connectionist approaches to Artificial Intelligence but has turned into a research area of its own. In recent years, there have been an increasing number of applications in perception, analogical reasoning, models of memory, and language processing. These applications in turn can help us to understand how these functions are performed by distributed networks of neurons in the brain. The purpose of this seminar is to convey this framework and recent developments to students across a wide variety of disciplines spanning neuroscience, computer science, electrical engineering, mathematics, and cognitive science. Olshausen. 3 units. Fall 2021.

Psychology 210B. Biological Bases of Behavior. Kriegsfeld. Spring of odd-numbered years (but may vary!!) Meets 3 hours per week, mixed lecture and seminar format.

Vision Science 260C: Introduction to Visual Neuroscience. This course provides an overview of the neuroscience of vision, spanning the entire neural pathway from retinal neurobiology to cortical processing of visual signals. The class will comprise a combination of lectures and active learning by the students in the form of a project, to be presented at the end of the semester. Silver, Olshausen, Puthussery, and Taylor. 3 units.

(R) Vision Science 265: Neural Computation. Introduction to the theory of neural computation, including the major theoretical frameworks and models used in neuroscience and psychology. Provides hands-on experience in using these models. Fall of even-numbered years. Olshausen.

CATEGORY C. COGNITION, BRAIN, AND BEHAVIOR COURSES

(U) Psychology 117: Human Neuropsychology. Advanced undergraduate course. Psychological approaches to neuropsychiatric disease and disability, including mental disorders, behavior changes following human brain injury and disease, and mental subnormality. Nervous system models and basic research are considered. Every Spring. Knight.

(U) Psychology C127: Cognitive Neuroscience. Advanced undergraduate course. The neurological basis of cognition, including perception, attention, memory, language, motor control, executive control, and emotion. Findings from brain-injured patients, neurophysiological research in animals, and normal cognitive processes in humans studied with functional Magnetic Resonance Imaging (fMRI), electroencephalography (EEG), and transcranial magnetic stimulation (TMS). Every Fall. Ivry.

(R) Psychology 210A: Cognitive Neuroscience. Proseminar surveying cognitive neuroscience. Every Spring. Ivry, Wallis, Gallant. Neuro and Psych graduate students are given equal priority for enrolling in this class.

Psychology 240: Proseminar on Biological, Cognitive, and Language Development. Survey Survey of the biology of the nervous system and behavior; the cellular interactions during development in animals and humans, including neurogenesis, synaptogenesis, cell death and synapse elimination; and the genetic and experiential determinants of neural development. Exploration of the origins and development of knowledge from infancy through childhood; the development of children's concepts across multiple domains including physics, biology, math, and psychology. Survey of facts and theories of language acquisition; focus on what learners acquire and the role of input in the process; review of phonology, syntax, and morphology. Every Spring. Bunge, Kidd

Public Health C217D: Biological and Public Health Aspects of Alzheimer's Disease. Survey of Alzheimer's disease (AD) from a biological and public health perspective. Includes clinical and neuropathological features, genetics and molecular biology, epidemiology, diagnosis, treatment and ethics of AD. Students read original research papers in medicine, neuroscience, and epidemiology. 3 hours per week. Seminar format. Every Spring. Jagust.

Public Health 290: Neuroepidemiology. Diseases of the nervous system represent unique challenges in the investigation of factors that affect population health. These disorders may be difficult to detect, and neurological outcomes can be resistant to quantitative measurement. Furthermore, neurological diseases are common, and many are associated with advancing age, representing a growing burden. Some neurological diseases like autism and chronic traumatic encephalopathy also pose major societal and ethical problems and controversies. A relative lack of easily deployed biomarkers, inadequate diagnostic criteria, and complex pathophysiology and etiological pathways impede research and public understanding. However, within the past several decades major advances in conceptual approaches to these disorders as well as new methods and tools for studying them have slowly begun to reveal insights into risks and resistance to a number of such disorders. This course will examine these issues and others in order to provide students with an insight into the current understanding of the epidemiology of neurological disorders. Spring. Jagust. 3 units.

Vision Science 262. Visual Cognitive Neuroscience. An overview of visual cognitive neuroscience, drawing from neuroanatomy, neurophysiology in humans and animal models, psychophysics, neuroimaging, neuropharmacology, neuropsychology, and computational models of vision and cognition. Topics include basic anatomy and physiology of the mammalian visual system, motion perception and processing, depth perception and representation of visual space, brightness and color, object and face recognition, visual attention, developmental and adult plasticity, perceptual learning, multisensory integration, and visual awareness. Fall, every 2-3 years. Silver. 3 units.

Courses that are Commonly Chosen as Electives

Electives can be chosen from any relevant graduate-level class in any department, including both seminars and lectures courses. Commonly chosen electives are listed below. Some of these electives may satisfy the statistics/quantitative analysis course requirement. You can also take any course in the Foundational Classes section as an elective. Consult your thesis adviser and thesis committee to select the most appropriate classes for you.

NEURO-RELATED SEMINAR COURSES

Seminar courses are small, highly interactive 1- and 2-unit courses that focus on specific current research topics, Topics change each semester, so check https://classes.berkeley.edu/ and the program's "Neuroscience-Related Courses" list (updated each semester).

MCB 290. Graduate Seminar. Selected research topics in molecular and cell biology. Past topics have included: molecular and cellular mechanisms of touch and pain; neural correlates of behavior; neurobiology of sleep; gene transfer to the nervous system; motor control; from synaptic pharmacology to consciousness; topics in synaptic pharmacology; cerebral cortex; topics in systems neuroscience.

Psychology 290: Graduate Seminar. Selected research topics in cognition, brain and behavior. Past topics have included: Neuronal mechanisms of learning and memory, data pre-processing for fMRI, neural bases of circadian rhythms; sleep; advanced topics in vision research, critical periods and plasticity, computational models of cognition.

Vision Science 298: Graduate Seminar. Past topics have included: advanced topics in color vision; statistics and data modeling; advanced topics in neural computation.

EECS 290: Advanced Topics in Electrical Engineering. Current topics of research interest in electrical engineering.

Linguistics 290: Special topics in Linguistics. This series of seminars covers advanced topics in syntax, semantics, pragmatics, phonology, psycholinguistics, and more.

NEUROSCIENCE

(R) NEUROSC 299: Applied statistics for neuroscience. A cooperative course covering statistical methods commonly used in neuroscience. Topics include a wide variety of parametric statistics, non-parametric statistics, and modeling. Students will learn implementations in R and Matlab. Instructor of record: Feldman. But primary instruction is cooperative among the students, facilitated by a GSI. 1-3 units. Every Spring.

PSYCHOLOGY

(U) Psychology 111. Human neuroanatomy. This course covers the anatomical composition of the human brain with particular emphasis on modern understanding regarding the micro- and macroanatomy of the cerebral cortex and the underlying white matter. The course is designed for students who intend to continue their postgraduate education toward a masters, doctorate, or medical degree in a field involving the study of the human brain. Weiner. Every Spring.

(U) Psychology 115. Introduction to brain imaging analysis methods. An introduction to brain imaging analysis methods with emphasis on functional magnetic resonance imaging (fMRI) of the human brain. Topics include: Basic MR physics of fMRI signals; linearity of the fMRI signal; time versus space resolution trade offs; noise in neuroimaging; correlation analysis; visualization methods; cortical reconstruction, inflation, and flattening; reverse engineering; relationship between brain activation and cognitive state; multi-voxel pattern analyses; fMRI-adaptation. Weiner. 3 units. Every Fall.

(U) Psychology 125. The developing brain. What are the changes in brain structure and function that underlie improvements in cognitive abilities over childhood and adolescence? Or, coming from a different perspective, what insights can we gain regarding the neural basis of cognition by examining how the brain develops? And how are such findings relevant for medicine, education, and the law? The cutting-edge new field of developmental cognitive neuroscience is beginning to address these and other questions. This course will constitute an overview of current research and methods in this field, focusing on both typically and atypically developing children and adolescents. There is no textbook for this course; all readings will be primary sources (e.g., journal articles). Bunge. Fall of even-numbered years.

Psychology 208. Methods in computational modeling for cognitive science. The objective of this course is to provide students in cognitive science, psychology, and neuroscience with the skills to use computational techniques to model their empirical data. Computational modeling is an essential method of research in these fields. It can help to provide insight into how people solve the challenging problems posed by everyday life. Computational models can relate behavior to individual differences measures or brain signals, going beyond what is possible with model-independent techniques. The course will cover all the steps needed to fit computational models to data in a rigorous way. It will provide both theoretical knowledge about the process of computational modeling, as well as hands-on experience in applying this process. Students will do a computational modeling project, either with their own data set or one provided by the course. In-class examples will focus on reinforcement learning and decision theory models, but the skills are more widely applicable. Collins. Fall.

(U) Psychology 102. Methods for research in psychological sciences. Lecture and computer lab course on advanced data analysis techniques used by researchers in psychology. The course will cover programming techniques in R and data analysis methods that include modeling, multivariate statistics, and data reduction and visualization techniques. The following topics will be covered: generalized linear model (includes logistic regression), discriminant analysis (includes multivariate ANOVA), principal component analysis, and factor analysis. Perez-Ceballos. 3 units. Every Fall.

Psychology 205A. Probability theory. The course is designed as a sequence with Statistics C205B/Mathematics C218B with the following combined syllabus. Measure theory concepts needed for probability. Expection, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale convergence theorems. Markov chains. Stationary processes. Brownian motion. Ganguly. 3 units. Every Fall.

Psychology 205B. Data analysis. This course serves both as a refresher for undergraduate statistics and as a preparation for more advanced courses. This course will cover fundamental principles of statistical thinking including probability theory, distributions, modeling, parameter fitting, error estimation, statistical significance and cross-validation. In addition, the course will cover all statistical tests that are part of the generalized mixed effect models: n-way analysis of variance (ANOVA), multiple regression, analysis of covariance, logistic regression, between subjects, within subjects, mixed designs and designs with random factors. Students will also be introduced to statistical programming using the computer language R. Theunissen. 3 units. Every Spring.

STATISTICS

(U) Stat 150. Stochastic Processes. Random walks, discrete time Markov chains, Poisson processes. Further topics such as: continuous time Markov chains, queueing theory, point processes, branching processes, renewal theory, stationary processes, Gaussian processes. Typically taught in Spring. Priority goes to Stats majors, and class fills up early.

(U) Stat 151A-151B. Linear Modeling: Theory and Applications. A coordinated treatment of linear and generalized linear models and their application. Linear regression, analysis of variance and covariance, random effects, design and analysis of experiments, quality improvement, log-linear models for discrete multivariate data, model selection, robustness, graphical techniques, productive use of computers, in-depth case studies. 151A every Fall, 151B every Spring, B can be taken without A. Priority goes to Stats majors, and class fills up early.

(U) Stat 153. Introduction to Time Series. An introduction to time series analysis in the time domain and spectral domain. Topics include estimation of trends and seasonal effects, autoregressive moving average models, forecasting, indicators, harmonic analysis, spectra. Every Fall and Spring. Priority goes to Stats majors, and class fills up early.

(U) Stat 158. The Design and Analysis of Experiments. This course covers planning, conducting, and analyzing statistically designed experiments with an emphasis on hands-on experience. Standard designs studied include factorial designs, block designs, latin square designs, and repeated measures designs. Other topics covered include the principles of design, randomization, ANOVA, response surface methodology, and computer experiments. Wooseok Ha. Spring.

Stat C241A. Statistical Learning Theory. Classification regression, clustering, dimensionality, reduction, and density estimation. Mixture models, hierarchical models, factorial models, hidden Markov, and state space models, Markov properties, and recursive algorithms for general probabilistic inference nonparametric methods including decision trees, kernel methods, neural networks, and wavelets. Ensemble methods. Also listed as Computer Science C281A. Every Fall. Fills quickly, register as early as possible.

Stat C241B. Advanced Topics in Learning and Decision Making. Graphical models and approximate inference algorithms. Markov chain Monte Carlo, mean field and probability propagation methods. Model selection and stochastic realization. Bayesian information theoretic and structural risk minimization approaches. Markov decision processes and partially observable Markov decision processes. Reinforcement learning. Also listed as Computer Science C281B. Offered most Spring semesters.

Stat 248. Analysis of Time Series. Frequency-based techniques of time series analysis, spectral theory, linear filters, estimation of spectra, estimation of transfer functions, design, system identification, vector-valued stationary processes, model building. Guntuboyina. 4 units. Spring.

Mathematics

(U) Math 118. Fourier analysis, wavelets, and signal processing. Introduction to signal processing including Fourier analysis and wavelets. Theory, algorithms, and applications to one-dimensional signals and multidimensional images. Generally offered once a year, but semester varies. Holtz. 4 units

Computer Science and Programming

CS C280. Computer Vision. Paradigms for computational vision. Relation to human visual perception. Mathematical techniques for representing and reasoning, with curves, surfaces and volumes. Illumination and reflectance models. Color perception. Image segmentation and aggregation. Methods for bottom-up three-dimensional shape recovery: line drawing analysis, stereo, shading, motion, texture. Use of object models for prediction and recognition. Also listed as Vision Science C280. Spring. Malik, Stella Yu. 3 units.

AY 250. Python Computing for Science. An undergraduate/graduate seminar course in Python, "the de facto superglue language for modern scientific computing". To be eligible, you must complete the Python Boot Camp – 3 full days in late August. Josh Bloom. The class assumes familiarity with basic programming concepts like loops and recursion. One 3-hr meeting per week. Weekly coding assignments and a final project in your own area.

Electrical Engineering

(U) EE 120. Signals and Systems. Continuous and discrete-time transform analysis techniques with illustrative applications. Linear and time-invariant systems, transfer functions. Fourier series, Fourier transform, Laplace and Z-transforms. Sampling and reconstruction. Solution of differential and difference equations using transforms. Frequency response, Bode plots, stability analysis. Illustrated by analysis of communication systems and feedback control systems. Roychowdhury. 4 units. Every Fall and Spring.

(U) EE 123. Digital Signal Processing. Discrete time signals and systems: Fourier and Z transforms, DFT, 2-dimensional versions. Digital signal processing topics: flow graphs, realizations, FFT, chirp-Z algorithms, Hilbert transform relations, quantization effects, linear prediction. Digital filter design methods: windowing, frequency sampling, S-to-Z methods, frequency-transformation methods, optimization methods, 2-dimensional filter design. Lustig. 4 units. Every Spring.

(U) EE 126. Probability and Random Processes. This course covers the fundamentals of probability and random processes useful in fields such as networks, communication, signal processing, and control. Sample space, events, probability law. Conditional probability. Independence. Random variables. Distribution, density functions. Random vectors. Law of large numbers. Central limit theorem. Estimation and detection. Markov chains. Ramanchandran. 4 units. Every Fall and Spring.

EE 221A: Linear System Theory. Concepts and properties of linear systems. Includes statespace and input-output representation, controllability, observability, minimality, state and outputfeedback, stability, observers, characteristic polynomial, Nyquist test. Tomlin. 4 units. Fall and Spring.

EECS 225A. Statistical Signal Processing. This course connects classical statistical signal processing (Hilbert space filtering theory by Wiener and Kolmogorov, state space model, signal representation, detection and estimation, adaptive filtering) with modern statistical and machine learning theory and applications. It focuses on concrete algorithms and combines principled theoretical thinking with real applications. Jiao. Fall. 3 units.

EE 225B. Digital Image Processing. 2-D sequences and systems, separable systems, projection slice thm, reconstruction from projections and partial Fourier information, Z transform, different equations, recursive computability, 2D DFT and FFT, 2D FIR filter design; human eye, perception, psychophysical vision properties, photometry and colorimetry, optics and image systems; image enhancement, image restoration, geometrical image modification, morphological image processing, halftoning, edge detection, image compression: scalar quantization, lossless coding, huffman coding, arithmetic coding dictionary techniques, waveform and transform coding DCT, KLT, Hadammard, multiresolution coding pyramid, subband coding, Fractal coding, vector quantization, motion estimation and compensation, standards: JPEG, MPEG, H.xxx, pre- and post-processing, scalable image and video coding, image and video communication over noisy channels. Zakhor. 3 units. Fall.

EE 226A. Random Processes in Systems. Probability, random variables and their convergence, random processes. Filtering of wide sense stationary processes, spectral density, Wiener and Kalman filters. Markov processes and Markov chains. Gaussian, birth and death, Poisson and shot noise processes. Elementary queuing analysis. Detection of signals in Gaussian and shot noise, elementary parameter estimation. Courtade. 4 units. Fall.

EE 227A. Convex optimization and approximation. Convex optimization as a systematic approximation tool for hard decision problems. Approximations of combinatorial optimization problems, of stochastic programming problems, of robust optimization problems (i.e., with optimization problems with unknown but bounded data), of optimal control problems. Quality estimates of the resulting approximation. Applications in robust engineering design, statistics, control, finance, data mining, operations research. Wainwright. 3 units. Spring.

EE 229. Information Theory and Coding. Fundamental bounds of Shannon theory and their application. Source and channel coding theorems. Galois field theory, algebraic error-correction codes. Private and public-key cryptographic systems. Ramchandran. 3 units. Spring.

EE 290. Advanced brain imaging methods. The course will introduce major brain imaging modalities and image analysis techniques. We will cover the systems, image reconstruction techniques and applications of several imaging modalities including magnetic resonance imaging (MRI), EEG/MEG, computed tomography (CT), positron emission tomography (PET), single photon emission computed tomography (SPECT) and optical tomography. The major emphasis will be on MRI due to its non-invasiveness, unparalleled soft tissue contrast and wide applicability in both medicine and neuroscience. We will discuss in depth advanced structural and functional MRI acquisition and analysis techniques, particularly, diffusion MRI and blood oxygen level dependent (BOLD) fMRI. The course will consist of lectures, seminars, hands-on experiments, homework. Teams will be formed to explore open research questions and engineering projects. Liu. 1-4 units. Spring

BIOENGINEERING

BIO ENG C265/EE 225E: Principles of Magnetic Resonance Imaging. [3 units]. Fundamentals of MRI including signal-to-noise ratio, resolution, and contrast as dictated by physics, pulse sequences, and instrumentation. Image reconstruction via 2D FFT methods. Fast imaging reconstruction via convolution-back projection and gridding methods and FFTs. Hardware for modern MRI scanners including main field, gradient fields, RF coils, and shim supplies. Software for MRI including imaging methods such as 2D FT, RARE, SSFP, spiral and echo planar imaging methods. The modern MRI "toolbox" will be introduced, including selecting a slice or volume, fast imaging methods to avoid image artifacts due to physiologic motion, and methods for functional imaging. Fall, Spring.

BIO ENG 231: Introduction to computational molecular and cellular biology. This class teaches basic bioinformatics and computational biology, with an emphasis on alignment, phylogeny, and ontologies. Supporting foundational topics are also reviewed with an emphasis on bioinformatics topics, including basic molecular biology, probability theory, and information theory. Holmes. 4 units. Fall.

VISION SCIENCE

Vision Science 260A. Optical and Neural Limits to Vision. This course will provide an overview of the early stage limits to human vision, from the eye's optics to sampling and processing in the retina. Students will learn basic optical properties of the eye as well as objective and subjective techniques on how to measure limits of human vision. The class will comprise a combination of lectures and active learning by the students in the form of a project, to be presented at the end of the semester. Fall. Roorda. 3 units.

Vision Science 260D. Seeing in Time, Space, and Color. This course will provide an overview of how we see in time (temporal signal processing, eye motion, motion detection), space (stereo vision, depth perception), and color as well as the anatomical and physiological factors that facilitate these capabilities. The course will be series of didactic lectures. Fall. Banks. 3 units.

PUBLIC HEALTH

Public Health 245. Introduction to Multivariate Statistics. The following topics are discussed in the context of biomedical and biological application: multiple regression, loglinear models, discriminant analysis, principal components. Instruction in statistical computing is given in the laboratory session. Fall. Lexin Li. 3 units.