Vision Science

Vision is one of the most valuable sensory modalities. It is also the source of a rich array of research questions relating to how we see, how and why vision fails, and what can be done about it. Investigators in Vision Science conduct human and animal research and modeling, yielding cutting-edge discoveries and applications in disciplines that include molecular genetics, clinical care, adaptive optics, neurobiology, cell biology, infectious disease, bioengineering, perception, and public health.

This Ph.D. program (http://vision.berkeley.edu/) emphasizes the interdisciplinary nature of vision science research through broad exposure to the basic concepts and techniques used in specialized fields. Engaged in laboratory-based and clinical research, our students (http://vision.berkeley.edu/?page_id=37) work with faculty (http://vision.berkeley.edu/?cat=2) advisers whose research matches their interests. Current research topics include biomedical optics, perception and visual cognition, molecular and cell biology, neuroscience, computational vision, genetics, immunology, microbiology, and clinical science.

To complete our Ph.D. program, students must complete a minimum of 120 units. These units can be earned by taking VISCI 260A, VISCI 260B, VISCI 260C, VISCI 260D, VISCI 298, VISCI 201A, VISCI 201B, and VISCI 300. Students in our program are also allowed to take course across campus as it fits into their research and progress towards their thesis.

Vision Science alumni (http://vision.berkeley.edu/?page_id=2019) are represented on the faculty of world-class universities — in medical schools, schools of optometry, and a wide range of other disciplines spanning psychology, physiology, bioengineering, and ophthalmology. Many others hold research positions in private institutes and federally sponsored agencies, including NASA and the NIH. Still, others can be found in the research and development divisions of the industry. Ophthalmic and biotechnology companies are among the major recruiters of our graduates.

Due to the program's interdisciplinary nature, we accept students with various backgrounds, including psychology, optometry, engineering, computer science, physics, chemistry, biophysics, neuroscience, mathematics, molecular and cell biology, and integrative biology.

Due to the program's interdisciplinary nature, we accept students with various backgrounds, including psychology, optometry, engineering, computer science, physics, chemistry, biophysics, neuroscience, mathematics, molecular and cell biology, and integrative biology. Because this program is designed to develop research scientists, it is also important that applicants are familiar with an experimental lab setting. Program-specific admissions guidelines can be found here (http://vision.berkeley.edu/?page_id=165).

Admission to the University

Minimum Requirements for Admission

The following minimum requirements apply to all graduate programs and will be verified by the Graduate Division:

1. A bachelor's degree or recognized equivalent from an accredited institution;
2. A grade point average of B or better (3.0);
3. If the applicant has completed a basic degree from a country or political entity (e.g., Quebec) where English is not the official language, adequate proficiency in English to do graduate work, as evidenced by a TOEFL score of at least 90 on the iBT test, 570 on the paper-and-pencil test, or an IELTS Band score of at least 7 on a 9-point scale (note that individual programs may set higher levels for any of these); and
4. Sufficient undergraduate training to do graduate work in the given field.

Applicants Who Already Hold a Graduate Degree

The Graduate Council views academic degrees not as vocational training certificates, but as evidence of broad training in research methods, independent study, and articulation of learning. Therefore, applicants who already have academic graduate degrees should be able to pursue new subject matter at an advanced level without the need to enroll in a related or similar graduate program.

Programs may consider students for an additional academic master's or professional master's degree only if the additional degree is in a distinctly different field.

Applicants admitted to a doctoral program that requires a master's degree to be earned at Berkeley as a prerequisite (even though the applicant already has a master's degree from another institution in the same or a closely allied field of study) will be permitted to undertake the second master's degree, despite the overlap in field.

The Graduate Division will admit students for a second doctoral degree only if they meet the following guidelines:

1. Applicants with doctoral degrees may be admitted for an additional doctoral degree only if that degree program is in a general area of knowledge distinctly different from the field in which they earned their original degree. For example, a physics PhD could be admitted to a doctoral degree program in music or history; however, a student with a doctoral degree in mathematics would not be permitted to add a PhD in statistics.
2. Applicants who hold the PhD degree may be admitted to a professional doctorate or professional master's degree program if there is no duplication of training involved.

Applicants may apply only to one single degree program or one concurrent degree program per admission cycle.

Required Documents for Applications

1. **Transcripts:** Applicants may upload *unofficial* transcripts with your application for the departmental initial review. Unofficial transcripts must contain specific information including the name of the applicant, name of the school, all courses, grades, units, & degree conferral (if applicable).
2. **Letters of recommendation:** Applicants may request online letters of recommendation through the online application system. Hard copies of recommendation letters must be sent directly to the program, by the recommender, not the Graduate Admissions.
3. **Evidence of English language proficiency:** All applicants who have completed a basic degree from a country or political entity in which the official language is not English are required to submit official evidence of English language proficiency. This applies to institutions from Bangladesh, Burma, Nepal, India, Pakistan, Latin America, the Middle East, the People's Republic of China, Taiwan, Japan, Korea, Southeast Asia, most European countries, and Quebec

(Canada). However, applicants who, at the time of application, have already completed at least one year of full-time academic course work with grades of B or better at a US university may submit an official transcript from the US university to fulfill this requirement. The following courses will not fulfill this requirement:

- courses in English as a Second Language,
- courses conducted in a language other than English,
- courses that will be completed after the application is submitted, and
- courses of a non-academic nature.

Applicants who have previously applied to Berkeley must also submit new test scores that meet the current minimum requirement from one of the standardized tests. Official TOEFL score reports must be sent directly from Educational Test Services (ETS). The institution code for Berkeley is 4833 for Graduate Organizations. Official IELTS score reports must be sent electronically from the testing center to University of California, Berkeley, Graduate Division, Sproul Hall, Rm 318 MC 5900, Berkeley, CA 94720. TOEFL and IELTS score reports are only valid for two years prior to beginning the graduate program at UC Berkeley. Note: score reports can not expire before the month of June.

Where to Apply

Visit the Berkeley Graduate Division application page (http://grad.berkeley.edu/admissions/apply/).

Coursework

As a Ph.D. student, you are eligible to take any course on campus during the academic year. This is a great perk and should be taken advantage of, but please be aware that your tuition and fees do not extend into the summer, so any summer courses will be paid out of pocket.

Core Curriculum

The Core Curriculum comprises a series of four courses split between the Fall and Spring semester of your first year. The series is intended to provide a general overview of the main topic areas in Vision Science for students of widely varying backgrounds. The Core Curriculum requirement must be fulfilled by the end of their first year. Each course must be passed with a B or better. Failure to achieve a B or better will require the course to be retaken the following year for a letter grade.

VIS SCI 201A: SURVEY OF LABORATORIES

The goal of this course is to introduce first-year students to the faculty and labs in the Vision Science program. During the first year of the graduate program, students are presented with an overview of the various research opportunities represented in the Vision Science group. Weekly one-hour lectures and/or lab tours are presented by the Vision Science faculty.

VIS SCI 201B: sTUDENT eVENING RESEARCH SEMINAR (sers)

The goal of the Student Evening Research Seminar (SERS) is to provide a forum for VS graduate students to discuss and develop strategies for giving effective presentations and to have an opportunity to practice giving scientific presentations in an informal setting. SERS is a required course for all first-year and second-year students although all graduate students, faculty, and postdocs are welcome and encouraged to attend.

VIS SCI 206A: 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 the 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.

VIS SCI 206B: INTRODUCTION TO OCULAR BIOLOGY

This course will provide an overview of eye development, anterior eye ocular anatomy and physiology, and ocular disease. The course will be a combination of didactic lectures and problem-based learning.

VIS SCI 206C: INTRODUCTION TO visual NEUROSCIENCE

This course will provide 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.

VIS SCI 206D: 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 a series of didactic lectures.

VIS SCI 230: ETHICS

In preparation for participation in research, each student is required to take the Ethics in Scientific Research course for a letter grade within the first 2 years of enrollment. Training in the responsible conduct of research is required for all students. This course examines a range of ethical issues that arise in the process of doing science.

VIS SCI 298: oXYOPIA SEMINAR

Oxyopia seminars are presented to the Vision Science and campus community on a weekly basis during the academic year. These seminars are given by local and visiting researchers and are an excellent way for students to become more familiar with the most recent developments in vision research. All graduate students, faculty, and postdocs are welcomed and encouraged to attend. All first-year and second-year students must take Oxyopia for a letter grade. Starting in their 3rd year, all VS students are required to make an annual presentation on a current research project at the Oxyopia lecture series.

VIS SCI 300: tEACHING METHODS

As Graduate Student Instructors in the School of Optometry, all first-year students are required to enroll in a teaching methods course. This course provides instruction in teaching methods and materials and opportunities to practice teaching in classrooms and laboratories.

Additional Coursework

The following represent fields of study that may be beneficial for student success but are not required courses.

Statistics

Strongly recommended for most areas of Vision Science. Meet with your Graduate Advisor to discuss your statistics background and appropriate courses for your intended area of research.

advanced courses and seminars

These are given as a continuation of the different themes established in the proseminar series. Courses offerings vary, and a complete list will be provided each semester. Please visit the Schedule of Classes for the most current listing.

Beyond vision science

Students may also consider courses offered by other departments on campus, according to their needs. Additional coursework is not recommended during the first 2 semesters. Students are encouraged to meet with their research advisor to discuss their needs and the options that are available to them.

Curriculum

Courses Required		
VIS SCI 201A	Seminar in Vision Science	2
VIS SCI 201B	Seminar in Vision Science	2
VIS SCI 299	Research in Vision Science (two required lab rotations)	1-12
VIS SCI 298	Group Studies, Seminars, or Group Research	1-6
VIS SCI 230	Ethics in Scientific Research	2
VIS SCI 300	Teaching Methods in Vision Science	1
Core Curriculum		
VIS SCI 260A	Optical and Neural Limits to Vision	3
VIS SCI 260B	Introduction to Ocular Biology	3
VIS SCI 260C	Introduction to Visual Neuroscience	3
VIS SCI 260D	Seeing in Time, Space and Color	3
Electives per approved individualized study list		

Vision Science

Expand all course descriptions [+]Collapse all course descriptions [-]

VIS SCI 201A Seminar in Vision Science 2 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
Graduate seminar in vision science.
Seminar in Vision Science: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: VS faculty

Seminar in Vision Science: Read Less [-]

VIS SCI 201B Seminar in Vision Science 2 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
Graduate seminar in vision science.
Seminar in Vision Science: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Gronert

Seminar in Vision Science: Read Less [-]

VIS SCI 203A Geometric Optics 4 Units

Terms offered: Fall 2016, Fall 2015, Fall 2014
Geometrical methods applied to the optics of lenses, mirrors, and prisms. Thin lens eye models, magnification, astigmatism, prism properties of lenses, thick lenses.
Geometric Optics: Read More [+]

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Formerly known as: 101

Geometric Optics: Read Less [-]

VIS SCI 203B Optical System and Physical Optics 4 Units

Terms offered: Spring 2016, Spring 2015, Spring 2014
Principles of optical systems, principles and clinical applications of aperatures and stops, aberrations and optical instruments. Optics of the eye. Selected topics in physical optics, diffraction, interference, polarization.
Optical System and Physical Optics: Read More [+]
Rules & Requirements

Prerequisites: 203A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Formerly known as: 102

Optical System and Physical Optics: Read Less [-]

VIS SCI 205 Visual Perception Sensitivity 4.5 Units

Terms offered: Fall 2016, Fall 2015, Fall 2014
Psychophysical basis for clinical tests in acuity, perimetry, and color vision. The visual stimulus and photometry. Visual receptors. Psychophysical method and visual threshold. Light sensitivity. Contrast sensitivity. Light and dark adaptation. Temporal and spatial properties of visual function. Color vision and abnormalities. Changes with age and disease. Visual illusion. Basis for advanced diagnostic procedures.
Visual Perception Sensitivity: Read More [+]
Hours & Format

Fall and/or spring: 15 weeks - 3.5 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Formerly known as: 104

Visual Perception Sensitivity: Read Less [-]

VIS SCI 206A Anatomy and Physiology of the Eye 2 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013
This course focuses on the anatomy and physiology of the eyeball. Overview of the gross anatomy of the eye followed by eye-relevant cellular and molecular biology. Cellular and molecular details of structure and function of each of the various non-neural components.
Anatomy and Physiology of the Eye: Read More [+]
Hours & Format

Fall and/or spring: 7.5 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructors: Gong, Fleiszig

Anatomy and Physiology of the Eye: Read Less [-]

VIS SCI 206B Anatomy and Physiology of the Eye and Visual System 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
Structure and function of the tissues of the eye, ocular appendages, and the central visual pathways. Basic concepts of physiological, neurological, embryological, and immunological processes as they relate to the eye and vision. Foster an appreciation of the pathophysiology of various disease processes. Convey the importance of anatomy and physiology in the medical approach to ocular disease processes.
Anatomy and Physiology of the Eye and Visual System: Read More [+]
Rules & Requirements

Prerequisites: ViS Sci 206A

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 2.5 hours of lecture and 0.5 hours of laboratory per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Anatomy and Physiology of the Eye and Visual System: Read Less [-]

VIS SCI 206C Anatomy and Physiology of the Eye and Visual System 2 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
Problem-based learning approach using clinical case examples. Continuation of 206A-206B.
Anatomy and Physiology of the Eye and Visual System: Read More [+]

Rules & Requirements

Prerequisites: 206A-206B

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 7.5 weeks - 4 hours of seminar per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Formerly known as: 106C

Anatomy and Physiology of the Eye and Visual System: Read Less [-]

VIS SCI 206D Neuroanatomy and Neurophysiology of the Eye and Visual System 2 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013
Structure and function of the neurosensory retina, photoreceptors, RPE including blood supply. Current concepts of etiology and management of major retinal conditions. Overview of diagnostic techniques in retinal imaging, electrophysiologic testing and new genetic approaches. Structure and function of the early visual pathway including retinal ganglion cells, optic nerves, lateral geniculate nucleus and visual cortex. Pupillary responses. Specialization in the visual cortex.
Neuroanatomy and Neurophysiology of the Eye and Visual System: Read More [+]

Rules & Requirements

Prerequisites: 206A (must be taken concurrently)

Hours & Format

Fall and/or spring: 7.5 weeks - 4 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructors: Flannery, Freeman

Formerly known as: half of 206A

Neuroanatomy and Neurophysiology of the Eye and Visual System: Read Less [-]

VIS SCI 215 Visual System Development 2 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013
Development of the eye and visual system. Normal development of the eye, retina, and central visual pathways. Effects of visual deprivation. Assessment of optical and visual function in human infants. Refraction and refractive error in infants and children. Development of visuomotor function, spatial vision, color vision, binocular vision, and depth perception.
Visual System Development: Read More [+]

Rules & Requirements

Prerequisites: 206B

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Formerly known as: 115

Visual System Development: Read Less [-]

VIS SCI 217 Oculomotor Functions and Neurology 2 Units

Terms offered: Spring 2016, Spring 2015, Spring 2014
Neuro-anatomical pathways for the control of eye position and movement; gaze holding, image stabilization and tracking eye movement systems; oculomotor signs of disorders of the central nervous system (palsies, nystagmus, opthalmoplegia, cog-wheel pursuits, saccadic dysmetria); the near visual-motor response and the synergistic coupling of accommodation and convergence; binocular misalignment (heterophoria and fixation disparity); and presbyopia.
Oculomotor Functions and Neurology: Read More [+]

Rules & Requirements

Prerequisites: 203B or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture and 10 hours of laboratory per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Formerly known as: 117

Oculomotor Functions and Neurology: Read Less [-]

VIS SCI 219 Binocular Vision and Space Perception 2 Units

Terms offered: Spring 2016, Spring 2015, Spring 2014
Perception of space, direction, and distance. Binocular retinal correspondence, horopters, differential magnification effects and anomalies of binocular vision development. Sensory vision, local stereopsis, static and dynamic stereopsis, binocular depth cues.
Binocular Vision and Space Perception: Read More [+]
Rules & Requirements

Prerequisites: 203A-203B

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture and 10 hours of laboratory per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Formerly known as: 118

Binocular Vision and Space Perception: Read Less [-]

VIS SCI 230 Ethics in Scientific Research 2 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
This seminar will examine a range of ethical issues that arise in the process of doing science. Beginning with the philosophical and social foundations, we will consider the pathogenesis of fraud, statistics and deception, the ethics of authorship and publication, research with human subjects, the use of animals, the definition(s) of misconduct and the difference between misconduct and questionable research practices, the relationship between industry and science, and finally, the responsibilities and obligations of the scientist in society.
Ethics in Scientific Research: Read More [+]
Hours & Format

Fall and/or spring: 15 weeks - 30 hours of seminar per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Ethics in Scientific Research: Read Less [-]

VIS SCI 260A Optical and Neural Limits to Vision 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
The 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. This is one of the four courses that form the Vision Science core curriculum.
Optical and Neural Limits to Vision: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Austin Roorda

Optical and Neural Limits to Vision: Read Less [-]

VIS SCI 260B Introduction to Ocular Biology 3 Units

Terms offered: Fall 2020, Fall 2019, Fall 2018
The course will provide an overview of eye development, anterior eye ocular anatomy and physiology and ocular disease. The course will be a combination of didactic lectures and problem-based learning. This is one of the four courses that form the Vision Science core curriculum.
Introduction to Ocular Biology: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Suzanne Fleiszig

Introduction to Ocular Biology: Read Less [-]

VIS SCI 260C Introduction to Visual Neuroscience 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
The course will provide 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. This is one of the four courses that form the Vision Science core curriculum.
Introduction to Visual Neuroscience: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Michael Silver

Introduction to Visual Neuroscience: Read Less [-]

VIS SCI 260D Seeing in Time, Space and Color 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
The 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. This is one of the four courses that form the Vision Science core curriculum
Seeing in Time, Space and Color: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Martin Banks

Seeing in Time, Space and Color: Read Less [-]

VIS SCI 262 Visual Cognitive Neuroscience 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2018
The course will provide 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 will 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.
Visual Cognitive Neuroscience: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Silver

Visual Cognitive Neuroscience: Read Less [-]

VIS SCI 265 Neural Computation 3 Units

Terms offered: Fall 2022, Fall 2020, Fall 2018
This course provides an introduction to the theory of neural computation. The goal is to familiarize students with the major theoretical frameworks and models used in neuroscience and psychology, and to provide hands-on experience in using these models. Topics include neural network models, supervised and unsupervised learning rules, associative memory models, probabilistic/graphical models, and models of neural coding in the brain.
Neural Computation: Read More [+]

Rules & Requirements

Prerequisites: Calculus, differential equations, basic probability and statistics, linear algebra, and familiarity with high level programming languages such as Matlab

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Olshausen

Neural Computation: Read Less [-]

VIS SCI C265 Neural Computation 3 Units

Terms offered: Prior to 2007
This course provides an introduction to the theory of neural computation. The goal is to familiarize students with the major theoretical frameworks and models used in neuroscience and psychology, and to provide hands-on experience in using these models. Topics include neural network models, supervised and unsupervised learning rules, associative memory models, probabilistic/graphical models, and models of neural coding in the brain.
Neural Computation: Read More [+]
Rules & Requirements

Prerequisites: Calculus, differential equations, basic probability and statistics, linear algebra, and familiarity with high level programming languages such as Matlab

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Olshausen

Also listed as: NEUROSC C265

Neural Computation: Read Less [-]

VIS SCI C280 Computer Vision 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
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.
Computer Vision: Read More [+]
Rules & Requirements

Prerequisites: MATH 1A; MATH 1B; MATH 53; and MATH 54 (Knowledge of linear algebra and calculus)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Instructor: Malik

Also listed as: COMPSCI C280

Computer Vision: Read Less [-]

VIS SCI 298 Group Studies, Seminars, or Group Research 1 - 6 Units

Terms offered: Spring 2021, Fall 2020, Spring 2020
Group studies of selected topics. Advanced studies in various subjects through special seminars on topics to be selected each year, informal groups studying special problems, group participation in experimental problems and analysis.
Group Studies, Seminars, or Group Research: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 2-6 hours of lecture per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Group Studies, Seminars, or Group Research: Read Less [-]

VIS SCI 299 Research in Vision Science 1 - 12 Units

Terms offered: Fall 2022, Summer 2022 Second 6 Week Session, Spring 2022
Research.
Research in Vision Science: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-16 hours of independent study per week
8 weeks - 1-12 hours of independent study per week

Additional Details

Subject/Course Level: Vision Science/Graduate

Grading: Letter grade.

Research in Vision Science: Read Less [-]

VIS SCI 300 Teaching Methods in Vision Science 1 Unit

Terms offered: Fall 2022, Fall 2021, Spring 2021
Instruction in teaching methods and materials, in vision science and optometry; practice teaching in classrooms and laboratory.
Teaching Methods in Vision Science: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing in vision science

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Vision Science/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Silver

Teaching Methods in Vision Science: Read Less [-]

VIS SCI 601 Individual Study for Master's Students 1 - 6 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
Individual study for the comprehensive requirements in consultation with the adviser in vision science.
Individual Study for Master's Students: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

Credit Restrictions: Course does not satisfy unit or residence requirements for master's degree.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Additional Details

Subject/Course Level: Vision Science/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Study for Master's Students: Read Less [-]

VIS SCI 602 Individual Study for Doctoral Students 1 - 6 Units

Terms offered: Fall 2022, Fall 2021, Spring 2021
Individual study in consultation with the adviser in vision science, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required for the Ph. D.
Individual Study for Doctoral Students: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

Credit Restrictions: Course does not satisfy unit or residence requirements.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Additional Details

Subject/Course Level: Vision Science/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Study for Doctoral Students: Read Less [-]