

Neuroscience (NEU)

NEU 119S, 219S, 319S, 419S, 519S, 619S, 719S, 819S, 919S Topics in Neuroscience 1-9 Hours

This course is used to record credit the student earns while enrolled at another institution in a program administered by the University's Study Abroad Office. Credit is recorded as assigned by the study abroad adviser in the Department of Neuroscience. University credit is awarded for work in an exchange program; it may be counted as coursework taken in residence. Transfer credit is awarded for work in an affiliated studies program.

NEU 320 Introduction to Neuroscience 3 Hours

Introduction to the nervous system with an emphasis on brain organization, neuron physiology, perceptual systems, and motor systems. Designed for non-neuroscience majors.

NEU 129S, 229S, 329S, 429S, 529S, 629S, 729S, 829S, 929S Topics in Neuroscience 1-9 Hours

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NEU 330 Neural Systems I 3 Hours

Introduction to the nervous system with an emphasis on brain organization, neuron physiology, perceptual systems, and motor systems.

NEU 335 Neural Systems II 3 Hours

Introduction to the nervous system with an emphasis on neural development and on the neural mechanisms of memory, emotions, and other higher cognitive functions.

NEU 137, 237, 337, 437 Selected Topics in Neuroscience 1-4 Hours
Topics include recent developments and research methods in the field of neuroscience.

NEU 137.3, 237.3, 337.3, 437.3 Neuroscience for Plan II 1-4 Hours

NEU 137.6, 237.6, 337.6, 437.6 Rigor in Neuroscience 1-4 Hours
Explore the application and integration of many different approaches, from molecules to behavior. Includes statistics, experimental design, and philosophy of science with a mixture of discussion and hands-on training.

NEU 340 Neural Systems III: Quantitative Tools 3 Hours

Introduction to quantitative approaches central to the study of the brain, with an emphasis on mathematical and statistical methods required for the rigorous design and interpretation of neuroscience experiments and data.

NEU 361T Comparative Animal Physiology 3 Hours

Examine the physiology of organ systems in animal phyla, with special emphasis on the neural and behavioral adaptations of organisms to their environment.

NEU 365D Principles of Drug Action 3 Hours

Introduction to the basic principles of pharmacology; including how drugs get into the body, exert their actions, and are metabolized and excreted.

NEU 365E Epigenetics of Neuroscience 3 Hours

Explore how epigenetic modifications cause long-lasting changes in gene expression.

NEU 365L Neurobiology Laboratory 3 Hours

An introduction to physiological, morphological, and molecular techniques used for analysis of the nervous system. Experiments and computer simulations illustrate basics of information processing by the nervous system.

NEU 365M Advanced Experimental Neurobiology 3 Hours

Examine neocortical cell and circuit function through presentation and critique of research goals and strategies.

NEU 365N Nerve Regeneration in Invertebrates and Vertebrates 3 Hours

Explore use of nerve regeneration and degeneration in invertebrate vs vertebrate systems to synthesize concepts in neuroscience.

NEU 365P Programming and Data Analysis for Modern Neuroscience 3 Hours

Explore the basics of programming, statistics, and machine learning, and apply these techniques to the analysis of data from neuroscience experiments.

NEU 365T Neurobiology of Disease 3 Hours

The neurobiological basis of disorders of the brain, with the main focus on mental illness. Emphasizes the neural circuitries and neurochemical events that underlie specific mental processes and behaviors.

NEU 365W Neurobiology of Addiction 3 Hours

Study of the neurobiology of neurotransmitters, and the influence of alcohol and drugs of abuse on neurotransmitters.

NEU 366C Ion Channels and the Molecular Physiology of Neuronal Signaling 3 Hours

Explores the role of molecular conformational changes in higher-level neuronal function and sensory transduction, including the generation and regulation of diverse types of neuronal signaling characteristics. Emphasizes a quantitative approach and the use of models to study function.

NEU 366D Synaptic Physiology and Plasticity 3 Hours

Detailed study of the physiology of synaptic transmission in the mammalian central nervous system. Covers dendritic integration and various forms and mechanisms of synaptic plasticity.

NEU 466G Functional and Synaptic Neuroanatomy 4 Hours

Neuroanatomy and function of synapses as a basis for brain function and behavior. Examine the ultrastructure and function of synapses, dendrites and axons underlying basic synaptic transmission and plasticity. Laboratory projects involve three-dimensional reconstructions from serial section electron microscopy.

NEU 366L Neuroimaging Laboratory 3 Hours

Basic principles of image formation and techniques of fluorescent imaging and confocal laser-scanning microscopy. Includes image processing and analysis to extract quantitative information from digital images. Survey of imaging techniques, including electron microscopy and MRI.

NEU 366R Rhythms in the Nervous System 3 Hours

Explore the study of systems of oscillators in the nervous system including mechanisms of generation and theories about functions.

NEU 366S Neuromolecular Genetics and Disease Laboratory 3 Hours

Explores techniques used to study the molecular genetic basis for nervous system function and disease with a powerful invertebrate model system. Subjects will range from studying the conserved molecular basis for our senses and male/female-specific behaviors, to exploring how mutations of conserved neural genes cause neurological disorders, such as Parkinson's disease and Alzheimer's disease.

NEU 466T Modeling and Theory in Neuroscience 4 Hours

Examine the basic mathematical and computational tools central to the analysis of neural systems in a laboratory setting. Discuss linear algebra, differential equations, filtering, correlation, probability with an emphasis on quantitative methodology and applications to neuroscience.

NEU 366W Neural Computation 3 Hours

Examine why quantitative methods are so important in neuroscience. Learn how to apply basic mathematical concepts to neuroscience, with the goal of seeing the applications of these concepts more broadly and appreciating the interactions between neuroscience and other quantitative fields.

NEU 367C Cellular and Molecular Bases of Neural Development 3 Hours

Introduction to the principles by which the neural tube (brain and spinal cord) forms during embryonic development. Discuss the cellular and molecular mechanisms underlying the formation of a three-dimensional neural tube and its division into forebrain, midbrain, hindbrain, and spinal cord.

NEU 367F Foundations of Human Neuroimaging 3 Hours

Survey of methods for neuroimaging research. Describes the physics of MRI image acquisition, the physiology of neural responses, and the design and analysis of MRI studies.

NEU 367S Analytical Skepticism 3 Hours

Examine basic principles that allow accurate interpretation and depiction of scientific data, with an emphasis on notions of behavioral economics, probability and statistics, and experimental design.

NEU 367V Evolutionary Neurobiology 3 Hours

Examination of the nervous system in an evolutionary context.

NEU 170C, 270C Topics in Neuroscience 1-2 Hours

Supervised study of selected topics in Neuroscience, by individual arrangement with the instructor.

NEU 177, 277, 377, 477 Undergraduate Research 1-4 Hours

Laboratory or research in the various fields of neuroscience under the supervision of one or more faculty members.

NEU 179H, 279H, 379H, 679H Honors Tutorial Course 1,2,3,6 Hours

Original laboratory research project under the direction of a faculty mentor leading to a thesis or research presentation.

NEU 379N Neuroscience and Computer Science Capstone 3 Hours

Investigate questions at the intersection of neuroscience and computer science through collaborative projects. Develop computational tools and methods to study the brain and behavior. Explore how ideas from neuroscience and computer science can inform each other.

NEU 380C Computational Neuroscience 3 Hours

Introduction to computational neuroscience. Examines neural network and learning theory, coding, dynamics, memory, computation and learning in recurrent and feed forward neural circuits.

NEU 380E Vision Systems 3 Hours

Introduction to the anatomy, physiology, and psychophysics of human vision from an information-processing and computational perspective.

NEU 080M Dual MD/PhD Program with UT Medical Branch 0 Hours

Preclinical medical study at the University of Texas Medical Branch at Galveston.

NEU 381G Grant Writing in the Behavioral and Biological Sciences 3 Hours

Introduction to grant writing in the behavioral and biological sciences and development of grant writing skills. Subjects include: finding grant opportunities, planning proposal activities, successful grant writing strategies, and how to talk to grant program officers. Write grant proposals (e.g., proposals to federal agencies such as NSF or NIH) and revise proposals based on peer and instructor feedback. Explore how grant proposals are reviewed by participating in a mock review session.

NEU 381N Basic Processes of Nerve Cells 3 Hours

Degeneration and regeneration in nervous systems following traumatic injury; invertebrate versus vertebrate, peripheral nervous system versus central nervous system, axonal versus cell body, role of glia versus neurons.

NEU 381V Mechanisms of Vision 3 Hours

Physiology of the eye, the retina, and the visual pathways. Prospects for nutritional prevention of blinding eye diseases. Functional and ecological adaptations of primate and nonprimate vision.

NEU 382E Epigenetics 3 Hours

Study of how epigenetic modifications are covalent modifications of DNA or histones that cause changes in gene expression and how epigenetic modifications appear to be a method through which nurture or the environment can influence nature. Emphasis on how experience or environmental factors epigenetically modify health or behavior of animals.

NEU 182T, 282T, 382T, 482T Principles of Neuroscience I 1-4 Hours

Examines the core material on essential topics in molecular and cellular neuroscience, together with review and discussion of important early studies and contemporary literature.

NEU 382V Neural and Computational Basis of Vision 3 Hours

Introduction to the physiology, psychophysics and computational aspects of the visual system. Review linear systems analysis, information theory, Bayesian statistical decision theory, and other relevant mathematical areas.

NEU 383C Functional Neuroanatomy 3 Hours

An examination of the anatomy of the brain and spinal cord, emphasizing connections and functions of neural systems.

NEU 383D Neuropharmacology 3 Hours

An advanced survey of neurotransmitters and systems in the brain. Emphasis is on pharmacological analysis at the molecular level to determine mechanisms of action of drugs that act on the brain.

NEU 383E Neuropharmacology II 3 Hours

Explore neuropharmacological concepts related to brain development, organization and anatomy; neuroendocrinology, neuroimmunology and neuroinflammation; gut-brain axis; neurobiology of addiction; and others.

NEU 383M Data Analysis and Statistics for the Neurosciences 3 Hours

Statistical applications relevant to areas of research in neuroscience.

NEU 183T, 283T, 383T, 483T Principles of Neuroscience II 1-4 Hours

Examines the core material on essential subjects in systems and behavioral neuroscience, together with review and discussion of important early studies and contemporary literature.

NEU 384C Bootstrap Statistics 3 Hours

An introduction to modern methods of statistical analysis based on numerical computer simulation. Covers a range of common data analysis situations drawn mainly from the fields of neuroscience and experimental psychology. Techniques include point estimation, two-group and multiple group experiments, regression and curve fitting, and Bayesian analysis.

NEU 384M Advanced Statistics: Inferential 3 Hours

Covers t-test, chi-square, analysis of variance, and nonparametric tests.

- NEU 185D Responsible Conduct of Science 1 Hour
Ethical considerations in the conduct of science, including issues of animal welfare, data analysis, fraud, publications, misconduct, intellectual property, grants, peer review, and mentor responsibility.
- NEU 185L, 285L, 385L, 485L Topics in Neuroscience 1-4 Hours
- NEU 185L.12, 285L.12, 385L.12, 485L.12 Quantifying Brain Structure 1-4 Hours
Concepts and hands-on applications for quantifying aspects of brain and cellular structure, with a focus on stereological approaches.
- NEU 185L.13, 285L.13, 385L.13, 485L.13 Neurobiology of Disease 1-4 Hours
Examines the neurobiological basis of disorders of the brain, with a focus on mental illness. Emphasis on the neural circuitries and neurochemical events that underlie specific mental processes and behaviors.
- NEU 185L.3, 285L.3, 385L.3, 485L.3 Addiction Biology 1-4 Hours
Current research in addiction biology. Students present individual research papers and reports.
- NEU 185L.5, 285L.5, 385L.5, 485L.5 Behavioral Neuroendocrinology 1-4 Hours
Current research in neuroendocrinology, including action of neuroendocrine systems on behavior, assays of substances in the blood to identify gene products, and examination of stress from neuroendocrine, behavioral, health, and immunity perspectives.
- NEU 185L.6, 285L.6, 385L.6, 485L.6 Foundations of Human Neuroimaging 1-4 Hours
A survey of the foundations for neuroimaging research with a focus on cognitive neuroscience. Describes the physical methods of image acquisition and physiological mechanisms used for functional imaging. Emphasis on magnetic resonance methods for structural and functional imaging. Surveys other imaging modalities, including positron emission tomography (PET), optical, and EEG/MEG electrical source localization.
- NEU 185L.7, 285L.7, 385L.7, 485L.7 Topics in Vision and Hearing 1-4 Hours
Current research in human vision and hearing.
- NEU 185L.8, 285L.8, 385L.8, 485L.8 Ion Channels and Neuronal Signaling 1-4 Hours
Molecular properties of ion channels and the mechanisms of electrical signaling in neurons and other excitable cells.
- NEU 185L.9, 285L.9, 385L.9, 485L.9 Synaptic Physiology and Plasticity in the Central Nervous System 1-4 Hours
Detailed background in the physiology and plasticity of synaptic transmission in the mammalian central nervous system.
- NEU 385P Programming and Data Analysis for Modern Neuroscience 3 Hours
Explore the basics of programming, statistics, and machine learning, and apply these techniques to the analysis of data from neuroscience experiments.
- NEU 386D Multivariate Pattern Analysis 3 Hours
Explores cutting-edge techniques for finding meaningful patterns in large, noisy brain data sets, and how to use these techniques to address a variety of questions in cognitive neuroscience.
- NEU 486T Modeling and Theory in Neuroscience 4 Hours
Examine the basic mathematical and computational tools central to the analysis of neural systems in a laboratory setting. Discuss linear algebra, differential equations, filtering, correlation, probability with an emphasis on quantitative methodology and applications to neuroscience.
- NEU 387S Analytical Skepticism 3 Hours
Examine basic principles that allow accurate interpretation and depiction of scientific data, with an emphasis on notions of behavioral economics, probability and statistics, and experimental design.
- NEU 288M Fundamentals of Fluorescence Microscopy 2 Hours
Explores optics, image formation, functioning of epifluorescent and confocal microscopes, detector technology (cameras and photomultiplier tubes), immunofluorescence techniques, image analyses, and image presentation for publication. Study of the technology and science behind widely-used high-end microscope systems.
- NEU 088V Career Development for Neuroscientists 0 Hours
Explore a range of careers in neuroscience and career development. Discuss professional development and careers with scientists from industry, academia, and government agencies.
- NEU 190, 290, 390 Research 1-3 Hours
- NEU 191 Graduate Seminar in Neuroscience 1 Hour
Presentations and discussions of research topics in neuroscience.
- NEU 391N Learning and Memory 3 Hours
Presentation of contemporary approaches to the study of conditioning and learning at the behavioral level. Focuses on empirical data and theoretical analysis of acquisition and performance in Pavlovian and instrumental conditioning. Includes discussion of habituation, sensitization, stimulus control, and other paradigms for studying cognitive processes in nonverbal organisms.
- NEU 394I Neuroinflammation in Health and Pathology 3 Hours
Assess cutting-edge pre-clinical and clinical neuroimmune research, and interact with professors from across campus in special seminars.
- NEU 394N Neural Networks 3 Hours
Biological information processing; architectures and algorithms for supervised learning, self-organization, reinforcement learning, and neuro-evolution; theoretical analysis; hardware implementations and simulators; applications in engineering, artificial intelligence, and cognitive science.
- NEU 394P Topics in Neuroscience: Seminar 3 Hours
- NEU 394P.1 Current Topics in Behavioral Neuroscience 3 Hours
Brain-behavior relationships, particularly recent research in behavioral neuroscience, including the anatomical and neurochemical mechanisms of behavioral events, and behavioral influences on the brain.
- NEU 394P.10 Statistical Methods in Computational Neuroscience 3 Hours
Introduction to statistical and computational methods for understanding information processing in the nervous system, with emphasis on neural coding and statistical modeling of neural responses.
- NEU 394P.11 Integrative Omics in the Evolution of Development and Behavior 3 Hours
Discuss the conceptual foundations and historical roots of research programs in evo-devo and evolutionary neuroscience including recent discoveries and limitations in these fields. Explore how -omics approaches and comparative methods enable novel insights into the diversification, convergence, and constraint of complex traits.
- NEU 394P.3 Neurobiology of Learning and Memory 3 Hours
Neuroanatomical systems that are functionally related to basic forms of learning and memory in mammals.
- NEU 394P.4 Advanced Topics in Neuroanatomy 3 Hours
Neuroanatomical systems and function across species. Basic forms of neuroanatomy in mammals.
- NEU 394P.7 Analysis of Functional Magnetic Resonance Imaging Data 3 Hours
Functional magnetic resonance imaging experimental design and analysis.
- NEU 394P.8 Topics in Systems Neuroscience 3 Hours
Focuses on one or two topics and examines them in depth through group discussions of key scientific manuscripts. Discusses both classical studies and contemporary research.

NEU 394P:9 Perception and Action 3 Hours

Current topics in visually guided behavior, including eye movements, attention, and motor control, from behavioral, computational, and neurophysiological approaches.

NEU 396D Clinical Psychopharmacology 3 Hours

Recent findings concerning the mechanisms of action and the behavioral effects of psychoactive drugs, particularly those used in psychiatry.

NEU 698 Thesis 6 Hours

NEU 399W, 699W, 999W Dissertation 3,6,9 Hours