NEUROSCIENCE NEU

Program in Neuroscience
College of Natural Science

215 Neuroscience and Society
Summer. 3(3-0) P: Completion of Tier I Writing Requirement Not open to students with credit in NEU 301 or ZOL 402.
Critical examination of important societal issues related to neuroscience, including stress, addiction, and sex differences. Comparison of peer-reviewed neuroscientific research and popular press publications.

230 Basic Concepts in Neuroscience
Spring. 3(3-0) P: Completion of Tier I Writing Requirement RB: ((PSY 101) or some background coursework (at the university or high school level) in psychology) and (BS 161 or BS 181H or LB 145)
Introduction to fundamental neuroscience concepts including neuroanatomy, neuronal signaling, and molecular mechanisms of learning and memory.

300 Neurobiology
Fall, Spring. 3(3-0) Interdepartmental with Integrative Biology. Administered by Neuroscience. P: (BS 162 or LB 144 or BS 182H) and (BS 161 or LB 145 or BS 181H) R: Not open to freshmen or sophomores and not open to students in the Program in Neuroscience and not open to students in the Lyman Briggs Neuroscience Major. SA: ZOL 402
Structure and function of nerve cells and nervous systems.

301 Introduction to Neuroscience I
Fall. 3(3-0) P: (BS 161 or BS 181H or LB 145) and (BS 162 or BS 182H or LB 144) RB: PSY 101 R: Open to undergraduate students in the Lyman Briggs College or in the College of Natural Science or in the Program in Neuroscience.
Survey of the field of neuroscience, including molecular, cellular, and autonomic, sensory and motor systems.

302 Introduction to Neuroscience II
Spring. 3(3-0) P: NEU 301 RB: PSY 101 R: Open to undergraduate students in the Program in Neuroscience.
Survey of brain-based behavioral and cognitive systems and related human diseases.

310 Psychology and Biology of Human Sexuality
Spring of even years. 3(3-0) Interdepartmental with Integrative Biology and Psychology. Administered by Neuroscience. P: (PSY 101 or concurrently) and ((BS 161 or concurrently) or (BS 162 or concurrently) or (LB 144 or concurrently) or (LB 145 or concurrently) or (BS 181H or concurrently) or (BS 182H or concurrently)) Not open to students with credit in HDFS 445.
Sexual behavior from biological, psychological and neuroscience perspectives. Sexual differentiation of the body. Role of hormones in development and reproduction in humans and other animals. Human sexual orientation. Fertility and contraception. Sexual disorders. Sexually transmitted diseases.

311L Neuroscience Laboratory (W)
Fall, Spring. 2(1-3) P: ((NEU 301 or concurrently) and completion of Tier I writing requirement) and (STT 201 or STT 231 or STT 421) and (BS 171 or BS 191H or LB 145) RB: PSY 101 R: Open to undergraduate students in the Program in Neuroscience.
Overview of neuroscience research methodology, including experimental design, data analysis, and presentation of results.

333 The Neurobiology of Food Intake and Overeating
Spring. 3(3-0) Interdepartmental with Psychology. Administered by Psychology. P: PSY 101 RB: PSY 209
Physiological and neurological mechanisms that drive food intake and overeating. Vulnerabilities to obesity.

416 Development of the Nervous System Through the Lifespan
Fall. 3(3-0) Interdepartmental with Integrative Biology. Administered by Neuroscience. P: NEU 302 or IBIO 300 or PSY 209 RB: IBIO 341 R: Open to undergraduate students in the Program in Neuroscience or in the Department of Integrative Biology or in the Department of Psychology or in the Lyman Briggs Neuroscience Major or in the Lyman Briggs Zoology Coordinate Major.
Development of neurons and their connections, roles of both genetics and behavioral experience in shaping the mammalian nervous system.

417 Instrumental Methods of Analysis in Neuroscience
Spring. 3(3-0) Interdepartmental with Chemistry. Administered by Neuroscience. P: {{(CEM 251 and CEM 252) or (CEM 351 and CEM 352)} and (PHY 231 and PHY 232)} or (PHY 183 and PHY 184) or (PHY 193H and PHY 294H) or (LB 273 and LB 274) RB: NEU 301 or CEM 262
Design, operational principles and practical application of modern instrumental methods used for the separation, identification and quantification of neurochemical species in neuroscience. Application of methods of chemical analysis to study neurosignaling, chemical composition in single secretory cells, chemical structure of cells and tissues.

420 Neurobiology of Disease
Spring. 3(3-0) P: NEU 301 and NEU 302 R: Open to undergraduate students in the Program in Neuroscience.
Genetic, molecular, cellular, systems, and behavioral abnormalities that contribute to the manifestation of neurologic and psychiatric diseases and disorders that affect the nervous system.

422 Fundamentals of Neuropharmacology
Spring. 2(2-0) Interdepartmental with Pharmacology and Toxicology. Administered by Pharmacology and Toxicology. P: NEU 301 or PSL 250 or PSL 310 or PSL 431 R: Open to juniors or seniors or approval of department.
Mechanisms and uses of action of drugs on neurons and neuron-controlled activities

425 Computational Modeling in Neuroscience
Spring. 3(3-0) P: NEU 302 RB: (MTH 124 and MTH 126) or (MTH 132 and MTH 133) R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Major.
Introduction to theory and network modeling techniques in neuroscience, using brain activity data to validate theoretical models. Review of successful network models.

430 Genomics of Brain Development, Learning, and Behavior
Summer. 3(3-0) P: (IBIO 341) and (NEU 302 or concurrently) RB: PSY 209
Role of genes in brain development and function. Issues in behavioral and psychiatric genetics.

431 Pharmacology of Drug Addiction
Fall. 3(3-0) Interdepartmental with Pharmacology and Toxicology. Administered by Pharmacology and Toxicology. RB: Zoology or Human Biology or Psychology or Biochemistry or Physiology.
Introduction to pharmacology and neuropharmacology. Understanding of the biological basis for drug abuse and addiction.

435 Ion Channels of Excitable Membranes
Fall. 3(3-0) Interdepartmental with Integrative Biology. Administered by Neuroscience. P: (NEU 302 and NEU 311L) or IBIO 402 RB: (PHM 350 or PSL 431) and IBIO 341 R: Open to undergraduate students in the Neuroscience Major or in the Bachelor of Science in Zoology or in the Lyman Briggs Neuroscience Major or in the Lyman Briggs Zoology Coordinate Major.
Introduction to ion channels and their critical role in normal physiological functioning, sensory and neuromuscular diseases and disorders, as well as targets of toxins and poisons.

440 Synaptic Transmission
Spring of even years. 3(3-0) P: NEU 301 R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Major.
Chemical and electrical aspects of nerve impulse transmission at synaptic and neuroeffector junctions. Influence of drugs.

445 Analysis of Neural Activity Data (W)
Fall. 3(3-0) P: ((NEU 301 and (NEU 302 or concurrently)) and completion of Tier I writing requirement) and (MTH 124 or MTH 132 or MTH 152H or LB 118) and (STT 201 or STT 231 or STT 421 or PSY 295)
Conceptual and practical approaches to analyzing large functional datasets. Emphasis on statistical issues, including preprocessing, estimation methods, hypothesis testing, dimension reduction, and correlation with behavior. Data types include electrophysiological recording, electroencephalography (EEG), magnetoencephalography (MEG), functional Magnetic Resonance Imaging (fMRI) and optical imaging.

490 Special Problems in Neuroscience
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. A student may earn a maximum of 15 credits A student may earn a maximum of 15 credits in NEU 490 and NEU 492. P: (PSY 101 and NEU 301) and (STT 201 or STT 231 or STT 421) RB: NEU 302 and NEU 311L R: Open to juniors or seniors. Approval of department.
Students work under the direction of a faculty member on a selected research problem.

492 Special Topics in Neuroscience
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. A student may earn a maximum of 15 credits A student may earn a maximum of 15 credits in NEU 490 and NEU 492. RB: PSY 101 R: Open to sophomores or juniors or seniors. Approval of department.
Current topics proposed by faculty that supplement regular course offerings.

800 Neuroscience Research Forum
Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 8 credits in all enrollments for this course. RB: Bachelor's degree in neuroscience, biological or psychological science, or related area.
Readings, presentations, and discussions of research literature in neuroscience. Professional development.

804 Molecular and Developmental Neurobiology
Fall. 3(3-0) Interdepartmental with Integrative Biology and Pathobiology and Diagnostic Investigation and Pharmacology and Toxicology and Psychology. Administered by Neuroscience. RB: Bachelor's degree in a Biological Science or Psychology. R: Open to graduate students in Neuroscience major.
Nervous system specific gene transcription and translation. Maturation, degeneration, plasticity, and repair in the nervous system.

807 Strategies in Neuroscience Research
Fall. 2(2-0) RB: PHM 827 R: Open to graduate students in the Neuroscience Major.
Methods and underlying principles of neuroscience research.

811 Advanced Behavioral Neuroscience
Spring. 3(3-0) Interdepartmental with Psychology. Administered by Psychology. RB: (PSY 411) or approval of department. R: Open only to graduate students in the Psychology major or Neuroscience major.
Biological mechanisms involved in learning and memory, motivated behaviors, biological rhythms, and psychopathologies.

827 Physiology and Pharmacology of Excitable Cells
Fall. 4(4-0) Interdepartmental with Integrative Biology and Pharmacology and Toxicology and Physiology. Administered by Pharmacology and Toxicology. R: Open to graduate students in the College of Natural Science or in the Department of Pharmacology and Toxicology or approval of department.
Function of neurons and muscle at the cellular level: membrane biophysics and potentials, synaptic transmission, sensory nervous system function.

832 Evolution of Nervous Systems
Spring of odd years. 3(3-0) Interdepartmental with Integrative Biology. Administered by Integrative Biology. RB: Background in neurobiology or evolutionary biology recommended. R: Open to graduate students in the Department of Computer Science and Engineering or in the Department of Integrative Biology or in the Program in Neuroscience or in the Department of Psychology or approval of department. SA: ZOL 832
Evolutionary origins, mechanisms, and consequences of evolutionary change in nervous systems.

839 Systems Neuroscience
Spring. 4(4-0) Interdepartmental with Human Anatomy and Pharmacology and Toxicology and Physiology and Psychology and Zoology. Administered by Neuroscience. R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Agriculture and Natural Resources, Natural Science, Social Science, and Veterinary Medicine. SA: ANT 839
Anatomy, pharmacology, and physiology of multicellular neural systems. Sensory, motor, autonomic, and chemo-regulatory systems in vertebrate brains.

840 Social, Cognitive, and Affective Neuroscience
Fall. 3(3-0) Not open to students with credit in NEU 839 or NEU 841.
Introduction to nervous system structure and function aimed at students and professionals with limited biological science background.

841 Medical Neuroscience
Fall. 3(3-0) RB: Undergraduate degree in the biological sciences Not open to students with credit in NEU 839.
Detailed survey of nervous system structure and function with an emphasis on medical applications

842 Neuroethics
Summer. 2(2-0) RB: (NEU 840 or concurrently) or (NEU 841 or concurrently)
Introduction to the field of neuroethics and the responsible application of advances in neuroscience research.

843 Methods for Assessing the Nervous System
Spring. 2(2-0) RB: (NEU 840 or concurrently) or (NEU 841 or concurrently)
Introduction to the various techniques and methods used to study brain structure and function.

844 The Science and Ethics of Brain Interventions
Summer. 2(2-0) RB: (NEU 840 or concurrently) or (NEU 841 or concurrently)
Introduction to cognitive enhancement to improve intellect and cognition, and legal and ethical implications of this.

845 Neuroscience of Drug Use and Human Disorders
Spring. 3(3-0) RB: NEU 840 or concurrently
Introduction to the neurochemical basis of human disorders and how drugs are used to treat these disorders.

846 Neurobiology of Nervous System Disorders
Spring. 3(3-0) RB: NEU 841 or concurrently
Overview of abnormalities that contribute to central nervous system, peripheral nervous system, and psychological diseases and disorders examined at genetic, cellular, and behavioral levels.

847 Development of the Nervous System
Fall. 3(3-0) RB: NEU 841 or concurrently
Introduction to processes involved in the development of the nervous systems and their clinical application.

848 Foundations of Law and Legal Research
Fall, Spring, Summer. 2(2-0) R: Open to graduate students in the Program in Neuroscience. Approval of department. Not open to students with credit in LAW 807A.
Introduction to the American legal system with focus on legal research and communication needs of nonlawyers

890 Independent Study in Neuroscience
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. RB: Bachelor's degree in neuroscience, biology, psychology, or related area.
Supervised student research on a specialized research topic in basic or clinical neuroscience.

892 Special Topics in Neuroscience and the Law
Fall. 1 to 3 credits. A student may earn a maximum of 4 credits in all enrollments for this course. RB: NEU 840 or concurrently
Topics in which the field of neuroscience and the legal system intersect

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 36 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
Master's thesis research.

992 Advanced Topics in Neuroscience
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. RB: (NEU 804 and NEU 811 and NEU 827) and Bachelor's degree in neuroscience, biology, psychology or related area.
Readings, presentations and discussion of specialized topics in neuroscience.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course.
Doctoral dissertation research.