Program in Neuroscience
College of Natural Science

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 Neurobiology. P: (BS 162 or LB 145 or BS 182H) and (BS 161 or LB 145 or BS 181H) RB: 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 Program in Neuroscience or in the Lyman Briggs Neuroscience Coordinate Major.
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 Lyman Briggs College or in the College of Natural Science or in the Program in Neuroscience.
Survey of brain-based behavioral and cognitive systems and related human diseases.

304 Neuroanatomy
Summer. 3(3-0) Summer: Florence, Italy and England. P: Completion of Tier I Writing Requirement R: Not open to freshmen. Approval of department; application required.
Structure and basic function of human nervous system, including the influence of art and cultural values on neuroanatomical knowledge throughout history.

306 History of Neuroscience
Summer. 3(3-0) Summer: Florence, Italy and England. P: Completion of Tier I Writing Requirement R: Not open to freshmen. Approval of department; application required.
Specific topics in the history of neuroscience with an emphasis on the influence of cultural values on theories and discoveries.

307 Topics in History of Neuroscience (W)
Summer. 3(3-0) Summer: Florence, Italy and England. P: Completion of Tier I Writing Requirement R: Not open to freshmen. Approval of department; application required.
Independent library research and group tutorial work aimed at critical analysis of the role that cultural values and historical events played in the specific topic investigated.

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) 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.

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 202 or STT 202L or STT 242 or PSY 295) R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Coordinate Major.
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.

402 Behavioral and Cognitive Neuroscience
Fall, Spring. 3(3-0) P: NEU 301 and NEU 302 R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Coordinate Major.
In-depth examination of neuronal mechanisms that regulate behavior, learning, cognition, and human disease.

403 Communication in Neuroscience (W)
Fall. Spring. 3(3-0) P: (NEU 301 and NEU 302) and completion of Tier I writing requirement R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Coordinate Major.
In-depth exploration of contemporary areas of neuroscience, emphasizing scientific literacy and effective written and oral communication.

415 Neuroinformatics and Quantitative Reasoning
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) R: Open to undergraduate students in the Neuroscience Major or in the Lyman Briggs Neuroscience Coordinate Major.
Quantitative reasoning and statistical methods for querying internet databases and understanding basic neuroscience models.

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 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 or in the Lyman Briggs Neuroscience Coordinate Major.
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.
Role of genes in brain development and function. Issues in behavioral and psychiatric genetics.

435 Ion Channels of Excitable Membranes
Fall. 3(3-0) Interdepartmental with Integrative Biology. 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.

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 or in the Lyman Briggs Zoology Coordinate 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.

Current topics proposed by faculty that supplement regular course offerings.

450 The Autonomic Nervous System
Fall. 3(3-0) P: (NEU 301) and (IPSL 310 or concurrently) or (PSL 431 or concurrently) R: Open to undergraduate students in the Neuroscience Major. Examination of the functional anatomy and physiology of the three autonomic nervous systems (enteric; parasympathetic; sympathetic)

455 Pharmacology of Drug Addiction
Spring. 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.

460 Current Approaches in Molecular and Cellular Neuroscience
Spring. 3(3-0) P: (NEU 301) and (IPSL 310 or concurrently) or (PSL 431 or concurrently) R: Open to undergraduate students in the Neuroscience Major. Investigation of the molecular and cellular pathways that allow neurons to connect and communicate, including the latest tools and technologies used to understand how complex molecular machinery within neuronal membranes interact with electrical potentials.

470 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) R: 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.

475 Special Topics in Neuroscience
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 in NEU 490 and NEU 492. R: PSY 101 R: Open to sophomores or juniors or seniors in the Neuroscience Major or in the Lyman Briggs Neuroscience Coordinate Major. Approval of department.

Current topics proposed by faculty that supplement regular course offerings.

490 Neuroscience Senior Research Thesis
Fall, Spring, Summer. 1 to 3 credits.
On Demand. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course, P: (NEU 490) and completion of Tier I writing requirement R: Open to seniors in the Neuroscience Major. Approval of department.

Independent research mentored by a neuroscience faculty member and conducted in their laboratory.

495 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.

800 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 Biological Science or Psychology. R: Open to graduate students in the Program in Neuroscience. Approval of department. Nervous system specific gene transcription and translation. Maturation, degeneration, plasticity, and repair in the nervous system.
**811 Advanced Behavioral Neuroscience**  
Spring, 3(3-0) Interdepartmental with Psychology. Administered by Psychology. **R:** (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.

**815 Neuroinformatics and Quantitative Reasoning**  
Fall, 3(3-0) **R:** Open to graduate students in the Medical Neuroscience Graduate Certificate or in the Neuroscience Major or in the Neuroscience-Environmental Toxicology Major. Approval of department. Quantitative reasoning and statistical methods for querying internet databases and understanding basic neuroscience models for graduate students.

**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. **R:** 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 Integrative Biology and Pharmacology and Toxicology and Physiology. Administered by Neuroscience. **R:** Open to graduate students or human medicine students or osteopathic medicine students in the College of Natural Science or in the College of Agriculture and Natural Resources or in the College of Human Medicine or in the College of Osteopathic Medicine or in the College of Social Science or in the College of 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) **R:** 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, Spring, 3(3-0) **R:** Undergraduate degree in the biological sciences **R:** Not open to doctoral students in the Program in Neuroscience. **R:** Not open to students with credit in NEU 802. Detailed survey of nervous system structure and function with an emphasis on medical applications.

**842 Neuroethics**  
Summer, 3(3-0) **R:** (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, 3(3-0) **R:** (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) **R:** (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) **R:** 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**  
Summer, 3(3-0) **R:** 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) **R:** NEU 841 or concurrently  
Introduction to processes involved in the development of the nervous systems and their clinical application.

**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. **R:** 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. **R:** NEU 840 or concurrently  
Topics in which the field of neuroscience and the legal system intersect.