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2018

# B.B. Behavioral Neuroscience 2018

Nova Southeastern University

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## Curriculum B. S. Behavioral Neuroscience 2018

The Behavioral Neuroscience major focuses on the biological basis of behavior by exploring the role of the nervous system in normal and abnormal behavior, thought, and emotion. It uses a multidisciplinary approach to study the organization and function of the nervous system, from the molecular to the behavioral level, in such areas as development, sensation and perception, cognition, learning and memory, movement, sleep, stress, aging, and neurological and psychological disorders. The major provides students with a program of study that prepares them to pursue entry-level positions in such areas as biomedical research and the pharmaceutical industry or graduate education in such disciplines as neuroscience, psychology, pharmacology, medicine, and neurobiology.

### Learning Outcomes

A successful behavioral neuroscience graduate is expected to:

1. Demonstrate a foundation of knowledge in behavioral neuroscience;
2. Demonstrate the ability to independently develop a research proposal and evaluate the application and limitations of various methodologies;
3. Demonstrate the ability to communicate research findings from the field of behavioral neuroscience.

### Curriculum Requirements

#### General Education Requirements (30 credits)

Students are required to complete 30 credit hours as part of the [General Education Program](#).

#### Behavioral Neuroscience Major Requirements (57 credits)

Required Courses (45 credits)

##### **BIOL 1500 - Biology I/Lab (4 credits)**

An introduction to the biological sciences for students interested in pursuing a career in this area. Includes subcellular and cellular organization, structures/function, biochemistry, classical/molecular genetics, and population dynamics - all arranged around evolution as a major theme. Includes laboratory sessions. **Prerequisites:** MATH 1040 or higher and COMP 1000 or higher.

##### **BIOL 4340 - Cellular and Molecular Biology (3 credits)**

Molecular and biochemical basis of cell structure and function. Topics covered include modern methods for studying cells; cell architecture, growth and divisions; structure and expression of prokaryotic and eukaryotic genes; chromosome structure; development; immune system and cancer biology. This course does not include laboratory sessions. **Prerequisites:** BIOL 1500 and CHEM 1310 or CHEM 1310H or CHEM 2310.

CHEM 1300 - General Chemistry I/Lab (4 credits) OR CHEM 1300H - General Chemistry I/Lab Honors (4 credits)

##### **CHEM 1300 - General Chemistry I/Lab (4 credits)**

This course and the related lab is the first part of a two-semester sequence that studies the laws, principles and theories of atomic structure, molecular structure and bonding, stoichiometry, states of

matter/solutions, energetics, oxidation reduction, and laboratory chemistry, including their applications. **Prerequisite:** MATH 1200.

### **CHEM 1300H - General Chemistry I/Lab Honors (4 credits)**

This course and the related lab is the first part of a two-semester sequence that studies the laws, principles and theories of atomic structure, molecular structure and bonding, stoichiometry, states of matter/solutions, energetics, oxidation reduction, and laboratory chemistry, including their applications. **Prerequisites:** MATH 1200; Honors students only.

CHEM 1310 - General Chemistry II/Lab (4 credits) OR CHEM 1310H - General Chemistry II/Lab Honors (4 credits)

### **CHEM 1310 - General Chemistry II/Lab (4 credits)**

This course and the related lab is the second part of a two-semester sequence that studies atomic structure, molecular structure and bonding, states of matter/solutions, dynamics (kinetics and thermodynamics), equilibrium, electrochemistry, and laboratory chemistry including their applications. **Prerequisite:** CHEM 1300 OR CHEM 1300H.

### **CHEM 1310H - General Chemistry II/Lab Honors (4 credits)**

This course and the related lab is the second part of a two-semester sequence that studies atomic structure, molecular structure and bonding, states of matter/solutions, dynamics (kinetics and thermodynamics), equilibrium, electrochemistry, and laboratory chemistry including their applications. **Prerequisite:** CHEM 1300 or CHEM 1300H. Honors students only.

MATH 2100 - Calculus I (4 credits) OR MATH 2100H Calculus I Honors (4 credits)

### **MATH 2100 - Calculus I (4 credits)**

Functions, limits, and derivatives of algebraic functions. Introduction to derivatives of trigonometric functions, logarithmic functions; application of derivatives to physics problems; related rates and maximum/minimum problems, and definite and indefinite integrals with applications. This course has been exempted from the requirements of the Writing Across the Curriculum policy. **Prerequisite:** Challenge examination or MATH 1250.

### **MATH 2100H - Calculus I Honors (4 credits)**

Functions, limits, and derivatives of algebraic functions. Introduction to derivatives of trigonometric functions, logarithmic functions; application of derivatives to physics problems; related rates and maximum/minimum problems, and definite and indefinite integrals with applications. This course has been exempted from the requirements of the Writing Across the Curriculum policy. **Prerequisites:** Challenge examination or MATH 1250; Honors students only.

### **NEUR 2500 - Introduction to Neuroscience/Lab (4 credits)**

This course highlights the biological structures and functions of the brain and nervous system and introduces the fundamental concepts in neuroscience and research methods used by behavioral neuroscientists. Concepts range from cellular to behavioral aspects of neuroscience.

### **NEUR 2600 - Introduction to Neuroanatomy (3 credits)**

This course will introduce students to structural, functional, and developmental features of the human nervous system. After each major structure, system, or anatomical pathway is presented, a clinical component will emphasize normal function and dysfunction resulting from injury or disease. Clinical cases will be presented to reinforce the relationship between structure and function. **Prerequisite:** NEUR 2500.

### **NEUR 2700 - Research Methods and Data Analysis in Behavioral Neuroscience/Lab (4 credits)**

This course will introduce students to a wide range of research strategies and methods being used by behavioral neuroscientists. The course will focus on modern, common techniques used in hypothesis-driven research to collect scientifically relevant and publishable data. Examples from various areas of inquiry (e.g., learning and memory, sleep, etc.) will be used to illustrate both applications and limitations of these techniques. **Prerequisite:** NEUR 2500.

### **NEUR 3000 - Behavioral Genetics (3 credits)**

This course provides an overview of the role of genes in animal (primarily human) behavior. Topics covered include population genetics and quantitative genetics of behavior, the molecular biology of gene discovery, and the evolution of behavioral traits. Methods and research techniques in behavioral genetics will also be covered ranging from twin and adoption studies to molecular techniques. **Prerequisite:** NEUR 2500.

### **NEUR 4880 - Senior Seminar in Behavioral Neuroscience (3 credits)**

Students will have the opportunity to integrate information from a variety of specialties in behavioral neuroscience. Each seminar will have a focal theme that will allow students to gain new perspectives, as well as apply knowledge from prior courses and experiences. This course is presented as a capstone experience; therefore students with advanced standing in the behavioral neuroscience major will benefit the most from the seminar. **Prerequisite:** NEUR 2700.

PSYC 1020 - Introduction to Psychology (3 credits) *OR* PYSC 1020H Introduction to Psychology Honors (3 credits)

### **PSYC 1020 - Introduction to Psychology (3 credits)**

An introduction to theory, research, and applications in the field of psychology. Topics include biological bases of behavior, perception, learning and memory, psychological development, personality, social psychology, and the identification and treatment of mental illness.

### **PYSC 1020H - Introduction to Psychology Honors (3 credits)**

An introduction to theory, research, and applications in the field of psychology. Topics include biological bases of behavior, perception, learning and memory, psychological development, personality, social psychology, and the identification and treatment of mental illness. **Prerequisite:** Honors students only.

**Select 6 credits from the following courses:**

### **NEUR 3100 - Developmental Neuroscience (3 credits)**

This course provides an overview of the progressive stages of neural development. The course will focus on molecular aspects of developmental neuroscience, with an emphasis on known signaling pathways involved in neural growth and specification. Current research in several fields such as growth cone guidance and collapse, activity dependent development, and applications of these to injury and disease will be discussed. **Prerequisite:** NEUR 2500.

### **NEUR 3200 - Drugs and the Brain (3 credits)**

This course provides a foundation in neuropharmacology. Topics covered include the impact of psychotropic drugs on the nervous system, basic principles of pharmacodynamics and pharmacokinetics, synaptic transmission, and an overview of brain structure and function. **Prerequisite:** NEUR 2500.

### **NEUR 4100 - Neurobiology of Disease (3 credits)**

This course is based on the National Institutes of Health Blueprint for Course Development in the Neurobiology of Disease. This course provides a lecture and literature based overview of

neurodegenerative diseases and disorders. The course will focus on basic genetic, molecular, and cellular mechanisms that underlie a wide range of neurodegenerative diseases and disorders. The course is designed to foster an understanding of the links between basic science, disease-oriented research, and translational research. The course offers a foundation of knowledge in critical areas of basic and clinical neuroscience. **Prerequisites:** NEUR 2500.

### **NEUR 4990 - Independent Study in Neuroscience (3 credits)**

### **Major Electives (12 credits)**

Select 12 credits from the following courses:

#### **BIOL 4200 - Neurobiology (3 credits)**

This course is an introductory survey that covers nerve function from the molecular level to behavior. The objective is to give the advanced student in the biological sciences insight into fundamental mechanisms of nervous integration. The instructional format will consist of lectures, discussion groups, computer simulations, and guest lectures by practicing neuro-scientists. **Prerequisite:** BIOL 3312 or BIOL 3320 or NEUR 2500.

#### **CHEM 3650 - Biochemistry/Lab (4 credits)**

The chemical properties of amino acids, monosaccharides, lipids and nucleotides are discussed. The structure of proteins, carbohydrates and biological membranes are studied. Mechanisms of enzymatic catalysis are outlined in detail with an emphasis on the structure/function of cofactors. Glycolysis and citric acid cycle are described. Electron transport and ATP synthesis are discussed in both mitochondria and chloroplasts. Metabolism of lipids, amino acids and nucleotides are presented. In addition to mechanistic studies of biochemical pathways and cycles, regulation of these processes is also covered. **Prerequisites:** BIOL 1500 and CHEM 2200 or CHEM 2410 or CHEM 2410H.

PHIL 3180 - Biomedical Ethics (3 credits) *OR* PHIL 3220 - Philosophy of Science (3 credits)

#### **PHIL 3180 - Biomedical Ethics (3 credits)**

This course provides an introduction to moral reasoning through a philosophical examination of major problems in biomedical ethics, such as abortion, euthanasia, allocation of resources, medical experimentation, genetic engineering, confidentiality, among others. Students will be introduced to the idea that ethical problems are largely a matter of reason; that progress toward solutions can be gained through an application of normative ethical (philosophical) theory. **Prerequisite:** COMP 2000, COMP 2010 or COMP 2020 or COMP 2000H.

#### **PHIL 3220 - Philosophy of Science (3 credits)**

A study of the conceptual foundations of modern science. The course focuses on the philosophical analysis of scientific method and its basic concepts and assumptions. **Prerequisite:** COMP 2000, 2010, or 2020 or COMP 2000H.

#### **PHYS 2350 - Physics I/Lab (4 credits)**

First of a two-part series covering mechanics, thermodynamics, vibrations, and waves. Includes laboratory sessions. This course has been exempted from the requirements of the Writing Across the Curriculum policy. **Prerequisite:** MATH 1250 or MATH 2100 or MATH 2100H.

#### **PHYS 2360 - Physics II/Lab (4 credits)**

Second of a two-part series covering electricity and magnetism, optics, and modern physics. Includes laboratory sessions. This course has been exempted from the requirements of the Writing

Across the Curriculum policy. **Prerequisites:** PHYS 2350 and either MATH 1250 or MATH 2100 or MATH 2100H.

### **PSYC 3900 - Neuropsychology (3 credits)**

This course will introduce students to higher cognitive functioning including language, memory and executive functioning. Neurological syndromes associated with damage to specific brain areas will be discussed along with their behavioral manifestations. Additionally, cerebral asymmetry and sex differences in brain organization will be introduced. This course will conclude with a review of neuropsychological instruments. **Prerequisite:** PSYC 1020 or 1020H.

### **PSYC 3920 - Sensation and Perception (3 credits)**

This class will cover the fundamentals of the sensory world, such as taste, touch, vision, hearing and extrasensory phenomenon. Students in sensation and perception will explore the value of each sense in the perceptual world and will be encouraged to consider what life would be like without each sense. Perceptual illusions will be employed in order to encourage students to delve into the neural underpinnings of sensory perception. Through studying the pathways from sensations to perceptions, students will gain an appreciation of the fragility of perceptions. **Prerequisite:** PSYC 1020 or 1020H.

### **PSYC 4300 - Psychophysiology (3 credits)**

This course is designed to introduce students to the field of psychophysiology, with a focus on human psychophysiology and physiological measures of emotion and cognition. Students in this course will examine the theory of psychophysiology as well as common psychophysiological techniques. **Prerequisite:** PSYC 1020 or 1020H.

### **PSYC 4400 - Hormones and Behavior (3 credits)**

Students in Hormones and Behavior will develop an understanding of the many topics related to behavioral endocrinology. This course will review the interrelationships among the major classes of hormones, brain and behavior. **Prerequisite:** PSYC