Course Description:
This course will introduce you to the structures, systems, methods, and theories that enable the nervous system to control normal and abnormal human behavior. This course will cover a range of topics. On the practical side, you will learn the essential elements of neuroanatomy and neurophysiology that provides a basic introduction to neurons, brain organization, and functional specialization of brain structures related to language, learning, memory, pain, reward and sensory/motor systems. We will also investigate how the nervous system is influenced and controlled by bioactive substances including natural stressors and hormones, pharmacological therapeutics and recreational drugs. We will end with an examination of neurological disorders and some of its treatments.

Reading Assignments:
There is no required textbook for this course. However, if you wish to reinforce concepts discussed in lecture, I recommend the following textbook:
Textbook page references are given on Blackboard for each lecture. Material covered in the textbook that is not addressed in lecture will NOT appear on exams.
A copy of this textbook is on reserve in Snell Library.

Several case studies will come from:
Fractured Minds: A Case-Study Approach to Clinical Neuropsychology / Ogden (2005)
These will be provided as PDFs on Blackboard.

Additional readings, animations, and interactive websites to accompany the lecture material are posted on Blackboard. Please check Blackboard regularly to stay up-to-date with readings.

Class Format:
This course will consist primarily of in-class lectures. A much as possible, I will find ways to make your time in class productive and engaging. Please come prepared to participate. Whenever possible, material will be presented in the form of case studies in order to examine and consolidate material in a more thoughtful and discussion stimulating manner.

My lecture slides will be posted on Blackboard by 9AM before class to help with your note taking. I record my lectures (see “Tegrity Classes” on Blackboard) and make them available so you can refer back to them when studying or so you can watch them at home in the event that you miss class. However, this is NOT an online class so watching the recorded lectures in lieu of attending class on a regular basis is not advisable. Unexpected computer issues might arise so I cannot guarantee that each lecture will be recorded. If you miss class, Blackboard is your source to find out what you missed and how you should prepare for the next class.

Peer tutoring:
Students requiring additional help are advised to come to my office hours (see above) with questions.
Peer tutoring is also available through the Peer Tutoring Program (http://www.northeastern.edu/csastutoring/).
**Evaluation Format:**
Your grade will be based on work during the semester in the following proportions:

3 EXAMS worth 33% each.
Exam 1 will be on Monday, Feb 9\(^{th}\).
Exam 2 will be on Thursday, Mar 19\(^{th}\).
Exam 3 will be on Thursday, Apr 16\(^{th}\).
Exams are non-cumulative in topic but knowledge of fundamental concepts covered earlier in the semester will be assumed.

**No make up exams will be offered during the semester. In the event of a health or personal emergency, 1 missed exam can be made up by taking the cumulative exam during Finals week.**

Exam format will consist of:
- multiple choice
- fill-in the blank
- matching
- problem solving
- true/false

If you are satisfied with your exam scores, you are NOT required to take the cumulative exam during Finals week. If you take all 3 exams AND the final, I will drop your lowest exam. Please note, the final is scantron only but CUMULATIVE. Requests for extra credit work cannot be granted.

Grades will be on the ABCDF scale with +/- grades. It is anticipated that letter grades for this course will be assigned according to the scale below, although these grade cutoffs may be lowered at my discretion. They will NOT be raised.

- A's (90-100%)
- B's (80-89.9%)
- C's (70-79.9%)
- D's (60-69.9%)
- F (below 60%)

**Academic Integrity and violations thereof:**
Honesty in academic work is expected of all students. Academic dishonesty is a very serious offense, recognized by the students themselves in the Academic Integrity Policy (http://www.northeastern.edu/osccr/academic-integrity-policy/), and renders the offender liable to disciplinary action. Students caught violating academic policy will be penalized according to the severity of the offense. Possible penalties range from grade reduction on the particular exam to grade reduction or failure for the entire course.

This course follows the College of Science Academic Course Policies, which are viewable at this link: http://www.northeastern.edu/cos/wp-content/uploads/2014/11/Northeastern-COS-Policies-Template.pdf

**Students with Disabilities:**
Accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resources Center.
TOPICAL OUTLINE

BIOLOGICAL PSYCHOLOGY – PSYC 3458

BLOCK 1. The Cellular Basis of Behavior.
• The Pseudoscience of Phrenology and a Brief History of the Brain.
• Genetics in a Nutshell and Other Essential Building Blocks of Biology (Central Dogma).
• How Protein Structure Affects Function.
• How Organelles are Specialized in Neurons.
• Neuron Doctrine versus Reticular Theory.
• Law of Dynamic Polarization.

• The Chemistry of Lipids.
• Why the Phospholipid Bilayer is a Problem for Ions.
• Passive Diffusion versus Active Transport.
• The Semi-Permeable Membrane.
• The Nernst Equation and the Goldman Equation.
• The Ionic Basis of a Neuron’s Resting Potential.

• The Electrically Excitable Domain.
• The Action Potential Explained.
• Functions of the Sodium Channel.
• Functions of the Potassium Channel.
• Factors Affecting Action Potential Conduction Speed.
  • Case Study of Multiple Sclerosis, a Demyelinating Disease.
• The Importance of Poisons and Toxins.

• The Chemically Excitable Domain.
• Summation and Integration.
• Functions of the Calcium Channel.
• Acetylcholine and Glutamate - Excitatory Neurotransmitters.
• Gamma-Amino Butyric Acid (GABA) and Glycine - Inhibitory Neurotransmitters.
• Learning and Memory - Habituation and Sensitization of a Behavior.
• Learning and Memory - Hebb’s Postulate and NMDA Receptors.

EXAM 1 (Monday, Feb 9th)
BLOC 5. The Spinal Cord and Brain.
• Peripheral and Central Nervous Systems.
• Orientation and Gross Subdivisions of the Brain.
• Functional Role of the Different Lobes in Your Brain.
• Integrative Circuits in the Spinal Cord for Sensory and Motor Responses.
• Reflex Arcs.
• Ventricles. Meninges and the Blood Brain Barrier.

BLOC 6. Pleasure and Pain.
• Limbic System.
• Is There a “Pleasure Circuit” in the Brain?
• The Role of Dopamine in Reward Pathways.
• Ascending Nociceptor Systems and Substance P.
• Descending Analgesia Systems.
• Top-down vs. Bottom-up Approaches to Understanding Pain Perception.
  Related Popular Movie: Cake (2015)
• The Mechanism of Opioid Peptide Action on Pain Transmission.

BLOCKS 7 & 8. Sensory Systems.
• Common Functions of Sensory Neurons.
• The Role of Inhibition in Sensory Networks.
• Somatosensory System – Homunculus.
• Auditory System and Mechanoreceptors.
• Breakdown of Language – Case Studies of Aphasia.
• Vision – Case Study of Visual Agnosia.
• Olfaction.
• Sensory Mix-ups – the McGurk Effect and Synesthesia.

EXAM 2 (Thursday, Mar 19th)
BIOLOGICAL PSYCHOLOGY – PSYC 3458

BLOCK 9. Dopamine Dysregulation and Disease.
- The Importance of the Basal Ganglia.
- How Too Little Dopamine can Lead to a Motor Disease – Case Study of Parkinson’s.
  Related Popular Movies: Awakenings (1990)
- The Dopamine Hypothesis of a Disease of Thought and Emotion – Case Study of Schizophrenia
  Related Popular Movies: A Beautiful Mind (2001); Clean, Shaven (1993)

BLOCK 10. Other Neurological Conditions.
- The Genetics of Huntington’s Disease.
- Structural Abnormalities – Case Study of Alzheimer’s Disease.
- Epilepsy and Seizures.
- Memory Consolidation and Amnesia - the Case Study of Patient H.M.

BLOCK 11. Psychopharmacology.
- Agonists and Antagonists.
- Pharmacokinetics.
- Addiction, Tolerance, and Withdrawal.
- Central Nervous System Depressants.
- Central Nervous System Stimulants.
- The GABA Receptor Complex.
- Hallucinogens.

BLOCK 12. Hormones and Behavior.
- Hormones as Circulating Signaling Molecules Produced by Endocrine Glands.
- Steroid Hormones as Nuclear Receptors.
- Genomic (slow) and Non-genomic (rapid) Effects of Steroids on the Nervous System.
- Organizational and Activational Effects of Steroids.
- Hormone Extirpation and Replacement Technique.
- Sex Differences in Brain and Behavior Including Drug Addiction and Depression.

EXAM 3 – (Thursday, Apr 16th)