Biological Psychology

Instructor: Jamie G. Bunce, PhD
Email: j.bunce@neu.edu *Email is the best way to reach me.
Phone: 617-373-6327
Office hours: Tuesday 9:30-11:30AM; Wednesday 12-1PM; Thursday 9:30-10:30AM & 2:00-3:00PM; Friday 10:30-11:30AM and by email appointment.
Office: 382 Nightingale Hall (Please use the black phone at the entrance to the 3rd floor to dial my extension [x6327] and I will escort you to the office).
Class: PSYC 3458, CRN 17874, Section 2; T&F 1:35-3:15PM; Shillman Hall, Room 335.
Prerequisites: PSYC 1101

Course Description:
We will explore the structures and systems of the brain and how these relate to behavior as well as the methods and theories which provide insight into biobehavioral processes. This course will cover a variety of topics ranging from cellular processes to the emergent function of neural systems. We will also investigate how the nervous system is affected by substances including hormones, pharmacological therapeutics and recreational drugs. We will end with an examination of neurological disorders and their treatment.

Learning Outcomes:

- Students should be able to state examples of theoretical perspectives and major findings across broad areas of neuroscience, e.g., anatomical, behavioral, developmental, clinical, comparative, and computational.
- Students should be able to demonstrate a depth of knowledge in self-selected areas of study in behavioral neuroscience and develop testable research questions based upon this knowledge.
- Students should be able to relate behavioral neuroscience with other disciplines, e.g., computer science, theoretical physics, health sciences, sport and society, sociology.

Class Web Site: Class documents, assignments, grades, and resources will be available on our Blackboard site, which also includes communication tools for the class. Check Blackboard regularly for updates and announcements.

Reading Assignments: There is no required textbook for this course. If you wish to have a resource to reinforce what we cover in class, 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 will be on reserve in the Snell Library.
**Top Hat:** See the Class Format section for description. Top Hat is a cloud based interactive lecture tool which I will use to take attendance, gather your feedback and pose questions each class period. Each question will be weighted 50% for accuracy and 50% for participation. Classroom questions can be completed only during lecture and there will be no make-ups for missed classes. Throughout the class, I will have a Top Hat Discussion open for any questions that arise. I will do my best to monitor open questions/feedback and answer/address the issue during class, after class via email, or revisit these topic during the next class.

**Class Format:** This course will consist of in-class lectures covering topics and concepts. Throughout the semester we will incorporate active learning sessions to discuss topics at hand or work on questions posed to the class. When applicable we will use case studies from the medical and scientific literature to frame concepts in the field of biopsychology. Information on case studies will be provided on Blackboard. To make lectures more engaging and to encourage participation and attendance, interactive questions will be posted to Top Hat which you will answer on your smart phone, laptop or tablet device during each class. You will receive an invitation to join our class Top Hat ($24 per semester or $72 for 5 year subscription).

My lecture slides will be posted on Blackboard before class to help with note taking.

**CO-OP:** If, at any time, we are covering a topic that is relevant or related to your co-op experience (or one you are planning to do), please share your experience and/or insight with the class.

**Grading:**

Exams: 3 @ 25% each  
Quizzes: 5 @ 4% each (6 quizzes will be given and the lowest score dropped)  
Attendance & Participation: 5% (if you have > 90% attendance you get 100%).

Exam and quiz format may consist of: Multiple choice (scantron), Fill-in the blank, Matching, Problem Solving, True/False and short answer questions. Exams will account for 75% of your final grade.

Quizzes are designed to encourage you to regularly review your notes as well as assess the effectiveness of my lectures. Quizzes will be given at the beginning of class and should take no more than 30 minutes to complete. No make up quizzes will be given. We will have 6 quizzes over the course of the semester and I will drop the lowest quiz score. Quizzes will account for 20% of your final grade.

Grades will be on the ABCDF scale with +/- modifiers. It is anticipated that letter grades for this course will be assigned to the scale below.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td>90-92</td>
<td>3.6</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Course Policies:

This course follows the College of Science Academic Course Policies, which are viewable at this link:


Exam Policy: Students will only be allowed to use the following materials during an exam: writing utensils, plain white scrap paper, and a basic calculator (if necessary). Students will not be allowed to use text books, notes, cell phones, e-readers, tablets or laptops during the exam period. Students caught with any of these materials with receive and automatic zero for the exam. Students will have the allotted class time to complete exams. Exams will primarily cover material from the current period, though knowledge of fundamental concepts covered earlier in the semester will be assumed. Make up exams can be scheduled should you have an unavoidable health or personal emergency. Only one make up exam per student per semester will be offered. Please contact me as soon as possible if you have a conflict with an exam so we can make the appropriate accommodations for you.

Cell Phone Policy: If there is a problem or emergency please excuse yourself and step outside of the classroom to take or make a phone call. Students who are disruptive during the class period will be warned, and receive a 2% deduction from your final grade for each time the instructor needs to address you after the first warning.

Getting Help: Come to my office hours; make an appointment to see me at another time; email me with questions.

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 via this link:

http://www.northeastern.edu/undergraduate/mentoring-advising/

Statement on Academic Integrity: I adhere to Northeastern’s Policy on academic integrity:

http://www.northeastern.edu/osccr/academic-integrity-policy/
Academic dishonesty is a serious offense and renders the offender liable to disciplinary action. Students caught violating the policy will be penalized according to the severity of the offense. Possible penalties range from grade reduction to failure of the course.

**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 (DRC), 20 Dodge Hall (x2675).

**TOPICAL OUTLINE BIOLOGICAL PSYCHOLOGY – PSYC 3458 CRN 17874**

In the event that class is canceled, all due dates (e.g., exams, quizzes) will be shifted to the next class.

**BLOCK 1. The Cellular Basis of Behavior**

9/11
The Pseudoscience of Phrenology and a Brief History of the Brain pg 14-20
Neuron Doctrine versus Reticular Theory pg 24-33
Law of Dynamic Polarization pg 59-89

9/15
Genetics in a Nutshell and Other Essential Building Blocks of Biology (Central Dogma) pg 157-184
How Protein Structure Affects Function.
How Organelles are Specialized in Neurons pg 24-25

**BLOCK 2. Communication Among Neurons: The Membrane Potential**

9/18
The Chemistry of Lipids
Why the Phospholipid Bilayer is a Problem for Ions
Passive Diffusion versus Active Transport pg 59-63

9/22 Quiz 1
The Semi-Permeable Membrane pg 59-89
The Nernst Equation and the Goldman Equation pg 63
The Ionic Basis of a Neuron’s Resting Potential pg 60-63


9/25
The Electrically Excitable Domain pg 73-75
The Action Potential Explained pg 63-71
Functions of the Sodium Channel pg 65-68

9/29
Functions of the Potassium Channel pg 65-68
Factors Affecting Action Potential Conduction Speed pg 68-71
Case Study of Multiple Sclerosis, a Demyelinating Disease pg 33, 200
The Importance of Poisons and Toxins pg 77-81

BLOCK 4. Communicating Among Neurons: The Synaptic Potential
10/2 Quiz 2
The Chemically Excitable Domain pg 59-89
Summation and Integration pg 73-75
Functions of the Calcium Channel pg 76-77

10/6
Acetylcholine and Glutamate - Excitatory Neurotransmitters pg 91-98
Gamma-Amino Butyric Acid (GABA) and Glycine - Inhibitory Neurotransmitters pg 72-73; 97-99
Learning and Memory - Habituation and Sensitization of a Behavior pg 525-559
Learning and Memory - Hebb’s Postulate and NMDA Receptors pg 97; 18, 210; 547-550; 560

10/9 EXAM 1

BLOCK 5. The Spinal Cord and Brain
10/13
Peripheral and Central Nervous Systems pg 21-56
Orientation and Gross Subdivisions of the Brain pg 38-49
Functional Role of the Different Lobes in Your Brain pg 39-41

10/16
Integrative Circuits in the Spinal Cord for Sensory and Motor Responses pg 327-345
Reflex Arcs pg 327-341
Ventricles pg 47-48
Meninges and the Blood Brain Barrier pg 47-49; 57

BLOCK 6. Pleasure and Pain
10/20 Quiz 3
Limbic System pg 457-489
Is There a “Pleasure Circuit” in the Brain? pg 118-119
The Role of Dopamine in Reward Pathways pg 118-119

10/23
Ascending Nociceptor Systems and Substance P pg 242-253
Descending Analgesia Systems pg 110-111; 247-250
Top-down vs. Bottom-up Approaches to Understanding Pain Perception.
*Related Popular Movie: Cake (2015)*
The Mechanism of Opioid Peptide Action on Pain Transmission pg 98; 110-111; 113; 123; 247-249

BLOCKS 7 & 8. Sensory Systems
10/27
Common Functions of Sensory Neurons pg 28; 225; 231-232
The Role of Inhibition in Sensory Networks
Somatosensory System – Homunculus pg 233; 339
Vision – Case Study of Visual Agnosia pg 624-625

10/30 Quiz 4
Auditory System and Mechanoreceptors pg 229-240; 255-273; 288-289
Breakdown of Language – Case Studies of Aphasia pg 605-608
Olfaction pg 281-290
Sensory Mix-ups – the McGurk Effect and Synesthesia pg 235

11/3 EXAM 2

BLOCK 9. Dopamine Dysregulation and Disease.
11/6
The Importance of the Basal Ganglia pg 44-45; 345-347; 351-353
How Too Little Dopamine can Lead to a Motor Disease – Case Study of Parkinson’s pg 46; 351-352
Related Popular Movies: Awakenings (1990)

11/10
The Dopamine Hypothesis of a Disease of Thought and Emotion – Case Study of Schizophrenia
pg 492-505; 521
Related Popular Movies: A Beautiful Mind (2001); Clean, Shaven (1993)

BLOCK 10. Other Neurological Conditions
11/13
The Genetics of Huntington’s Disease pg 207; 346; 352-353
Structural Abnormalities–Case Study of Alzheimer’s Disease pg 213-216; 219; 556

11/17 Quiz 5
Epilepsy and Seizures pg 59; 84-86; 89; 518; 525-527; 618; 627
Memory Consolidation and Amnesia- the Case Study of Patient H.M. pg 526-529

BLOCK 11. Psychopharmacology.
11/20
Agonists and Antagonists pg 78; 94;100-102; 118; 120-121; 123
Pharmacokinetics pg 103
Addiction, Tolerance, and Withdrawal pg 101-102; 113; 116-123

11/24
Central Nervous System Depressants pg 108
Central Nervous System Stimulants pg 112-114; 123
The GABA Receptor Complex pg 97-99; 123
Hallucinogens pg 114-115; 123
11/27-THANKSGIVING NO CLASS

BLOCK 12. Hormones and Behavior.

12/1 Quiz 6
Hormones as Circulating Signaling Molecules Produced by Endocrine Glands pg 137-149
Steroid Hormones as Nuclear Receptors pg 133-137
Genomic (slow) and Non-genomic (rapid) Effects of Steroids on the Nervous System pg 131-137

12/4
Organizational and Activational Effects of Steroids pg 130-136
Hormone Extirpation and Replacement Technique
Sex Differences in Brain and Behavior Including Drug Addiction and Depression pg 506-510

EXAM 3 – (Final TBA)

This syllabus is subject to change with notification.