Psychology 565, section 1
Functional Neuroanatomy

Semester: Fall 2017
Meeting Day/Time: M/W 2:30-3:50
Location: Psychology A, room 256

Course Director: Dr. Brenda Anderson
Office: Psychology B, room 216
Office Hours: By appointment
Email: Brenda.Anderson@stonybrook.edu
Course website: Blackboard, Psych 565

Course Materials:
Textbooks: - Kandel, Schwartz and Jessel, Principles of Neural Science 5th ed. (required)
Supplementary readings will be made available online.

-The class will rely on the Michigan State University online atlas at the following link: https://msu.edu/~brains/brains/human/index.html

Target Audience: Although it is easier for students to come into this course with at least one course in biological psychology/integrative neuroscience or neuroscience more broadly, the course is designed to accommodate students with very little background. Strong students that are highly motivated but with little background have received As in this course.

-All materials made available for this course are solely for your personal use during the semester in which you are enrolled. Materials should not be widely distributed or posted on any public site.

- The instructor reserves the right to modify any aspect of this syllabus as necessary to accommodate unforeseen circumstances or to maintain the fair and orderly conduct of the course.

-Cell phone use is prohibited in class. Computers, tablets, and like devices can be used only for class-related activities (e.g. note taking). It is highly recommended, however, that you take notes by hand. (http://www.psychologicalscience.org/index.php/news/releases/take-notes-by-hand-for-better-long-term-comprehension.html)

Course Learning Outcomes:

-Students will understand the strategy by which the brain processes the features of the external world and the paths that carry sensation from the external world through the brain to execute voluntary action and emotional motor programs.
-Students will develop a framework and knowledge base that supports greater depth of understanding, synthesis and analysis of the literature from the fields of neuroscience, including literature from the fields of behavioral, cognitive and affective neuroscience, and information that will challenge their beliefs about behavior.
-Students will be better prepared to make original and lasting research contributions.

Why Anatomy?
Just as function can be derived from the structure of everyday objects, so too can function be derived from the study of brain architecture and neural connectivity. For example, Ramon y Cajal identified many dynamic mechanisms in the nervous system simply by studying the anatomy of neurons. These properties were later confirmed by physiologists, and continue to be recognized as fundamental principles of neural signaling. Similarly, Marr (1969) and Albus (1970), inspired by the wiring in the cerebellum, hypothesized that the cerebellum could be a site for learning. It took more than a decade before physiologists recognized and described the form of plasticity predicted by Marr and Albus. From these examples, we can recognize the importance of studying the anatomy of the brain, and the connectivity between structures for greater understanding of brain function, and the organization of behavior.

To conform to the interests of psychologists, this course, in contrast to similar courses in the medical school context, emphasizes the connectivity of higher order brain regions, while de-emphasizing spinal cord anatomy and the study of peripheral nerves. Students will first be introduced to the global nervous system organization, and a representative sensory system. Cortical organization will then be discussed. Traditional motor output pathways will be covered. Then the extrapyramidal motor systems will be discussed. Finally, the course ends with a discussion of the limbic system and the coordinated endocrine, autonomic, and motor output. How these latter systems are integrated into emotion will be discussed. Throughout the course, each anatomical circuit will be associated with behavioral functions. Although we cover structure-function relationships, there is an equal emphasis on the integrated interactions across regions. By studying the connectivity of the brain, students will gain new insight into the organization of behavior, which squarely places this course within field of psychology.

COURSE LEARNING OBJECTIVES:
Students will be able to identify and recognize pathways by which information flows into, through and out of the brain.
Student will be able to identify the location of major brain structures and regional subdivisions and classify regions based on function.
Students will be able to state the global structure/organization of the brain, and the major regions supporting the divisions of the global structure.
Students will learn functions associated with each major region, supported by their input and output pathways.
Students will learn about intrinsic circuits that support complex movement sequences, and complex sensory processing.

Course Requirements:
-Lectures will be delivered online, and discussion will take place face to face. Therefore, this course requires access to the internet, and an up to date browser that is compatible with the current version of Blackboard supported by SBU. Also some material may be viewed on a cell phone, it is recommended that students complete homework assignments on a computer to avoid any software incompatibility.
Discussions and some exams will take place in the classroom so students are expected to be on campus.

Course Calendar

Week 1:  
Introductions, 
Gross Neuroanatomy 
Overviews of the Cerebral Cortex, Hippocampus, Cerebellum, Basal Ganglia 
Textbook, chapter 15

Week 2  
Functional organization of perception, Chapter 16 (5th ed.) 
Internal representations of Space and Action, Chapter 17 (5th ed), cont. 
Integration of sensory and motor function, chapter 18, 19

Week 3  
Exam 1
  Locating basic anatomical features of CNS 
  Functional categories of the thalamus 
  Basic anatomy of the spinal cord 
  Basics of information flow (hierarchical loops, integration, principles of nervous system organization, pattern generators, feedforward and feedback control)

  Coding of Sensory Information 
  Somatosensation (Chapters 22-23)

Week 4  
Vision, Chapters 25, 27, 28, 29 
Discussion: 

Week 5  
Exam 2: Somatosensory and Visual Pathways 
Hearing, Chapter 31 (start at page 601).

Week 6  
Cerebellum 
Discussion: 

Week 7  
Exam 3: Audition, Cerebellum 
Voluntary Movement (chapter 33, 37, 38).

Week 8  
Basal Ganglia (chapters 43)
In class discussion:
Come to class prepared to discuss the following papers:

Week 9  Exam 4: Motor Cortex and spinal tracts, Basal Ganglia,
Emotional Motor System Introduction
What are emotions?
Limbic System: Hippocampus (Chapter 48)

Week 10  Discussion:

Week 11  Amygdala
The control of Basic Motivated Behaviors and emotional motor programs
Hypothalamus

Week 12  Exam 5: Hippocampus, Amygdala
Endocrine system: Pituitary, Posterior Pituitary (Chapter 47)
Basic Motivated behaviors and emotional motor programs: Midbrain/Brainstem
We will focus on circuits implicated in anxiety.

Week 13  Brainstem Modulatory functions (Chapter 46).
Physiological arousal: Autonomic Nervous system (Chapter 47)

Week 14  Interoception (awareness of the bodies state)and its relationship to emotion
Class Discussion
If time, and desired: Control of Gaze (Chapter 39) (If there is time and interest)

Final Exam  Exam 6: Hypothalamus, Midbrain/Brainstem, Brainstem Modulatory Systems, Autonomic Nervous System, Interoception

Grading
1) Exams (76)
   a. Exam questions will be in the form of short answer, matching, fill in the blank and regional identification.
2) Homework/Participation Points. Additional points will be given for
   a. Preparation and participation in discussions of supplementary readings
   b. Homework assignments on Blackboard

Final grades will be calculated as the sum of the following two scores:

Exam points earned/Exam points possible * 50 for a maximum of 50% points.

Homework points earned/homework points possible * 50 for a maximum of 50% points.

DISABILITY SUPPORT SERVICES (DSS) STATEMENT (must be the following language)

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact
Disability Support Services, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748. They will
determine with you what accommodations, if any, are necessary and appropriate. All information and documentation
is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their
professors and Disability Support Services. For procedures and information go to the following website:
http://www.stonybrook.edu/ehs/fire/disabilities

ACADEMIC INTEGRITY STATEMENT (must be the following language as approved by the undergrad council):

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work.
Representing another person's work as your own is always wrong. Faculty are required to report any suspected
instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health
Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow
their school-specific procedures. For more comprehensive information on academic integrity, including categories
of academic dishonesty, please refer to the academic judiciary website at
http://www.stonybrook.edu/uaa/academicjudiciary/

AMERICANS WITH DISABILITIES ACT

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact
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determine with you what accommodations, if any, are necessary and appropriate. All information and documentation
is confidential.

CRITICAL INCIDENT MANAGEMENT (must be the following language as approved by the undergrad council):

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are
required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach,
compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools
and the School of Medicine are required to follow their school-specific procedures.

COURSE EVALUATIONS

Each semester Stony Brook University asks students to provide feedback on their courses and instructors through an
online course evaluation system. The course evaluation results are used by the individual faculty, department chairs
and deans to help the faculty enhance their teaching skills and are used as part of the personnel decision for faculty
promotion and tenure.
Stony Brook contracts with an outside vendor to administer the surveys and all results are completely anonymous. No individually identifiable data are ever reported back to the university or instructor. Students who have completed previous evaluations can view all faculty ratings at: tlt.stonybrook.edu/evaluate

Resources:
http://www.columbia.edu/itc/hs/medical/neuroanatomy/neuroanat/ [interactive, click on cell, and cell in image colors to show where it is located]
http://library.med.utah.edu/kw/hyperbrain/animations/pathways/quiz3.html [great interactive pathway quizzes]
more from the same group at:
http://library.med.utah.edu/WebPath/HISTHTML/NEURANAT/NEURANCA.html
http://www.loni.ucla.edu [brain atlas]
http://pathology.mc.duke.edu/neuropath/nawr/nawr_index.html
http://www.med.harvard.edu/AANLIB/home.html
http://www.pbs.org/wnet/brain/3d/index.html
http://neuroanatomy.bsd.uchicago.edu/ [cropped images, not ideal for students, by system, development, EM, comparative atlas]

Additional readings to consider:


Centenary of Christfried Jakob’s discovery of the visceral brain: An unheeded precedence in affective neuroscience, Triarhou, L.C. , Neuroscience and Biobehavioral Reviews, 32, 984-1000.


Supplementary reading:
Additional interesting resources

Data base for cell type neurochemistry:

Resources for more detail: [http://senselab.med.yale.edu/](http://senselab.med.yale.edu/) [provides information about receptor and neurotransmitter types] NeuronDB provides a dynamically searchable database of three types of neuronal properties: voltage gated conductances, neurotransmitter receptors, and neurotransmitter substances. It contains tools that provide for integration of these properties in a given type of neuron and compartment, and for comparison of properties across different types of neurons and compartments. CellPropDB: Cellular Properties Database (CellPropDB) provides a simple repository for data regarding membrane channels, receptor and neurotransmitters that are expressed in specific types of cells. The database

By remaining enrolled in this course, you confirm that you have read the syllabus and understand the grading system. With that in mind, you understand that all students will be graded as fairly as possible. You understand that your grade along with all grades in the course will be based on your test performance, and the quality of your homework, participation in group activities, and attendance. With fairness in mind, you recognize that students cannot ask for special consideration when final grades are given. Therefore, you will not ask the instructor to change a grade because of outside circumstances.