Northeastern University, Bouve College of Health Sciences,  
Department of Physical Therapy

**Course Number and Title:** PT5410: Functional Human Neuroanatomy – Lecture Syllabus

**Course Days/Time:** Tuesday and Friday; 9:50 -11:30

**Credits:** 4 SH lecture

**Clock:** Lecture 2 X 1hr 40min

**Location:** 625BK (Behrakis Building)

**Course Coordinator:** Robert W Sikes, PhD

**Office Location** 301H Robinson Hall

**Phone and email:** r.sikes@neu.edu

**Office Hours:** By Appointment

**Prerequisites:** An introduction to neuroanatomy (e.g. PSYC 3458-Psychobiology, BIOL 1117-Anatomy and Physiology 1, BIOL 3405 – Neurobiology, BIOL1103-Principles of Biology 2 or BIOL1113-General Biology2) or by permission of the instructor.

**This course requires co-registration in PT5411: Functional Human Neuroanatomy – Lab.**

**Course Description:** This course examines the detailed structure of the human nervous system linking structure to function at both the clinical and neurobiological level. The goal of this course is to provide students with a solid functional anatomical foundation for neuroscience. The course reviews basic neuroanatomy and then provides a detailed look into the structure of the nuclei within the central nervous system and their connectivity. The role of these structures in motor and sensory function as well as in complex cognitive functions will be examined at a physiological and clinical level.

**Course Objectives**

After completion of the course/lecture, the student will be able to:

- describe the anatomy of neurons and glia in histological sections of the nervous system
- describe the major levels of the nervous system and their borders
- describe the main external anatomical features of brain, brainstem
- list the cranial nerves and describe their function
- describe the blood supply of the brain and spinal cord and the areas supplied by specific branches
- describe the key nuclei and tracts of the central nervous system in stained sections and MRI.
- describe the major systems of anatomical structures and connections that provide sensation, control movement and underlie complex behavior
- predict motor and sensory neurological symptoms produced by damage to the specific regions of the nervous system

**Teaching Methods and Learning Experiences**

Lectures will introduce human regional neuroanatomy and the functions of the nuclei, nerves and tracts. Focusing primarily on the central nervous system, the lectures cover the main regions, e.g.
spinal cord, brainstem and forebrain in detail. Additionally, the functional anatomy of the major motor and sensory systems will be covered -- including the cranial nerves, and the anatomical substrates of complex brain functions such as memory and emotion will be introduced. The effects of damage to the nervous system will be introduced in lecture and explored in depth in the accompanying labs. Lectures will be enhanced by online activities and discussion.

**Evaluation (% Total Grade submitted for both lecture and lab)**

Although students sign up for lecture and lab as separate courses, all grades are averaged as describe below and the resulting average is the final grade for both lecture and lab. Lecture exams are primarily multiple-choice with some short answer. Lab exams are short answer.

- Lecture (55%)
  - Exam 1 (15%)
  - Exam 2 (15%)
  - Final exam (20%)
  - Quizzes (5%)
- Lab (40%)
  - 17% Midterm Exam
  - 23% Final Exam
- Online lab assignments (5%)
  - Most labs will have online assignments due at the beginning of lab and designed to prepare you for lab. The purpose is to get you to come to lab well prepared and to review materials covered so far.
- Class Paper (Optional 2%) – Possible topics include a review of specific neuroanatomical structures related to your research or neuroscience interests.
- In both lecture and lab you will have an opportunity to earn extra credit added to the lecture or lab grade.

**Textbooks and Materials**

- **Required**
  - Purves Neuroscience – Fourth Edition or higher. Although earlier editions are similar, the fourth edition is bundled with a license for the neuroanatomical atlas software Sylvius 4. **This software is required for lab** so if you purchase a used version without the software, you will need to purchase it separately.
  - Learning Catalytics Account (In class and online response entry – requires mobile device (laptop, tablet, smartphone) - Learningcatalytics.com

- **Recommended**
  - Students will probably find textbooks from their introductory courses in neuroscience to be very valuable.
  - Students who have limited background in anatomy may need to purchase an introductory human anatomy text and atlas.
  - Blumenfeld Neuroanatomy through Clinical Cases (either edition 1 or 2) – Excellent illustrations of complex neuroanatomical structures. Solid, if somewhat dated, information on anatomical pathways. Good companion for Purves,
especially for students planning on a health care career or future neuroscience graduate students planning on someday submitting a grant to NIH (instead of NSF).

Course Number and Title: PT5411: Functional Human Neuroanatomy – Lab Syllabus
Course Days/Time: Tuesday; 1:35 pm - 3:15 pm
Credits: 1 SH Lab
Clock: Lab 1hr 35 min
Location: 625 BK
Course Coordinator: Robert W Sikes, PhD
Lab Instructors: James Marchand, PhD and Robert W Sikes
Office Location: 301H Robinson Hall
Phone and email: r.sikes@neu.edu
Office Hours: By Appointment

Prerequisites: An introduction to neuroanatomy (e.g. PSYC 3458-Psychobiology, BIOL 1117-Anatomy and Physiology 1, BIOL 3405 – Neurobiology, BIOL1103-Principles of Biology 2 or BIOL1113-General Biology2) or by permission of the instructor.
This lab requires co-registration in PT5410: Functional Human Neuroanatomy – Lecture.

Course Description: This lab examines the detailed structure of the human nervous system in specimens of the human brain and spinal cord as well as in images of stained sections of these tissues and Magnetic Resonance Images (MRI). The structure of individual nuclei and the main sensory and motor tracts of the nervous system will be examined in and discussed by students working in small groups. Although focusing on anatomical details, the lab introduces the student to clinical diagnosis of neurological cases.

Course Objectives
After completion of the lab, the student will be able to:
1. identify the major levels of the nervous system and external features of brain, brainstem and spinal cord in images and human brain specimens. This includes the cranial nerves and blood supply.
2. identify the key nuclei and tracts of the central nervous system in stained sections and MRIs.
3. describe the major systems of anatomical structures and connections that provide sensation, control movement and underlie complex behavior
4. predict motor and sensory neurological symptoms produced by damage to the specific regions of the nervous system in example clinical neurological cases
Teaching Methods and Learning Experiences
In lab, we will examine the external anatomy of the brain, brainstem and spinal cord in human specimens and models. Then the internal anatomy of important nuclei, tracts and cortical regions will be explored in using slices of human brain as well and multimedia images of brain sections including MRI. Basic clinical neurology will be introduced as students analyze case histories of patients with damage to the nervous system. Lab will be enhanced by online activities and discussion.

Evaluation (% Total Grade submitted for both lecture and lab)
Although students sign up for lecture and lab as separate courses, all grades are averaged as described below and the resulting average is the final grade for both lecture and lab. Lecture exams are primarily multiple-choice with some short answer. Lab exams are short answer.

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Additional information for lecture and lab

Grading Criteria

Letter grades will be coded from the overall rounded numeric average as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93 or more</td>
</tr>
<tr>
<td>A-</td>
<td>90 to 92</td>
</tr>
<tr>
<td>A+</td>
<td>87 to 89</td>
</tr>
<tr>
<td>B+</td>
<td>83 to 86</td>
</tr>
<tr>
<td>B</td>
<td>80 to 82</td>
</tr>
<tr>
<td>B-</td>
<td>77 to 79</td>
</tr>
<tr>
<td>C+</td>
<td>73 to 76</td>
</tr>
<tr>
<td>C-</td>
<td>70 to 72</td>
</tr>
<tr>
<td>C</td>
<td>67 to 69</td>
</tr>
<tr>
<td>D+</td>
<td>63 to 66</td>
</tr>
<tr>
<td>D</td>
<td>60 to 62</td>
</tr>
<tr>
<td>D-</td>
<td>59 or less</td>
</tr>
</tbody>
</table>

Grades are not scaled, although ambiguities or errors in exam questions will be corrected as determined by the professor. The letter grade required for students will be determined by their home department.

Accommodations: Students who have a disability are encouraged to seek accommodations though the University Disability Resource Center. We wish to support your needs and ask you to speak privately with me and/or your recitation leader about your needs for accommodations and strategies to support your success. This information will be confidential.

Attendance/Participation: Students are expected to attend all class lectures, be on time, and be dressed appropriately for all course-related activities. If a student is unable to attend a lecture, that student will still be held responsible for the material. Participation in course feedback and teacher evaluations is expected.

Assignments: All written assignments are due on the assignment due date. Any assignment NOT turned in on time will receive a 0. Prior to the due date, a student may request an extension with a reasonable explanation. It is at the primary instructors’ discretion to permit tardy assignments. Excused tardy assignments may be subject to a 5 point deduction for each day late.

Make Up Exams: If you are unable to be present for an examination or have an issue that would impair your performance on the exam, you MUST notify the primary instructor(s) prior to the start of the examination. Failure to give prior notice will result in a zero for the missed examination. A make-up examination may be given at the discretion of the primary instructor. The make-up examination will not necessarily be in the same format as the in-class examination. Students will not be permitted to make-up an examination due to travels plans.

Use of Electronic Devices: Audio recorders or videotaping may be used during lecture or lab sessions only by permission of the instructor. Use of electronic devices is not permitted in any examination except for what is provided by the instructor. Beepers and cellular phones must be turned off so that there is no disruption of class or lab. Any infringement of this policy will result
in the student being asked to leave for that class or laboratory period. Repeated offenses are subject to University disciplinary procedures.

**Accommodations:** The Disability Resource Center (DRC), which is located on campus in 20 Dodge Hall (ext 2675) can provide you with information and other assistance to help manage any challenges that may affect your performance in your coursework. The University requires that your provide documentation of your disability to the DRC. If you have a documented disability that may require accommodations for this course I encourage you to please meet with me after class or during my office hours to discuss appropriate adaptations or modifications that might be helpful for you. This information will remain strictly confidential.

**Professional Behavior:**
Professional and ethical behavior in all interactions with instructors and peers in lecture, lab, clinical visits, and examination environments is expected at all times. Any display of unprofessional behavior may result in a student being asked to discontinue that behavior, and may be asked to leave the lecture/lab/recitation for that day. If the student is asked to leave a lecture, s/he is responsible for all material that is missed. It is at the discretion of the instructor whether or not points will be deducted from the overall course grade for rude and unprofessional behavior. Repeated tardiness, missed scheduled appointments, and inappropriate or threatening language are considered unprofessional behavior and may result in up to ten points being deducted from the final course grade. Repeated offenses of unprofessional behavior are subject to University disciplinary procedures

**Grade Dispute:**
If a student disagrees with any grade received on an examination or assignment the student may dispute that grade within one week of receipt of the grade. The dispute MUST be typed, the question(s) under consideration identified, the rationale for the student’s answer stated with the appropriate reference source/page number (class notes not accepted), and be presented to the primary instructors. After the dispute has been reviewed, the student will either receive a written response or will be scheduled to meet with the instructor to review the issue(s).

**Academic Dishonesty:**
Academic dishonesty violates the most fundamental values of an intellectual community and depreciates the achievements of the Physical Therapy Program as well as the entire University community. Cheating, plagiarism, fabrication and unauthorized collaboration will not be tolerated under any circumstances. It is the student’s responsibility to understand the definitions of plagiarism, cheating, fabrication, falsification and unauthorized collaboration, which can be found in the Northeastern University Graduate Student Handbook (http://www.neu.edu/handbook/studenthandbook.pdf) OR Refer to the Northeastern Student Handbook) to familiarize yourself with the university policy and for information about disciplinary action in cases of academic dishonesty.. Group work in preparing for examinations/presentations is encouraged. However, plagiarizing or copying and reproducing another’s work for independent assignments is NOT acceptable. Any student found cheating on an assignment or examination will receive a zero on that assignment and will be referred to the University’s Judicial Affairs Committee. A second offense will result in an automatic failing grade for that course and further disciplinary action through Northeastern University’s student judicial
committee. Lack of awareness and knowledge of these policies and definitions does not eliminate the student’s responsibility for abiding by them.

**Religious Observances**

Any student who is unable, because of his/her religious beliefs, to attend classes or to participate in any examination, study, or work requirement shall be provided with an opportunity to make up such examination, study, or work requirement that he/she may have missed because of such absence on any particular day provided, however, such make-up examination or work shall not create an unreasonable burden upon the school. Students should make appropriate arrangements with the instructor in advance of the absence, preferably at least two weeks before the religious observance.

**Schedule**

The schedule is published on Blackboard and is subject to change. Students will be informed when changes are made and should update their files. The current schedule will always be available on Blackboard.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Weekly Lecture Topics - Reading Assignments</th>
<th>Lab Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Tu</td>
<td>12-Jan</td>
<td>Introduction to Functional Neuroanatomy - PNS and CNS Basics - Chapter Appendix</td>
<td>No Lab Week 1</td>
</tr>
<tr>
<td>1-Fr</td>
<td>15-Jan</td>
<td>Online Lectures - External Anatomy of Forebrain, Directions of The Brain - Chapter Appendix</td>
<td></td>
</tr>
<tr>
<td>2-Tu</td>
<td>19-Jan</td>
<td>Lecture - Neuroembryology - Chapter 22</td>
<td>Lab 1 - Welcome to the Brain - Regional Anatomy of the Brain and Brainstem</td>
</tr>
<tr>
<td>2-Fr</td>
<td>22-Jan</td>
<td>Lecture - Gyri, Bump and Borders of the Cerebrum - Chapter Appendix</td>
<td></td>
</tr>
<tr>
<td>3-Tu</td>
<td>26-Jan</td>
<td>Neurohistology of CNS - Neurons and Glia - Dr. Jim Marchand - Chapter 1</td>
<td>Lab 2 Brain External Anatomy -- Major brain and brainstem structures and External Forebrain</td>
</tr>
<tr>
<td>3-Fr</td>
<td>29-Jan</td>
<td>Online Lecture - Neuroanatomy of Brainstem, Cerebellum and Cranial Nerves - Chapter Appendix</td>
<td></td>
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<tr>
<td>4-Tu</td>
<td>2-Feb</td>
<td>Blood supply of the CNS - Arteries</td>
<td>Lab 3 Brainstem, Cerebellum and Cranial Nerves</td>
</tr>
<tr>
<td>5-Tu</td>
<td>5-Feb</td>
<td>Online Lecture - Blood Supply of the CNS - Sinuses and the Meninges</td>
<td>Lab 4 Blood supply of brain, sinuses and Meninges</td>
</tr>
<tr>
<td>6-Tu</td>
<td>12-Feb</td>
<td>Lecture Exam 1 (Introduction to Blood Supply) -</td>
<td>Lab 5 Ventricles and Forebrain in Slices</td>
</tr>
<tr>
<td>6-Fr</td>
<td>19-Feb</td>
<td>Online Lectures - Neuropharmacology 2 - ACh</td>
<td></td>
</tr>
<tr>
<td>7-Tu</td>
<td>26-Feb</td>
<td>Online Lecture - Internal Spinal cord - Histology</td>
<td>Lab 6 External Spinal Cord and Lab Exam Review</td>
</tr>
<tr>
<td>7-Fr</td>
<td>1-Mar</td>
<td>Somatosensory System - Fine Touch and Proprioception System</td>
<td></td>
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<tr>
<td>8-Tu</td>
<td>8-Mar</td>
<td>Online Lecture - Neuropharmacology 3 - Catatholamines</td>
<td>Had a nice Spring Break?</td>
</tr>
<tr>
<td>8-Fr</td>
<td>11-Mar</td>
<td>Online Lecture - Motor Control and the Lower Motor Neurons</td>
<td></td>
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<tr>
<td>10-Tu</td>
<td>15-Mar</td>
<td>Review Neuropharmacology 3 and part 1 of Online Lower Motor Neurons and then Lecture Exam 2 Topics</td>
<td>Lab 11 Internal Spinal Cord</td>
</tr>
<tr>
<td>10-Fr</td>
<td>18-Mar</td>
<td>Lecture Exam 2 - Synaptic Transmission to Spinal Cord</td>
<td></td>
</tr>
<tr>
<td>11-Tu</td>
<td>22-Mar</td>
<td>Autonomic Nervous System and Visceral Motor Neurons</td>
<td>Lab 12 Medulla - Practice Quiz on Spinal Cord</td>
</tr>
<tr>
<td>11-Fr</td>
<td>25-Mar</td>
<td>Online Lecture - Cranial Nerves of Face</td>
<td></td>
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<tr>
<td>12-Tu</td>
<td>29-Mar</td>
<td>Descending Motor Pathways - The Upper Motor Neurons</td>
<td>Lab 13 Pons - Practice Quiz Spinal Cord to Medulla</td>
</tr>
<tr>
<td>12-Fr</td>
<td>1-Apr</td>
<td>Cerebellum Anatomy and Functions</td>
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</tr>
<tr>
<td>13-Tu</td>
<td>5-Apr</td>
<td>Deep Cerebral Nuclei and Online Lecture - Dopamine Hypothesis</td>
<td>Lab 14 Midbrain and Forebrain 1 - Practice Quiz Spinal Cord to Pons</td>
</tr>
<tr>
<td>13-Fr</td>
<td>8-Apr</td>
<td>Auditory and Vestibular System</td>
<td></td>
</tr>
<tr>
<td>14-Tu</td>
<td>12-Apr</td>
<td>Visual System</td>
<td>Lab 15 Forebrain 2 - Practice Quiz - Spinal Cord to Forebrain</td>
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<tr>
<td>14-Fr</td>
<td>15-Apr</td>
<td>Lecture - Anatomy of Cerebral Cortex</td>
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<tr>
<td>15-Tu</td>
<td>19-Apr</td>
<td>The Amygdala and it's Functional Connections - Dr. Jim Marchand</td>
<td>Lab Exam 2 - Internal Anatomy Spinal Cord to Forebrain</td>
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<td><strong>Reading Day Thursday</strong></td>
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<td>Final Exam Thursday April 28 - 8:00-10:00 am Room Dodge 140</td>
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