

Duke University TIP Summer Studies Program 2017
Neuropsychology
Louisiana State University, Term 2
Instructor: Ms. Laura Heisick, M.A.
Teaching Assistant: TBD

Course Description: Why are roller coasters thrilling for some and terrifying for others? How does brain development affect perception, judgment, and decision-making? Understanding the intersection and interaction of the human brain and behavior is at the heart of neuropsychology. Study the physiology of the brain and cognitive functions that affect behavior. Investigate how the brain works by also considering neuroscientific, philosophical, neurological, and psychiatric perspectives.

Required Texts:

- 1.) The Society for Neuroscience (2012). Brain Facts: A Primer on the Brain and Nervous System (7th ed.) Washington, DC.
- 2.) The Man Who Mistook His Wife For A Hat: And Other Clinical Tales (Paperback). Oliver Sacks
- 3.) 3D Brain by DNA Learning Center (iPhone/Android App)

Course Overview:

There are few things as interesting as human behavior. Thankfully, it comes with an endless source of topics to explore! Every behavior, from talking to tying your shoes to becoming a Grand Master at chess, involves the brain. Neuropsychology puts its emphasis on the important role of neuronal communication in behavior, or in other words, the *biological* basis of human behavior and psychological processes. This course is designed to provide you with a deeper understanding of the biological basis of behavior, with a special focus on the role of the central nervous system. To that end, you will learn the basic components and functions of the nervous system, such as the individual components that make up the brain, and how the brain and body interact to produce higher-order cognition like emotions and memories.

This course is designed to provide an introduction to neuropsychology, from its historical roots to its contemporary cross-disciplinary applications. Course content will cover topics such as neuroanatomy, sensation and perception, movement, consciousness, learning and memory, and neurological disorders. By the end of this course, you will (hopefully!) understand the biological basis for a broad range of topics within the realm of psychology. Students are encouraged to approach the curriculum with an open mind and to think critically, challenge themselves, and respectfully contribute to a collective learning environment.

Course Objectives:

- Provide a basic understanding of neuroanatomy and neurophysiology;
- Critically examine what is currently known about the nervous system, and identify how these mechanisms underlie complex behaviors;
- Garner an appreciation for the amazing capabilities of the brain;
- Analyze the scientific methods used to generate neuropsychological knowledge through hands-on experiences, activities, and active participation;
- Provide interactions with professionals in neuropsychology-related fields and explain post-secondary academic and career opportunities.

Expectations:

This course is designed to be learner-centered, which means students will drive the instruction and pace. All students are expected to:

1. Arrive on time to class

2. Maintain respectful classroom etiquette (i.e., no talking while the instructor or another student is)
3. Ask questions (and participate!) in discussions
4. Treat other students as colleagues when in the classroom, which includes respecting other students' opinions
5. Adhere to the Duke TIP code of conduct

Assignments and Evaluation:

While there will be no exams for the class, students are expected to perform assigned reading tasks and participate in class discussions of the textbook material. There will be group and individual activities throughout the course, including class presentations, hands-on exercises, educational games, and journal entries. All students are expected to fully participate in these activities. Students are expected to ask questions and interact respectfully with others within the classroom. At times, students will be expected to prepare for class projects during their evening study session. The teaching assistant will guide the students during this time, and all are required to use this allotted hour to prepare for class.

There will be group and individual activities throughout the course, including class presentations, hands-on exercises, educational games, and journal entries. Evaluations will be made of each student throughout the course, and a final evaluation summary will be provided at the end of the three weeks. These evaluations will include how well the student participated, how their understanding of material grew throughout the course, and how well they used designated study and research time.

Course Outline: Instructor will alert students to any modifications to the following schedule*.

Week 1 – The Basics

Day 1: Monday

What is Neuropsychology?

- **Morning:** Classroom Expectations/Icebreakers/Introductions
- **Afternoon:** What is neuropsychology?
 - Quiz yourself! What do you know about neuropsychology already?
 - A brief history of neuropsychology
 - Neuropsychology careers
- **Evening Study:** What is inside your brain that makes you who you are?

Day 2: Tuesday

Structures of the Human Brain Part I: The Nervous System

- **Morning:** Peripheral and Central Nervous Systems
 - What are the divisions of the nervous system?
 - What are the functions of the nervous system?
- **Afternoon:** Gathering evidence, reading about research, and generating debates
 - Learning how to read and interpret primary sources
 - Generating debate topics
- **Evening Study:** Review, debate preparation, and t-shirt design!

Day 3: Wednesday

Structures of the Human Brain Part II: Neuroanatomy

- **Morning:** Neurons, Structure and Function
 - What are the components of neurons?
 - What do neurons do?
 - Making model neurons

- **Afternoon:** How do neurons communicate?
 - Electrical activity in the brain
 - Acting out action potentials
- **Evening Study:** Review, debate preparation, and t-shirt design!

Day 4: Thursday

Neural Communication

- **Morning:** What are neurotransmitters, and what are their functions?
 - Chemical activity in the brain
- **Afternoon:** The great debate!
- **Evening Study:** Review neurotransmission, Letters from a neurotransmitter

Day 5: Friday

The Developing Brain

- **Morning:** How does the brain develop?
 - How does the brain grow and change as we age?
 - Are there “critical periods” of brain development?
- **Afternoon:** Neural bases of developmental disorders
 - Dyslexia, Autism Spectrum Disorders, ADHD
 - Discussing case studies of human development

Day 6: Saturday

Neurological Ted Talks

- Where is neuropsychology today? Where is the field going?
- Neurological research methods

Week 2 – Sensation and Perception

Day 1: Monday

Vision

- **Morning:** Getting information from our visual environment to the brain
 - How do we interpret the world around us?
 - Where does vision happen in the brain?
- **Afternoon:** Field trip to an art museum! Identifying psychological principles in the real world
 - Common visual experiences
 - Exploring visual illusions
- **Evening Study:** The importance of depth perception

Day 2: Tuesday

Audition

- **Morning:** Turning sound waves into neural signals
 - How do we turn sound waves into information the brain can interpret?
- **Afternoon:** Balancing acts: The vestibular system
 - What role does the ear play in balance?
 - Spinning bat races and balancing acts!
- **Evening Study:** Music in the brain

Day 3: Wednesday

Chemical Senses: Gustation and Olfaction

- **Morning:** How do we experience taste?

- How do we interpret things we taste?
- Try it yourself: Dining in the dark!
- **Afternoon:** How do we experience smell?
 - How do we interpret things we smell?
 - Neuropsychologist designs perfume
- **Evening Study:** Experiencing multiple senses: Synesthesia

Day 4: Thursday

The Somatosensory System

- **Morning:** How do we experience pressure, texture, temperature, and pain?
 - How does the brain regulate what we feel?
 - Can you feel it? Can you still feel it? Somatosensory experiments!
- **Afternoon:** Test your knowledge in Neurojeopardy!
- **Evening Study:** Discussion: Which sense would you be willing to live without?

Day 5: Friday

Kinesthetics

- **Morning:** The sensation of movement
 - Movement, reflex, and where it all happens in the brain
- **Afternoon:** The future of kinesthetic research
 - Is kinesthetic research informing current directions of developing artificial intelligence?

Day 6: Saturday

Sleep and the Brain

- What happens in the brain while we sleep (hint: It's not nothing!)?

Week 3 – Higher-Order Functions

Day 1: Monday

Neural Bases of Memory, Learning, and Cognition

- **Morning:** Memory and attention in the brain
 - How do we make memories? How do we learn?
 - Acting out exceptional memory
- **Afternoon:** Failures of memory and attention
 - Is our memory always 100% accurate?
- **Evening Study:** Test your memory!

Day 2: Tuesday

Neural Bases of Emotions

- **Morning:** Emotions in the brain and overview of mood disorders
 - How are emotions regulated by the brain?
 - How does brain activity influence mood disorders such as depression or Schizophrenia?
- **Afternoon:** Altered emotions in the brain affecting overt behavior
 - How do you make emotional decisions?
- **Evening Study:** How do emotions affect decision-making?

Day 3: Wednesday

Damage to the Human Brain

- **Morning:** Acute damage and neurodegenerative disorders
 - How do brain damage and/or neurodegeneration influence behavior?

- Be a brain detective!
- **Afternoon:** Begin final projects!
 - Pick your favorite neuropsychology topic to explore deeper!
- **Evening Study:** Continue final projects

Day 4: Thursday

Neurobiology of Stress

- **Morning:** Stress and the brain
 - What is the neurobiological foundation of stress?
 - How does stress affect our brains?
 - Managing your own stress
- **Afternoon:** Continue final projects
- **Evening Study:** Continue final projects

Day 5: Friday

Final Project Presentations

- **Morning:** Dazzle us with your final project!
- **Afternoon:** What have you learned, and where will you (and neuropsychology!) go next?

Day 6: Saturday

Parent Conferences

***Note: This syllabus is subject to change based on student need or instructor discretion.**