CIEE Prague, Czech Republic

Course title:	Introduction to Neuroscience
Course code:	(GI) PSYC 1002 PRCZ
Programs offering course:	Business, Arts and Sciences, Central European Studies, Communication, New Media, and Journalism
Language of instruction:	English
U.S. semester credits:	3.00
Contact hours:	45.00
Term:	Fall 2023

Course Description

This course introduces Neuroscience as it relates to human behavior. Students will explore the biological basis of psychology. Students investigate the impact of genes, gene-environment interactions, cellular biology, neurons and neuroanatomy on sensory perception, motor control, and complex behavioral functions, like learning, attention, emotion, motivation and sensory perception. They explore the effect of drugs on these behavioral functions and the biological bases of mental disorders. Throughout, students will explore how behavioral neuroscience informs our understanding of culture and society, with special attention on comparative cultural influences on neurocognitive processes.

Learning Objectives

By completing this course, students will:

- Define Neuroscience and relate its application to our understanding of human behavior.
- Describe biological processes, human behavior and mental processes using terms and concepts from neuroscience.
- Draw on current concepts, theory and experimental findings to build a contemporary understanding of the biological foundation of human behavior.
- Connect human behavior to genes, neurons, neural systems, hormones, age and other biological processes.
- Differentiate biological from environmental impacts on human behavior.
- Summarize the scientific method, its application to behavioral neuroscience and ethical concerns of research on non-human and human subjects.
- Explain the biological basis of mental disorders, pharmacological impacts and treatments.
- Apply Neuroscience principles to understand everyday life.
- Articulate how behavioral neuroscience informs their understanding of local culture, regional identity, and actions of our global society.

Course Prerequisites

None

Methods of Instruction

Students will attend interactive lectures, problem-solving workshops, discussions and excursions. Lectures will emphasize experiential learning, participation and applications. Students will use critical thinking to connect recent literature, historical perspectives, experimental findings and theory. Discussions and written assignments help develop a personal understanding of Neuroscience and Psychology, as well as how these reflect and inform culture and society. Excursions will investigate local Neuroscience research and application.

Assessment and Final Grade

1.	Weekly Quizzes	30%
2.	Lecture Activity Worksheets	20%
3.	Behavioral Neuroscience and Culture Essays	10%
4.	Experimental Neuroscience Review	20%
5.	Participation	20%

TOTAL	100%

Course Requirements

Weekly Quizzes

Each week, students will take a quiz on the previous week's course material, including lectures, activities and readings. Quizzes will have True/False, Multiple Choice, filling in blanks and short answer questions. Quizzes will cover only new material from that week but will build on previous concepts.

Lecture Activity Worksheets

During and after lectures, students will have a series of tasks, discussions and demonstrations related to the lecture material. They will work in groups to complete the tasks, handing in answers to a series of questions before leaving the class.

Behavioral Neuroscience and Culture Essays

Students will use their knowledge of behavioural neuroscience to explore facets of culture. Students will write two 300 word essays: one on a cultural feature of the host culture and another comparing two cultures. In each case, Behavioral Neuroscience concepts will be used in the analysis and to make major points.

Experimental Neuroscience Review

Students will review experimental studies from the professional literature on an approved, current topic in Behavioral Neuroscience of their choice. The review will provide background and how at least three new experimental studies further our understanding of the topic. A 1000 – 1500 word paper will be produced, using a minimum of five peer-reviewed experimental studies drawn from appropriate journals. A companion short 5-10 minute PowerPoint or similar presentation will be shared with fellow students.

Participation

Participation is valued as meaningful contribution in the digital and tangible classroom, utilizing the resources and materials presented to students as part of the course. Meaningful contribution requires students to be prepared in advance of each class session and to have regular attendance. Students must clearly demonstrate they have engaged with the materials as directed, for example, through classroom discussions, online discussion boards, peer-to-peer feedback (after presentations), interaction with guest speakers, and attentiveness on co-curricular and outside-of-classroom activities.

Attendance

To encourage engaged learning, regular class attendance is required throughout the program. This includes any required co-curricular class excursion or event, as well as internship, service-learning, or other required field placement.

An excused absence in a CIEE course will only be considered if approved by a CIEE Center Director/Academic Director (not the Instructor), and:

- it is a self-certified absence for illness (only once per course, requires formal request before or within 24 hours, cannot miss assessment worth more than 5% of final course grade)
- a doctor's note from a local medical professional is provided
- evidence of a family emergency is provided
- it is a pre-approved observance of religious holiday

Unexcused absences include personal travel and/or travel delays, as well as missing more than 25% of a single class period (including tardiness and early departure). Assessments missed due to unexcused absences will be marked as zero. Students with over 10% unexcused absences will be contacted by CIEE staff. Students with over 20% unexcused absences will be contacted by CIEE staff, receive a formal warning letter (shared with their home institution) and lose 10% of the final course point total (e.g., a final A grade of 93% will be lowered to a B grade of 83%).

For more detail, please consult your CIEE Academic Manual.

Academic Integrity

Academic integrity is essential to a positive and inclusive teaching and learning environment. All students are

expected to complete coursework responsibilities with fairness, respect, and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own can result in grade penalties or disciplinary action. See the CIEE Student Academic Manual for further information on academic integrity.

N.B. Course schedule and co-curriculars are subject to change. The final duration and distribution of content and assignments will be determined and presented to students at the onset of the course.

Weekly Schedule

Week 1

Class: 1.0 What is Behavioral Neuroscience?

Students define the mind-brain problem in behavioral neuroscience. They describe the history and contributions of philosophers and scientists to the development of behavioral neuroscience as a discipline. Students then consider the role of physiologists to contemporary behavioral neuroscience. They weigh the relative contributions of genes and environment in the development of behavioral characteristics and the fixed nature of heredity in shaping behavior. Students go into the city center to observe human behavior and later discuss its possible biological foundations.

Readings: Chapter 1 What is Behavioral Neuroscience? And What is Behavioral Neuroscience? 2019. All Psychology Careers. https://www.allpsychologycareers.com/topics/behavioral-neuroscience.html

Watch: My Major: Neuroscience. 2017. ALightSwitch. https://www.youtube.com/watch?v=0BQURQUKLGU and Gage, G. 2015. How to Control Someone Else's Arm with your Brain. TedTalk. https://www.ted.com/talks/greg_gage_how_to_control_someone_else_s_arm_with_your_brain

Due: Lecture Activity Worksheet

Week 2

Class: 2.0 Communication within the Nervous System

Students identify the cells of the nervous system, then draw and name neuronal structures. They compare sensory, motor, and interneuron functions. They also explain the roles of ions and the cell membrane in nervous system communication. Students demonstrate how neurotransmitters effect communication between nervous system cells. They discuss how neurons coordinate to allow experiences. Students explore the ways that excitation and inhibition function in the nervous system. They then use internet resources to report on new advances in our understanding of how the nervous system works and impacts our behavior.

Reading: Chapter 2 Communication within the Nervous System and Hamilton, J. 2017. Art Exhibition Celebrates Drawings by the Founder of Modern Neuroscience. NPR. https://www.npr.org/sections/health-shots/2017/01/26/511455876/art-exhibition-celebrates-drawings-by-the-founder-of-modern-neuroscience

Due: Lecture Activity Worksheet

Quiz 1 (covers material from Week 1)

Class: 3.0 The Organization and Function of the Nervous System

Students will identify major components of the central nervous system, including structures in the forebrain, midbrain, and hindbrain. Students investigate how damage to specific brain structures might impact behavior. They consider how the body protects the brain from potential damage. They then explore the peripheral nervous system, its components and functions. Students explain how the peripheral and central nervous systems interact and resultant impacts on senses and behaviors. They summarize nervous system in terms of human development. Finally, students consider changes that occur in the nervous system as the result of experiences. Students work in groups to investigate cases where brain injury created behavioral changes.

Readings: Chapter 3 The Organization and Functions of the Nervous System and Henry, L.C., Tremblay, S. and De Beaumont, L., 2017. Long-term effects of sports concussions: bridging the neurocognitive repercussions of the injury with the newest neuroimaging data. The Neuroscientist, 23(5), pp.567-578

at https://journals.sagepub.com/stoken/default+domain/DYQt47kVe3tFfwjI7ud4/full

Watch: The Chemical Mind – Crash Course in Psychology #3. 2014. https://www.youtube.com/watch?v=W4N-7AlzK7s&t=15s and Meet Your Master: Getting to Know Your Brain -Crash Course in Psychology #4. 2014. https://www.youtube.com/watch?v=vHrmiy4W9C0&t=4s and Why Scientists are Still Fascinated by Phineas Gage. 2018. Grunge. https://www.youtube.com/watch?v=vb8Jg1PAL90

Due: Lecture Activity Worksheet

Week 3

Class: 4.0 Methods and Ethics of Research

Students Explain how scientific theories are generated. They demonstrate how scientists test hypotheses and describe the differences between correlational and experimental studies. Students then assess the methods that scientists have for studying the role of brain structures in behavior, while comparing the methods that scientists use to investigate the structure and function of brain cells. They identify ethical protections in place for human participants and review ethical protections that exist for research animals. They examine ethical concerns that have been raised about stem cell and gene therapy research. Students work in groups to examine recent published literature with human and animal subjects, discussing steps researchers took and how they assured ethical treatment of test subjects.

Quiz 2 (covers material from Week 2)

Readings: Chapter 4 The Methods and Ethics of Research, and Bespalov, A. and Steckler, T., 2018. Lacking quality in research: Is behavioral neuroscience affected more than other areas of biomedical science? Journal of neuroscience methods, 300, pp.4-9.

Watch: Boyden, E. 2017. How We Want to Go Forward as a Civilization. Breakthrough. https://www.youtube.com/watch?v=vanLGc3EZ8g and Levine, R. 2011. Research Ethics. Yale University https://www.youtube.com/watch?v=jD-YCDE_5yw

Due: Lecture Activity Worksheet

Class: 5.0 Drugs, Addiction and Reward

Students describe the main classes of drugs. They explore the effects of each class of drugs on the nervous system and predict how different drugs will affect behavior, based on the neural systems on which those drugs act. Students consider how the brain changes during addiction. They discuss the role of learning in overdose and addiction, including its prevention. They explain how pharmacology can be used to treat addiction. Students then contrast environmental and hereditary influences on addiction. Students work in groups to review case studies of different drugs, their impacts and treatments on human behavior.

Readings: Chapter 5 Drugs, Addiction and Reward, and Gruber, S. A., & Sagar, K. A. (2017). Marijuana on the Mind? The Impact of Marijuana on Cognition, Brain Structure, and Brain Function, and Related Public Policy Implications. Policy Insights from the Behavioral and Brain Sciences, 4(1), 104-111

Watch: The Chemistry of Addiction –SciShow. 2011. https://www.youtube.com/watch?v=ukFjH9odsXw

Due: Lecture Activity Worksheet, Psychology and Culture Essay 1

Class: 6.0 Motivation and Regulation of Internal States

In this session, students assess psychological theories of motivation. They use temperature regulation and thirst to illustrate the concept of homeostasis. Students also explain the role of taste in choices of food and identify the brain signals that control when we begin and end eating. They compare the roles of environment and heredity in risk for obesity and examine how the environment and genetics impact risk for eating disorders. Students discuss the role of neurotransmitters in eating disorders. Finally, students use internet resources to investigate and report on other links between motivation and internal states. Students go on to consider sex as a motivational behavior. They link hormones to sexual behavior, and explore biological and environmentally-caused differences in sexual behavior, gender identity and sexual orientation.

Readings: Chapter 6 Thinking and Intelligence and Chapter 7 The Biology of Sex and Gender

Watch: Arundel, R. 2015. Why is Gender So Important? TedXWarwickSalon. https://www.youtube.com/watch?v=IFBU7h7fqLc

Due: Lecture Activity Worksheet

Week 4

Class: 7.0 Emotion and Health

Students describe brain structures and neurotransmitters involved in emotion. They explain how the body and the peripheral nervous system contribute to the experience of emotion. They also identify the adaptive and maladaptive components of the stress response. Students discuss the contributions of genetics and environment to stress responses. They compare the affective and sensory components of pain. Finally, students examine the brain structures and chemical systems involved in aggression.

Quiz 3 (covers material from Week 3)

Readings: Chapter 8 Emotion and Health, and Baer, D. 2017. Rich people literally see the world differently. New York Magazine. https://www.thecut.com/2017/02/how-rich-people-see-the-world-differently.html

Watch: Aggression vs. Altruism – Crash Course Psychology #40. 2014. https://www.youtube.com/watch?v=XoTx7Rt4dig and Winch, G. 2015. How to Practice Emotional First Aid. Ted Talks. https://www.youtube.com/watch?v=F2hc2FLOdhI and The Science of Depression. 2014. AsapScience https://www.youtube.com/watch?v=GOK1tKFFIQI

Due: Lecture Activity Worksheet

Class: 8.0 Visit to Psychiatric/Neuroscience Institute or Museum.

During this visit, students will speak with professional Psychology and Neuroscience researchers about current projects connecting Behavioral Neuroscience to culture and society. Students will have a tour, speak with several researchers and discuss Behavioral Neuroscience: historically as well as cutting-edge theories and experiments. Students will then use online resources to further explore two cultures, explaining similarities and differences between them using a current understanding of Behavioral Neuroscience.

Readings: Lonner, W. J. (2015). Half a century of cross-cultural psychology: A grateful coda. American Psychologist, 70(8), 804-814.

Watch: Bourrelle, J.S. 2015. How Culture Drives Behavior. TEDx Talks. https://www.youtube.com/watch?v=l-Yy6poJ2zs

Class: 9.0 Hearing and Language

Students summarize how the nervous system perceives and then elicits reactions to sound. They identify the brain structures involved in hearing. And describe the role of specific brain structures in language ability. Students explain how lateralization is important to the brain organization of language processing. They predict the brain regions that are impaired in specific language disorders and contrast the communication abilities of other animals with human language.

Reading: Chapter 9 Hearing and Language, and Siegel, R. and A. Hsu. 2017. Using Music and Rhythm to Help Kids with Grammar and Language. NPR. https://www.npr.org/sections/health-shots/2017/06/01/530723046/using-music-and-rhythm-to-help-kids-with-grammar-and-language

Watch: Science Nation. 2016. Babies are Language Sponges – even with sign language. https://www.youtube.com/watch?v=qyz8uSzh4eg

Due: Lecture Activity Worksheet, Psychology and Culture Essay 2

Week 5

Class: 10.0 Visual Perception

Students describe different structures within the eye and how they function to receive visual information and translate it to the brain. They explore the processing pathways of visual

information from the eye up to cortical brain areas. Students compare the major theories of color processing and form processing. They discuss how visual information is segregated and reconstructed in the visual system. Students identify how action potentials and synaptic transmission can produce a variety of visual experiences. They predict how damage to specific portions of the visual system will impact a person's visual perceptions. Students use online resources to investigate vision, neural connections, perception and behavior.

Quiz 4 (covers material from Week 4)

Readings: Chapters 10 Vision and Visual Perception, and Cobils – Color Blindness Simulator http://www.color-blindness.com/coblis-color-blindness-simulator/

Watch: Lotto, B. 2009. Optical Illusions Show How We See. Ted Talk https://www.youtube.com/watch?v=mf5otGNbkuc

Due: Lecture Activity Worksheet

Class: 11.0 Body Senses and Movement

Students identify the receptors involved in skin sensations of different types. They describe methods used by the brain to get information about the body and the environment. They consider how the cortical areas for sensation correspond to portions of the body. Students assess mechanisms that generate pain. They explore brain structures involved in the production of movement and predict how movement is impaired in specific movement disorders.

Readings: Chapter 11 The Body Senses and Movement, and Schwartz, R. 2015. Prosthetic Breakthrough Lets Amputees "Feel" Their Artificial Limbs. Good Worldwide, Inc. https://www.good.is/articles/prosthetic-limb-lets-amputees-feel-ends-phantom-limb-pain

Due: Lecture Activity Worksheet

Class: 12.0 Learning and Memory

Students explain how the brain is involved in different types of memory. They diagram neural involvement in processing of information that is stored in memory and describe the changes that occur in the brain as learning proceeds. They examine how memory changes during aging. Finally, they contrast the impacts of normal aging and disorders on memory. Students work in groups to investigate aging effects on learning and memory.

Readings: Chapters 12 Learning and Memory

Watch: Loftus, E. 2013. How Reliable is Your Memory? TedGlobal https://www.ted.com/talks/elizabeth_loftus_the_fiction_of_memory

Due: Lecture Activity Worksheet, Experimental Neuroscience Review

Week 6

Class: 13.0 Intelligence and Cognitive Function

Students explore how scientists have defined intelligence. They critique the scientific methodology used to measure intelligence. Students identify how the structure of the nervous system relates to intelligence. They appraise the relative contributions of heredity and environment to intelligence and assess the impact of aging on cognitive function. Students then compare the impacts of intellectual disability, autism, and attention-deficit/hyperactivity disorder on intelligence.

Quiz 5 (covers material from Week 5)

Readings: Chapter 13 and Barbey, A.K. 2018. Network Neuroscience Theory of Human Intelligence. Trends in Cognitive Science. 22(1): 8-20.

Watch: Kaku, M. 2014. The Evolution of Intelligence. Big Think. https://www.youtube.com/watch?v=bu7VulZUUdE

Due: Lecture Activity Worksheet

Class: 14.0 Sleep and Consciousness

Students summarize characteristics of the rhythms that occur during sleep and waking. They describe the neural controls of sleep and waking rhythms. Students then examine the functions of sleep and related shorter rhythms. They assess causes of sleep disorders. They also explain how researchers are approaching the issue of consciousness and indicate the neural processes that contribute to consciousness. Students work in groups to investigate sleep and consciousness online resources.

Reading: Chapter 15 Sleep and Consciousness

Watch: Foster, R. 2013. Why Do We Sleep? TedTalks. https://www.ted.com/talks/russell_foster_why_do_we_sleep

Due: Lecture Activity Worksheet

Class: 15.0 Psychological Disorders

Students name and describe the various categories of psychological disorders. They investigate characteristics and neurological causes of schizophrenia. They also describe how heredity and environment interact to produce psychological disorders. Students explore the symptoms and causes of the affective disorders. They also describe the symptoms and physiological causes of anxiety disorders. In groups, students investigate and then explain the causes and features of the various personality disorders to one another.

Readings: Chapter 14 Psychological Disorders and Kutner, M. 2017. The Aaron Hernandez Suicide: A Football Brain Injury Link? Newsweek 4/26/17. https://www.newsweek.com/aaron-hernandez-prison-suicide-cte-brain-injury-589819

Watch: Getting Help – Psychotherapy: Crash Course Psychology #35. 2014 https://www.youtube.com/watch?v=6nEL44QkL9w and Psychological Disorders – Crash Course Psychology #28. 2014. https://www.youtube.com/watch?v=wuhJ-GkRRQc and related videos.

Due: Lecture Activity Worksheet

Final Quiz

Course Materials

Readings

Course Textbook

Garrett, B. and Hough, G., 2017. Brain & Behavior: An Introduction to Behavioral Neuroscience. Sage Publications.

Readings

Barbey, A.K. 2018. Network Neuroscience Theory of Human Intelligence. Trends in Cognitive Science. 22(1): 8-20.

Baer, D. 2017. Rich people literally see the world differently. New York Magazine. https://www.thecut.com/2017/02/how-rich-people-see-the-world-differently.html

Gruber, S. A., & Sagar, K. A. (2017). Marijuana on the Mind? The Impact of Marijuana on Cognition, Brain Structure, and Brain Function, and Related Public Policy Implications. Policy Insights from the Behavioral and Brain Sciences, 4(1), 104-111.

Hamilton, J. 2017. Art Exhibition Celebrates Drawings by the Founder of Modern Neuroscience. NPR. https://www.npr.org/sections/health-shots/2017/01/26/511455876/art-exhibition-celebrates-drawings-by-the-founder-of-modern-neuroscience

Henry, L.C., Tremblay, S. and De Beaumont, L., 2017. Long-term effects of sports concussions: bridging the neurocognitive repercussions of the injury with the newest neuroimaging data. The Neuroscientist, 23(5), pp.567-578 at https://journals.sagepub.com/stoken/default+domain/DYQt47kVe3tFfwjI7ud4/full

Kutner, M. 2017. The Aaron Hernandez Suicide: A Football Brain Injury Link? Newsweek 4/26/17. https://www.newsweek.com/aaron-hernandez-prison-suicide-cte-brain-injury-589819

Lonner, W. J. (2015). Half a century of cross-cultural psychology: A grateful coda. American Psychologist, 70(8), 804-814.

Schwartz, R. 2015. Prosthetic Breakthrough Lets Amputees "Feel" Their Artificial Limbs. Good Worldwide, Inc. https://www.good.is/articles/prosthetic-limb-lets-amputees-feel-ends-phantom-limb-pain

Siegel, R. and A. Hsu. 2017. Using Music and Rhythm to Help Kids with Grammar and Language. NPR. https://www.npr.org/sections/health-shots/2017/06/01/530723046/using-music-and-rhythm-to-help-kids-with-grammar-and-language

Steckler, T., 2018. Lacking quality in research: Is behavioral neuroscience affected more than other areas of biomedical science? Journal of neuroscience methods, 300, pp.4-9.

Online Resources

20 Ways to Use Psychology in Everyday Life. Online Psychology Review Guide. https://www.onlinepsychologydegree.info/great-psychology-tricks-for-success/

Green, H. and J. Green. 2014. Crash Course Psychology. https://www.youtube.com/channel/UCX6b17PVsYBQ0ip5gyeme-Q

Textbook student resources at https://edge.sagepub.com/garrett5e/student-resources