Behavioral Neuroscience (BCPSY 1117, 1119)
Course Syllabus

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Course Description

Behavioral Neuroscience is the discipline dedicated to the scientific investigation and advancement of theory pertaining to processes underlying the biological basis of human behavior. The field is interdisciplinary in approach requiring some knowledge of psychology, biology, chemistry, neuropharmacology, biochemistry, and the clinical sciences (e.g., neurology and neuropsychiatry). The goal of this course is to provide a comprehensive introduction to behavioral neuroscience beginning with a detailed review of the nerve cell, conduction and neurotransmission. Next, we build upon this smallest unit of the nervous system through study of neuroanatomy, structure/function relationships and the developmental evolution of the whole brain. As the course proceeds, these foundational topics will nurture understanding of the neural bases of sensation, perception, cognition and emotion as well as ingestive, sexual and addictive behavior.

The course takes a research based approach through interpretation, analysis and application of experimental findings. Additional insight will be gained by examination of neural dysfunction in neurological and neuropsychiatrically impaired clinical populations. By the conclusion of the course students will have a solid background in concept and theory, research methodology, and application of neuroscientific knowledge to normal behavior and clinical disorders/syndromes. Finally, in an age of rapid neurotechnological advancement, a course in neuroscience would be incomplete without reflective consideration of ethical issues surrounding our efforts to understand the brain, its function and impact on behavior. Therefore, neuroethical dilemmas will be highlighted and integrated when relevant to discussion topics.

Course Requirements

Examinations

Students are required to complete two midterms and a final examination. If a student is unable to take an exam, documentation from a physician or college dean must be provided.

Extra Credit

Students may opt to complete an extra credit paper due at the final exam. A more detailed description of this assignment will be available in the first class session.

Attendance/Participation

A portion of each class will be taught in lecture format, however there will be many opportunities for class discussion. Active participation from each student will inevitably contribute to a more engaging and entertaining classroom experience for all. Consistent attendance and preparation prior to lecture is required and will not go unnoticed.

Extra Help

I am available for extra help during office hours and by appointment. Please do not hesitate to ask for assistance if you are experiencing difficulty with the course material. I greatly enjoy talking with students about life at Barnard and Columbia and/or future career interests.

Readings

Primary Textbook

The required text for the course is Carlson, N.R. (2006). The Physiology of Behavior, 9th Edition. Allyn and Bacon Publishers: Boston, Massachusetts. It may be purchased at the Columbia Bookstore or from booksellers online. All lecture material will be based on the most recent edition. It is strongly encouraged that you do not use an older text edition.

Supplemental Readings

Links to original research journal articles and clinical case material will be available on the *Courseworks* website.

Grading

Your final average will be computed as follows:

Exam One:	30%
Exam Two:	30%
Final Exam:	40%

Course Content

Class Session	Lecture/Discussion Topic

Session 1	Welcome and Introduction
Session 2	Research Methods in Behavioral Neuroscience *Neuroethics Spotlight: Ethical Issues in Animal and Human Experimentation*
Session 3	Organization of the Nervous System: Brain, Nerve Cells, Genes and Behavior
Session 4	Structure of the Nervous System: Neuroanatomy *Neuroethics Spotlight: Ethical Issues and Neuroimaging*
Session 5	Neural Conduction and Synaptic Transmission, Hormones *Discussion Topic: Psychoactive Drug Action*
Session 6	Neurodevelopment *Clinical Case Analysis: Hydrocephalus and Fetal Alcohol Syndrome*
	EXAM 1
Session 7	Sensory and Perceptual Processes *Clinical Case Analysis: "Aura" and Migraines*
Session 8	Control of Movement *Clinical Case Analysis: Parkinson's Disease and Tourette's Syndrome* *Neuroethics Spotlight: Ethical Issues and Neurotransplantation*
Session 9	Ingestive Behavior *Clinical Case Analysis: Bulimia Nervosa and Neurobiological Theory*
Session 10	Sleep and Biological Circadian Rhythms *Clinical Case Analysis: Pharmacological Treatments for Insomnia*
	EXAM 2
Session 11	Hormones and Reproductive Behavior
Session 12	Memory, Learning and Neuroplasticity *Clinical Case Analysis: Patient H.M. and the Amnesias*
Session 13	Cognition, Intelligence and Consciousness *Clinical Case Analysis: The Split Brain Patient*

Class Session	**Lecture/Discussion Topic**
Session 14	Emotion
Session 15	Disorders of Thought and Volition: Schizophrenia

Session 16 Disorders of Anxiety and Mood: Unipolar and Bipolar Depression
Anxiety Disorders
Discussion Topic: Psychopharmacology as a tool for understanding the neurobiology of psychopathology

Required Reading

Session 1 and 2: Welcome and Introduction/Research Methods

Primary Text (Carlson): Chapter 5: Methods and Strategies of Research

Session 3: Organization of the Nervous System

Kolb and Whishaw (2006). An Introduction to Brain and Behavior: Chapter 2: How is the Brain Organized?

Session 4: Structure of the Nervous System: Neuroanatomy

Primary Text (Carlson): Chapter 3: Structure of the Nervous System

Illes, J., Kirschen, M.P. & Gabrieli, J.D.E. (2003). From neuroimaging to neuroethics. *Nature/ Neuroscience* 6(3):205.

Illes, J., Racine, E., & Kirschen, M. (2006). A picture is worth 1000 words, but which 1000: In Illes, J. (Ed.), Neuroethics: Defining the Issues in Theory, Practice and Policy (pp. 149-168). New York, New York: Oxford
University Press.

Session 5: Neural Conduction and Synaptic Transmission, Hormones

Primary Text (Carlson): Chapter 2: Structure and Functions of Cells of the Nervous System
Chapter 4: Psychopharmacology

Session 6: Neurodevelopment

Anderson, V., Northam, J & Wrennall, J (2005). Developmental Neuropsychology. Chapter Six: Hydrocephalus and Spina Bifida.

Kolb and Whishaw: Chapter 3: How Does the Brain Develop?

Prenatal Exposure to Alcohol (2000). *Alcohol Research and Health* 24 (1):32-41.

Session 7: Sensory and Perceptual Processes

Primary Text (Carlson): Chapter 6: Vision
Chapter 7: Audition, Body Senses, and Chemical Senses

Dahlem, M.A., Engelmann, R., Lowel, S & Muller, S.C. (2000). Short Communication: Does the migraine
aura reflect cortical organization? *European Journal of Neuroscience* 12: 767-770.

Session 8: Control of Movement

Primary Text (Carlson): Chapter 8: Control of Movement

Langston, J.W. (2005). The promise of stem cells in parkinson's disease. *The Journal of Clinical Investigation* 115(1):23-25.

Singer, H.S. & Minzer, K. (2003). Neurobiology of tourette's syndrome: concepts of neuroanatomic localization and neurochemical abnormalities. *Brain Development* 25(Suppl 1):S70-84.

Session 9: Ingestive Behavior

Primary Text (Carlson): Ingestive Behavior

Frances, A & Ross, R (1995). Case Analysis: Bulimia Nervosa: A Young Woman Who Can't Stop Eating.

Mauri, MC, Rudell, R, Somaschini, E, Roncoroni, L, Papa, R, Mantero, M, Longhini, M & Penati, G (1996). Neurobiological and psychopharmacological basis in the therapy of bulimia and anorexia. *Progress in*
Neuropsychopharmacology, and Biological Psychiatry 20(2):207-40.

Session 10: Sleep and Biological Circadian Rhythms

Primary Text (Carlson): Sleep and Biological Rhythms

Ebert, B., Wafford, KA. & Deacon, S (2006). Treating insomnia: current and investigational pharmacological approaches. *Pharmacological Therapeutics* 112(3):612-629.

Session 11: Hormones and Reproductive Behavior

Primary Text (Carlson): Chapter 10: Reproductive Behavior

Session 12: Memory, Learning and Neuroplasticity

Primary Text (Carlson): Chapter 13: Learning and Memory

Milner, B., Corkin, S., & Teuber, H.L. (1968). Further analysis of the hippocampal syndrome: 14 year follow-up study of H.M. *Neuropsychologia* 6, 215-234.

Session 14: Emotion

Primary Text (Carlson): Chapter 11: Emotion

Session 15: Disorders of Thought and Volition: Schizophrenia

Primary Text (Carlson): Chapter 16: Schizophrenia and Affective Disorders

Jones, H. & Pilowsky, L. (2002). Dopamine and antipsychotic drug action revisited. *British Journal of Psychiatry* 181: 271-5.

Session 16: Disorders of Anxiety and Mood: Unipolar and Bipolar Depression, Anxiety Disorders

Primary Text (Carlson): Chapter 17: Anxiety Disorders, Autistic Disorder, Attention-Deficit/Hyperactivity
Disorder, and Stress Disorders

Rowe, D.L. & Hermens, D.F. (2006). Attention deficit/hyperactivity disorder: neurophysiology, information processing, arousal and drug development. *Expert Reviews in Neurotherapeutics*. 6(11):1721-34.

WELCOME TO THE COURSE!!!!