

COURSE APPROVAL DOCUMENT
Southeast Missouri State University

Department: Psychology

Course No. PD511

Title of Course: Fundamentals of Neuroscience

Date: August 1, 2015

Please check: New
 Revision

I. Catalog Description (Credit Hours of Course): The course is a general overview of neural and chemical bases of behavior, with attention to clinical implications of abnormalities (3).

II. Co- or Prerequisite(s): none

III. Purposes or Objectives of the Course (optional):

- 1) Identify, classify, describe and compare the types of neurons and glial cells in the central nervous system (CNS) and the peripheral nervous system.
- 2) Review and compare the embryological origins of the major subdivisions of the CNS.
- 3) Describe the external topography of the CNS.
- 4) Describe the meningeal coverings of the CNS
- 5) Describe the blood supply and circulation of cerebrospinal fluid in the CNS.
- 6) Describe the major structural and functional subdivisions of the CNS.
- 7) Describe the major neural systems in the CNS and the main functional pathways by which the systems operate.
- 8) Differentiate the main categories of neurotransmitters.
- 9) Identify cranial nerves' nuclei and pathways, describe their sensory and motor functions, and integrate this information to evaluate their roles in given clinical case scenarios.
- 10) Discuss how neurotransmitters operate at the pre-synaptic, post-synaptic, and synaptic cleft level.
- 11) Understand the basic mechanism of operation of neurotransmitters at the cell membrane level.
- 12) Identify those neurotransmitters most associated with the operation of motor systems, motivational states, emotional reactivity, and cognitive and memory processes.
- 13) Gain a general appreciation of the main neurochemical dysfunctions most frequently presenting as neurological/neuropsychological syndromes in clinical settings.
- 14) Comprehension of the effects of pharmacological agents in the treatment of neurochemical abnormalities.

Add additional Objectives as needed

IV. Student Learning Outcomes (Minimum of 3):

- 1) The student will explain how neurotransmitters function at the synaptic level, how neurotransmitters function in emotional and cognitive processes, and how they are related to various clinical syndromes.
- 2) The student will describe the major structural and functional subdivisions of the CNS.
- 3) The student will describe the effects of various pharmacological agents on neurotransmitters and clinical syndromes.

Add additional SLOs as needed

V. Optional departmental/college requirements:

- A.
- B.

VI. Course Content or Outline (Indicate number of class hours per unit or section):

See sample Ponce syllabus attached. Total credit hours of course: 3

- A.
- B.
- C.

VII. Please Attach copy of class syllabus and schedule as an example

Signature: _____
Chair

Date: _____

Signature: _____
Dean

Date: _____

**PONCE HEALTH SCIENCES UNIVERSITY
CLINICAL PSYCHOLOGY PSY.D. PROGRAM**

SYLLABUS

COURSE TITLE	Fundamental of Neurosciences
CODING	PSY 511
CREDIT HOURS	3 credits
CONTACT HOURS	45
PREREQUISITE	None
PROFESSOR	Job Description: Biological Basis of Behavior
TEACHING ASSISTANT	
OFFICE HOURS	
EMAIL ADDRESS	
SEMESTER	

COURSE DESCRIPTION:

Starting with a general exploration of the intrauterine development of the neural tube and neural crest cells, the course explores the anatomical and physiological foundation of the nervous system within a developmental context. It provides a general overview of the neural and chemical basis of behavior. The lectures will mostly address normal neurological development and functioning but will make reference of the clinical implications of various endogenous and exogenous abnormalities such as genetic and neurodevelopmental variations and morphological abnormalities. The sensory, motor and arousal systems will be examined in detail.

GENERAL OBJECTIVE:

Understand the anatomical and physiological foundation of the nervous system with emphasis in the chemical basis of behavior.

SPECIFIC OBJECTIVES:

By the end of the course the students will be able to:

1. Identify, Classify, describe and compare the types of neurons and glial cells in the central nervous system (CNS) and the peripheral nervous system.
2. Review and compare the embryological origins of the major subdivisions of the CNS
3. Describe the external topography of the (CNS).
4. Describe the meningeal coverings of the CNS
5. Describe the blood supply and circulation of cerebrospinal fluid in the CNS.
6. Describe the major structural and functional subdivisions of the CNS
7. Describe the major neural systems in the CNS and the main functional pathways by which the systems operate.
8. Differentiate the main categories of neurotransmitters.
9. Identify cranial nerves nuclei and pathways, describe their sensory and motor functions, and integrate this information to evaluate their roles in giving clinical case scenarios.
10. Discuss how neurotransmitters operate at the pre-synaptic, post-synaptic and synaptic cleft level.
11. Understand the basic mechanism of operation of neurotransmitters at the cell membrane level.
12. Identify those neurotransmitters most associated to the operation of motor system, motivational states, emotional reactivity, and to cognitive and memory processes.
13. Gain a general appreciation of the main neurochemical dysfunctions most frequently presenting as neurological/neuropsychological syndromes in clinical setting.
14. Comprehension of the effects of pharmacological agents in the treatment of neurochemical abnormalities.

COURSE CONTENT

SESSION 1:

Evolution, Development and Composition (overview) of the nervous system.

- A. Development during embryonic stages: from ectoderm to neural tube and neural crest.
- B. Abnormalities associated to neural tube defects.
- C. Cell differentiation: neurons and neuroglia.

Assigned readings:

Overview of the central Nervous System: Chap. 1: 3-18
Development of the Nervous System: Chap. 2: 19-34

SESSION 2:

The Neuron and other Nerve Cells

- A. Description of Neuron and neurohistological techniques.
- B. Cytology of the Neuron.
- C. Synapses, action potential and transmission
- D. Neuroglial Cells
- E. Development of Neurons and Neuroglial cells

Assigned readings:

Histology of the nervous system. Chap. 5: 61-76
Electrophysiology of neurons. Chap. 6: 77-94

SESSION 3:

Central nervous system cavities, cerebrospinal fluid and blood irrigation

- A. Ventricular system
- B. Cerebrospinal fluid
- C. Blood irrigation

Assigned readings:

Meninges and cerebrospinal fluid. Chap. 3: 35-46
Blood supply of the central nervous system. Chap 4: 47-58

Session 4:

Organization of the Central nervous System: Brainstem

- A. Medulla Oblongata
- B. Pons
- C. Midbrain

Assigned readings:

Brainstem I: The medulla Chap. 10: 169-182
Brainstem II: Pons and cerebellum. Chap. 11: 183-196
Brainstem III: The midbrain. Chap. 12: 197-206

Session 5:

Organization of the Central Nervous System: The Spinal Cord

- A. Gross anatomy
- B. Internal structure
- C. Cytoarchitectural organization
- D. Spinal segments
- E. Spinal cord tracts
- F. Lesions

Assigned readings:

The spinal cord. Chap. 9: 139-168

Session 6:

The Cranial Nerves

- A. Classification of the cranial nerves
- B. Anatomical organization of the cranial nerves
- C. Description of related nuclei, ganglia and function of cranial nerves

Assigned readings:

The Cranial Nerves. Chap: 14: 227-254

Session 7:

The cerebral cortex and thalamus

- A. Anatomical and functional characteristic of the gray matter of the cerebral cortex
- B. Afferent connections
- C. Cerebral dominance
- D. Anatomical and functional characteristic of the thalamic nuclei

Assigned readings:

The thalamus and the cerebral cortex. Chap. 26: 465-492

Session 8:

Neurochemistry: Neurotransmitter Systems Chemical basis for neuronal communication

- A. General overview of how neurotransmitters operate
- B. Levels of operation and action of neurotransmitters; pre & post synaptic
- C. Neurochemical basis of psychological processes; emotion, motivation, cognition, behavior.

Assigned readings:

Neurotransmitters. Chap. 8: 107-136

Session 9:

Sensory System I

- A. The Auditory System
- B. The Vestibular System
- C. Olfaction and taste

Assigned readings:

The auditory and vestibular system. Chaps. 17: 293-310
Olfaction and taste. Chap 18: 311-322

Session 10:

Sensory System II and The Autonomic Nervous System

- A. The Visual System
- B. Autonomic nervous system
 - a. Divisions:
 - i. Sympathetic
 - ii. Parasympathetic
 - iii. Enteric

Assigned readings:

Visual system. Chap 16: 271-292
The autonomic nervous system. Chap: 22: 381-406

Session 11:

Motor System and Hypothalamus

- A. Basal Ganglia
- B. Cerebellum
- C. Motor cortex
- D. Hypothalamus

E. Pituitary gland

Assigned readings:

- The basal ganglia. Chap. 20: 343-356
- The cerebellum Chap. 21: 357-378
- The hypothalamus. Chap. 24: 427-444
- The upper motor neuron. Chap. 19: 325-342

Session 12:

Emotions and the brain

- A. The Limbic System
- B. The Papez Circuit
- C. Aggression
- D. Neural Basis of Reinforcement

Assigned readings:

- The Limbic System. Chap. 25: 445-464

Session 13:

Sleep and Brain Rhythms

- A. REM sleep and dreaming
- B. Circadian Rhythms
- C. Epilepsy and EEG

Assigned readings:

- Sleep and wakefulness. Chap. 23: 419-422
- Electroencephalogram: Waxman SG, (2010) Clinical Neuroanatomy, 225-228, McGraw Hill Lange

TEACHING STRATEGIES AND ACTIVITIES

- A. Lectures
- B. Small group discussion

RESOURCES

- A. Professors with a PhD degree in Anatomy and Physiology.
- B. Audiovisual resources of the school library.

STUDENT'S EVALUATION CRITERIA AND GRADING SYSTEM:

- A. Midterm and Final exam 90%
- B. Class participation10 %

OTHER IMPORTANT INFORMATION

Diversity Statement

Diversity relates to the acknowledgement of the human condition in all manifestations; its similarities and differences. Diversity seeks to understand different biopsychosocial experiences. It strives towards the human values of equality, respect, and acceptance, within a multicultural world whose boundaries have been overshadowed by technology and globalization. Diversity is the antithesis to oppression in all its manifestations (e.g. sexism, racism, exploitation) and to discrimination in any form, including discrimination due to sexual orientation, physical (dis) Abilities, socioeconomic status, worldviews, places of origin, cultural orientation, primary language, or to any other human characteristic, preference or state.

The notion of diversity is central to the study of human behavior. It requires the development of self-awareness of prejudiced attitudes. It includes understanding of differences in worldviews associated to the psycho-cultural and psycho-economic background of recipients of psychological services. Our training program promotes the awareness of subtle and “invisible” prejudice (e.g. homophobia) acquired during formative years.

Request for Reasonable Accommodations

Students in need of accommodation based on the impact of a disability should contact the professor privately to discuss the specific need. Students with documented disabilities should contact the Academic Deanship Office to coordinate reasonable accommodations.

Attendance Policy

After three absences for a 3 credit course, or 2 absences for a 2 credit course, the student will automatically be dropped from the class unless the professor recommends otherwise. The complete institutional attendance policy is included in the Appendix.

Honor Code Reminder

Any violation of the ethical dispositions of our institution or program will be automatically referred to the corresponding authorities. For the present course, plagiarism may lead to obtaining a grade of “0” on the plagiarized work and this would most probably lead to a failing grade in the course. Students found to violate this policy may be referred to the institutional Promotions Committee with a recommendation of dismissal from the program. The complete plagiarism policy is included in the Appendix.

Note

This syllabus is a guide and is subject to change according to circumstances that may arise during the semester. Students are responsible for all announced changes in the syllabus.

TEXTBOOK

Siegel, A. and Sapru H.N. (2006). Essential Neuroscience. Lippincott Williams & Wilkins

BIBLIOGRAPHY

Blumenfeld, Hal (2010). Neuroanatomy Through Clinical Cases. Sinauer Associates, Inc.

Snell R. (2010). Clinical Neuroanatomy. Lippincott Williams & Wilkins

Nolte, J. (2009). The human Brain and Introduction to its Functional Anatomy. Mosby, ElSevier

Felten D.L. and Jozefowicz R.F. (2003). Netter’s Atlas of Neuroscience. Icon Learning Systems

Haines, D.E., (2002). Fundamentals of Neuroscience. New York: Churchill Livingstone

Kandel, E.R., Schwartz, J.H., Jessel, T.M. (2000). Principles of Neural Science. 4th Ed. McGraw-Hill

Kiernan, John A. (2009). Barr’s The Human Nervous System. Lippincott William & Wilkins

Kinsley, Robert E. (2000). Concise Text of Neuroscience. Lippincott Williams and Wilkins

Martin, John H. (2003). Neuroanatomy Text and Atlas. McGraw-Hill.

Nolte, J. (2002). The Human Brain, An Introduction to Its Functional Anatomy. Mosby

INSTITUTIONAL ATTENDANCE POLICY

Attendance at lectures and laboratory exercises is mandatory unless excused because of illness or by previous authorization of the professor in charge of the course. Each department will decide the relative weight to be given to the attendance in calculating the final grade.

Attendance to clinical activities involving patients, patient models, and similar types of activities is considered part of the students' professional responsibility and is mandatory. Absence may be excused after the student consults with the respective department chairperson. Three unexcused absences may adversely affect the final grade for a course.

Incomplete work due to illness or other serious circumstances during the course will be handled according to departmental policies, which must be provided to the students in writing at the beginning of each term. Faculty are not obligated to repeat lecture/laboratory topics that were presented at scheduled times and dates.

PROGRAM POLICY ON ACADEMIC HONESTY AND PLAGIARISM

There are different ways in which a student may incur in one of the various forms of academic dishonesty. Lack of knowledge does not justify academic dishonesty as common sense usually helps to prevent potentially problematic situations. In case of doubt, the standards of academic honesty call for the student to ask the professor or advisor. The most frequent form of academic dishonesty is plagiarism. According to the Random House Webster's college Dictionary plagiarism is: *"the unauthorized use of the language and thoughts of another author and the representation of them as one's own. 2. something used and represented in this manner"*.

Our faculty recognizes that plagiarism in any of its forms and/or manifestation is a serious offense both in the academic and the professional world. Some of the acts that constitute plagiarism are:

- a. Using words or thoughts of authors without giving due credit.
- b. Presenting work done for one course to fulfill the requirements of another course (self-plagiarism).
- c. Taking credit for phrases or ideas of other authors to produce a collage of ideas that have not been created by the student.
- d. Not using quotation marks to identify the exact words of an author.
- e. Taking information from Internet without citing the source.
- f. Buying papers from the Internet or from other sources.
- g. Using another student's paper or clinical report to satisfy course requirements.

Each professor will evaluate alleged cases of academic dishonesty and will proceed to deal with each case according to institutional policies and procedures.