Spring 2-1-2008

BMED 662.01: Neurosciences for the Health Professions

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Physical Therapy PT 536 Neurosciences for the Health Professions (5 credits)
Portion of BMED 662
Spring Semester 2008

Course Description: Neuroanatomy and physiology of the human nervous system with emphasis on evaluation of central nervous system lesions and pathological conditions, clinical applications to physical therapy. Course is offered through the School of Physical Therapy and Rehabilitation Science with instruction support from the Department of Biomedical & Pharmaceutical Sciences of the Skaggs School of Pharmacy.

Instructors:
Steve Fehrer, PhD, PT (Course Director PT 536)
Sheng Li, PhD, MD
Darrell Jackson, Ph.D. (Course Director BMED 662)
Diana Lurie, Ph.D.

Class hours: 9:10-10:00 Tue.; 10:10-12:00 Wed. and Fri. in SB 025

Required Textbooks:
1. Nolte, The Human Brain, An Introduction to Its Functional Anatomy, 5th edition, Mosby, 2002.
2. Ciccone, Pharmacology in Rehabilitation 4th edition, F.A. Davis, 2007
3. McKinnis et al, Medical Imaging in Rehabilitation, 2 CD set

Additional References:
Leonard, The Neuroscience of Human Movement, Mosby, 1998. Copy on reserve at Mansfield Library Reserve

Teaching Methods and Learning Experiences: The content for this course will be presented primarily through a lecture format, the assignment of readings in the required textbooks and the use of self-study CD materials. The content will be presented by a variety of faculty. The course will also include occasional laboratory activities addressing nervous system clinical tests for assessment of neurological dysfunction. A Blackboard shell has been created for the course. Depending upon the desires of the individual course instructors this shell may contain power point presentations, class notes, additional reference material, and review questions.

Evaluation of Student Performance:
Classroom attendance is voluntary. Students are responsible for all material covered in lectures and laboratory/study group activities. Assigned textbook readings are meant to assist the student in their comprehension of course material. The student's grade will be based on **three** examinations. The first examinations (50 points) will be one hour long and include only a written portion. The second (midterm) and third (final) examinations (100 points each) will be two hours long and include written and photographic slide practical sections. The final examination will be comprehensive, covering all the

material presented in the course. Course grades for PT 536 will be determined as follows: A = 90-100%, B+ = 87-89%, B = 83-86%, B- 80-82 %, C+ = 77-79 %, C =73-76%, C- 70-72 %, D+ 67-69%, D 63-66%, D- 60-62%, <60% F. Scores less than 73% on any exam will require the student to arrange a meeting with the professor within one week to address remediation strategies. Evaluation of student performance on the examinations will be reported through the Blackboard shell grade reporting system.

The grading criteria for PT 536 will follow the policy of the School of Physical Therapy and Rehabilitation Science (see student handbook) with a passing grade being a "C" and a 73 percent. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and /or disciplinary sanction by the University. Any evidence of cheating or plagiarism will result in failure of the course. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/SA/VPSA/index.cfm/page1321.

2008 Course Schedule:

Week 1

Tuesday Jan 22, 2008
9:10-10:00 Fehrer - Introduction; Nolte 1-36, Leonard 1-20

Wednesday Jan 23, 2008
10:10-12:00 Fehrer – Nervous system development; Disorders of neuron-embryonic development; Nolte 37-52, Leonard 124-128

Friday Jan 25, 2008
10:10-12:00 Fehrer – Meningeal coverings, gross structure of brain and spinal cord; Nolte 53-66 Ventricles and CSF, meningitis/encephalitis;
Nolte 79-97, 98-118.

Week 2

Tuesday Jan 29, 2008
9:10-10:00 Fehrer – Blood supply of brain & spinal cord, control of cerebral blood flow; Cerebral vascular disease; Nolte 119-146, 255-257

Wednesday Jan 30, 2008
10:10-12:00 No class DPT students on outing

Friday Feb 1, 2008
10:10-12:00 Fehrer – Autonomic nervous system; Nolte 250-255

Week 3

Tuesday Feb 5, 2008
9:10-10:00 Fehrer – Neurotransmission; Nolte 147-167

Wednesday Feb 6, 2008
10:10-12:00 Jackson – Autonomic pharmacology

Friday Feb 8, 2008
10:10-12:00 Fehrer – Neurotransmission; Nolte 175-195

Week 4

Tuesday Feb 12, 2008
9:10-10:00 Fehrer - Neuron damage and regeneration

Wednesday Feb 13, 2008
10:10-11:00 Jackson – support cells, MS and other neurodegenerative diseases
11:10-12:00 Fehrer – Neuromuscular pathology
End of material for first examination

Friday Feb 15, 2008
10:10-12:00 Fehrer - Sensory systems, sensory modalities; Nolte 197-222

Week 5

Tuesday Feb 19, 2008
9:10-10:00 **Examination 1** (50 points)

Wednesday Feb 20, 2008
10:10-11:00 Fehrer – Pain pathways
11:10-12:00 Jackson – Opioid pharmacology and pain modulation, Nolte 208-209

Friday Feb 22, 2008
10:10-12:00 Fehrer – GTO and muscle spindle; Nolte 210-214, 234-238, Leonard 20-30, 70-101

Week 6

Tuesday Feb 26, 2008
9:10-10:00 Fehrer – Ascending spinal cord pathways; Nolte 221-252

Wednesday Feb 27, 2008
10:10-12:00 Fehrer – Ascending/descending spinal cord pathways

Friday Feb 29, 2008
10:10-12:00 Fehrer – Peripheral and central lesion problems, Spinal cord injury, anterior horn lesions

Week 7

Tuesday March 4, 2008
9:10 – 10:00 Jackson - Pharmacological control of spasticity

Wednesday March 5, 2008
10:10-12:00 Lurie - Visual pathways; Nolte pp.511-524

Friday March 7, 2008
10:10-12:00 Lurie – visual clinical tests

Week 8

Tuesday March 11, 2008
9:10-10:00 Li - Brainstem and cranial nerves

Wednesday March 12, 2008
10:10-12:00 Li - Cranial nerves

Friday March 14, 2008
10:10-11:00 Li – Cranial nerves
11:10-12:00 Fehrer - Vestibular system; Nolte 337-342, 358-370, Leonard 175-184
End of material for Examination 2

Week 9

Tuesday March 18, 2008
9:10-10:00 Li - Basal ganglia

Wednesday March 19, 2008
10:10-12:00 Li - Basal Ganglia, Parkinson disease, dystonia, Huntington disease

Friday March 21, 2008
10:10-12:00 **Examination 2** (100 points)

Week 10 Spring Break

Week 11

Tuesday April 1, 2008
9:10-10:00 Li -Videotape: Common movement disorders

Wednesday April 2, 2008
10:10-12:00 Fehrer - Cerebellar anatomy and function; Nolte 486-509, Leonard 49-58

Friday April 4, 2008
10:10-12:00 Fehrer - Cerebellar dysfunction

Week 12

Tuesday April 8, 2008
9:10-10:00 Fehrer - Diencephalon; Nolte 386-409, Leonard 59-63

Wednesday April 9, 2008
10:10-11:00 Jackson – Hypothalamic pituitary target axis

11:10-12:00 Fehrer - Organization of cerebral cortex; Leonard 102-133

Friday April 11, 2008
10:10-12:00 Jackson - Neural response to damage

Week 13

Tuesday April 14, 2008
9:10-10:00 Jackson - Limbic system (including taste and olfaction)

Wednesday April 15, 2008
10:10-11:00 Jackson – Limbic system continued
11:10-12:00 Fehrer - Cerebral Cortical function; Nolte 525-555, Leonard 63-65

Friday April 18, 2008
10:10-12:00 Fehrer - Role of cerebral cortex in movement; Leonard 102-139

Week 14

Tuesday April 22, 2008
9:10-10:00 Fehrer – Physical therapy neurological examination

Wednesday April 23, 2008
10:10-12:00 Fehrer – Lab activity neurological exam

Friday April 25, 2008
10:10-11:00 Fehrer - Neurological evaluation – motor function and functional activities
11:10-12:00 Self study - Diagnostic imaging of the CNS; McKinnis CD

Week 15

Tuesday 29, 2008
9:10-10:00 Self study – Diagnostic imaging of the CNS; McKinnis CD

Wednesday April 30, 2008
10:10-12:00 Fehrer - Neuroscience of motor learning and motor systems; Leonard 203-226

Friday May 2, 2008
10:10-12:00 Fehrer - Neural control of human locomotion; Leonard 146-175

Final examination: Wednesday May 7, 2008, 10:10 AM -12:10 PM, SB 025

Course Objectives:

1= Knowledge and Comprehension
2= Application
3= Psychomotor
4= Analysis, synthesis and Evaluation

5= Affective

Content Area:

A. Embryology- Neural Tube; Neural Crest; Cell Migration

1.1 Define and list basic processes involved.
1.2 Recognize and describe component parts
2.1 Demonstrate application by assimilating this information as the course progresses. Examination scores and class participation will reflect student success in this area.
3.1 Not applicable
4.1 As per 2.1
4.2 Predict clinical consequences of damage after injury, during certain stages of development, and to specific structures
4.3 Analyze potential sites of involvement when given a case study
5.1 N/A

B. Neonatal Nervous System: Genetic and Epigenetic factors - For this and all subsequent content areas, the assessment of knowledge (1), Application (2), Psychomotor (3), Analysis (4) and Affective (5) are as per Content area A.

C. Gross Anatomy of the Cerebral Cortex, Brainstem and Spinal Cord
D. CNS/Brain Organization
E. Neurohistology: Neuron types, support cells, synapses, neuromuscular junction, staining techniques.
F. Responses of neurons to damage
G. Degeneration/regeneration/collateralization
H. Histology and organization of cerebral cortex
I. Fluid environment of the brain; Clinical manifestations
J. Blood supply of the brain; Clinical manifestations
K. Clinical manifestations of tumor locations (motor emphasis)
L. Spinal cord anatomy/physiology
M. Neurophysiology: action potential; myelin; EPSP; IPSP; presynaptic inhibition; spatial summation; temporal summation; long term potentiation
N. Spinal cord physiology: Spindles, Myotatic reflexes, GTOs, Renshaw cells, Ia inhibitory interneurons
O. Spinal cord physiology: Neurotransmission, spasticity
P. Spasticity: Clinical Perspectives
Q. Gross anatomy of brainstem
R. Cranial Nerves: function and pathways
S. Blood supply cranial nerves and brainstem: clinical issues
T. Somatosensory pathways and receptors; dorsal columns; pain pathways
U. Somatosensory pathways; Autonomic nervous system
V. Limbic system; Reticular system
W. Neuroimmunology/Neurohormonal control
X. Autonomic Nervous system; Hypothalamus; Papez circuit
Y. Visual system; pathways and clinical signs of lesion induced impairment
Z. Vestibular System
AA. Higher cortical functions
-speech, cognition, memory (motor, cognitive, emotional)
BB. Motor Systems: basal ganglia, cerebellum, cerebral cortex
CC. Neural mechanisms subserving muscular cocontraction
DD. Neural consequences of perinatal vs. adult onset CNS damage
EE. Principles of the neurological examination and evaluation
FF. Major Neurological pathologies – CVA, SCI, MS, Guillain Barre, meningitis, anterior horn diseases, peripheral nerve injuries, Parkinson, Huntington, TBI, migraine, epilepsy
GG. Pharmacological agents – opioids, antispastic agents, antiparkinson agents