Montgomery College Physical Therapist Assistant Program
PHTH 204 - Neurophysiology and Motor Learning

Credit/ Clock Hours: 2 semester hours for 30 clock hours lecture.

Meeting Schedule and Location: Thursday 1 – 3:15. This class meets over 10 weeks from August 31-November 2, 2018. Final exam week is November 2 - 6, 2018. **There will be three (3) Mandatory class assigned Fridays (Sept. 14th, 21st, and 28th) from 10:00-12:30pm.** Students are responsible for all assigned materials and content if class is missed. Class will meet in HC 229.**NB: unsuccessful completion of practical exams or didactic exams may result in delay or cancelation of PHTH 223 Clinical Practicum # 1.**

Instructor and course information: Anniet M. Glenn, PTA, MS

Office phone: 240 567 5524
E-mail: anniet.glenn@montgomerycollege.edu

Angela Venerable Joyner, PT, MHS

Email: angela.venerablejoyner@montgomerycollege.edu

Course Description: In depth review of neurological physiology, anatomy, and pathology and an introduction to motor control and motor learning throughout the lifespan. Course content will focus on developing sufficient foundational knowledge to work with neurological pathology encountered in physical therapy practice, and with geriatric and pediatric populations

Course Prerequisite: Program standing

Course Content Outline

1) Review of Anatomy, Physiology and Pathology of Neuromotor systems
   a) Normal structure and function
   b) Normal developmental milestones
   c) Normal aging
   d) Typical signs and symptoms of pathology
   e) complications: acuity, LOC, cognition, depression
   f) Typical recovery patterns, recovery versus compensation
2) Theories of motor learning and motor control
3) Lifespan changes associated with
   a) Gait
   b) Posture
   c) Balance and coordination
   d) Endurance
   e) ADLs
4) Data collection and interventions for neurological conditions
   a) Data collection and interventions for gait and transfers
   b) Data collection and interventions for posture
   c) Data collection and interventions for balance and coordination
   d) Data collection and interventions for endurance, strength, and ROM relating to ADLs
   e) Data collection and interventions for wheelchair mobility
5) Orthotics
6) Geriatrics, CVA, TBI, Parkinson's, Vestibular disorders
7) Review of ADA and architectural barriers

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Course Outcomes: Upon completion of this course, the student will be able to:

1. Describe anatomy of the normal neuromotor systems.
   a. identify neurological structures and sensorimotor pathways on lab models or pictures.
   b. examine the principles and importance of hierarchal and parallel processing in the nervous system.
   c. differentiate between the structures and the roles of the CNS and the PNS.
   d. differentiate between the signs and symptoms of upper motor neuron and lower motor neuron lesions.

2. Describe physiology of the normal neuromotor systems.
   a. explain the process of nerve conduction and muscle contraction.
   b. describe the composition and function of spinal nerves.
   c. name the cranial nerves and describe their function. Identify components and describe the functions of the brain and spinal cord.
   d. describe the visual and vestibular pathways and appraise their role in motor function.
   e. integrate the pathways of sensory and motor impulses with the contributions from other CNS structures.

3. Describe normal developmental milestones across the lifespan.
   a. describe and demonstrate on a doll or lab partner, the stimulus and response for spinal reflexes, righting and equilibrium reactions.
   b. state the sequence and the age when developmental reflexes and reactions would be seen.
   c. rank in chronological order gross and fine motor skills.
   d. identify the progression of speech and language development.
   e. given the age and description of a child, assess the child for possible developmental delays or abnormal development.
   f. identify physical developmental milestones throughout infancy, childhood, and adolescence.
   g. apply the concepts of the developmental sequence, righting and equilibrium reactions, and other prerequisites for functional movement to treatment procedures on a lab partner or a child.
   h. differentiate between normal physical aging changes and pathology from young adulthood to old age.
   i. discuss the effects of normal aging on learning, memory, problem solving, and intelligence.
   j. discuss teaching and communication strategies that are helpful in treating the elderly while under the direction and supervision of a Physical Therapist.
   k. observe normal movement on lab partners and compare normal movement strategies between individuals.

4. Describe popular theories of motor learning and motor control.
   a. define motor control
      i. explain how factors related to the individual, the task, and the environment affect the organization and control of movement
      ii. discuss limitations and clinical applications of the theories of motor control relating to recovery of function
   b. define motor learning
      i. explain the similarities and differences between learning, performance, and recovery of function
      ii. identify the following theories of motor learning: stages of motor learning, closed loop, schema, and ecological
      iii. discuss limitations and clinical applications of the theories of motor learning relating to recovery of function

iv. identify the significance of feedback in the recovery of function
v. explain the differences between recovery and compensation

5. Interpret findings from standard tests and measures of arousal, mentation, and cognition.
   a. identify tests and measures for arousal, mentation, and cognition
   b. relate pathology to typical cognitive and perceptual impairments
   c. identify function effects of cognitive and perceptual impairments

6. Analyze the impact of common neurological pathology on the achievement of developmental milestones.
   a. relate pathology to disruption of developmental milestones in genetic, acquired, or traumatic conditions
   b. discuss how alterations in developmental milestones will affect lifespan development, recovery, and function
      i. postural control, coordination and balance
      ii. mobility function ADLs, Wheelchair mobility, gait and transfers
      iii. grasp, reach, and manipulation, strength and endurance
   c. differentiate between deficits resulting from spinal and cranial nerve trauma.

7. Analyze the impact of common neurological pathology on motor control and motor learning.
   a. Describe data collection tests and measures for balance, coordination, posture, tone, wheelchair mobility, gait and transfers, strength, endurance and ROM related to ADL
   b. describe impairments of postural control, mobility function, and grasp, reach, and manipulation associated with common neurological pathology
   c. contrast recovery, function, and compensation in common neurological pathology – geriatrics and vestibular problems

8. Analyze impact of common neurological pathology (geriatrics, CVA, TBI, Parkinson's and vestibular disorders) on arousal, mentation, and cognition.
   a. discuss how alterations will affect motor control and motor learning
   b. describes modifications in clinical interventions to maximize recovery

9. Create clinical interventions for individuals with neurological pathology based on the diagnosis, treatment goals, and physical therapy plan of care
   a. problems of balance, coordination, tone and postural control
   b. problems of mobility function: strength, endurance and ROM related to ADLs; gait and transfers; wheelchair mobility
   c. problems of grasp, reach, and manipulation
   d. orthotics

Required Texts:

Fell, Dennis, Lunnen, Karen, Rauk, Reva. Lifespan NEUROREHABILITATION: A Patient-Centered Approach from Examination to Intervention and Outcome. Philadelphia, PA: FA Davis Company 2018

Martin, Suzanne and Kessler, Mary. Neurologic Interventions for Physical Therapy, 3rd Edition. St. Louis: Elsevier Saunders, 2016

Lescher, P. J .Pathology for the Physical Therapist Assistant. FA Davis Company, 2011

Supplemental readings:

Shumway-Cook, Anne and Marjorie Woollacott.*Motor Control: Translating Research into Clinical Practice, 4th Ed.*Baltimore, MD: Lippincott Williams & Wilkins, 2012

O'Sullivan, Susan B. and Thomas J. Schmitz. *Physical Rehabilitation,6th Edition*. Philadelphia: FA Davis Company, 2013

O'Sullivan, Susan B. and Thomas J. Schmitz. *Improving Functional Outcomes in Physical Rehabilitation.* Philadelphia: FA Davis Company, 2007.

Umphred and Lazaro. *Neurorehabilitation for the Physical Therapist Assistant, 2nd Ed.*Thorofare, NJ: Slack Incorporated, 2006.

Cameron, Michelle. Physical Rehabilitation for the Physical Therapist Assistant. St. Louis: Elsevier, 2011

COURSE TEACHING METHODS - Teaching methods employed will include lectures, audiovisual presentations, small group discussions, question and answer sessions, demonstrations, patient case discussions, and web-quests.

GRADING POLICY - See *Student Handbook* for grading scale. However, this class is graded on points as follows:

%	Letter Grade	Points
90-100	A	810-900
80-89	B	720-801
74-79	C	666-711
74-Below	F	666

Exams (2)	150 point/each	300 points	
Quizzes (4)	100-100-25-25 points	250 points	
Communicators (3)	30-40-30 points	100points	
Neuroanatomy Chart	150 points	150 points	
Pediatrics Project	50 points	50 points	
Neuro Evaluation	50 points	50 points	**Total Points = 900**

Detailed criteria and scoring rubric for case study and documentation will be distributed at least 2 weeks prior to the due date.

COURSE REQUIREMENTS

Attendance: On time attendance of all lecture sessions are mandatory. The skills taught and practiced in this course are essential to physical therapist assistant practice. MC college-wide regulations state that if a student misses more than two classes (equivalent to one week of classes), then the student may be dropped from the class.

All absences are considered unexcused with the exception of court appearances, sudden hospitalization, religious observation, natural disaster, or family emergency. In order to be considered an excused absence, the student must provide documentation.

Three late arrivals will count as one absence from class. Two absences will result in a decrease of the final grade by one letter. (An "A" becomes a "B," etc.)

Make up policy: If the student must be absent during a quiz, practical or written exam, he/she will notify the instructor by telephone or e-mail at least 24 hours in advance. In order to qualify for a make-up quiz, practical or written exam, the reason for absence must be documented. As stated above, only court appearance, sudden hospitalization, religious observation, natural disaster, or family emergency will we considered appropriate reasons.

Make-up written quizzes and exams are taken in the Assessment Center (Student Services Building). Make up practical exams are re-scheduled at the instructors availability. The instructor

reserves the right to alter the content or format of any make up quizzes, written or practical exams in order to preserve the academic integrity of the assessment.

Re-takes and extra credit: If a student is unsuccessful in the first attempt at a practical exam, ONE re-take is scheduled. Additional re-takes on practical exams are scheduled at the discretion of the instructor and may require a second faculty member as an impartial evaluator. No additional assignments outside of those scheduled on this syllabus, termed "extra credit", will be given for grade improvement.

Student Code of Conduct and Academic Honesty: Students are referred to the *Student Handbook* as well as Academic and Student Services web pages for details.
http://www.montgomerycollege.edu/departments/academicevp

Classroom Behavior: Each and every student is expected to behave in ways which promote a positive leaning atmosphere. Students have the right to learn; however, they do not have the right to interfere with the freedom of the faculty to teach or the rights of other students to learn. Students are treated respectfully; and in return, are expected to interact respectfully with peers and faculty.

All class discussions are carried out in a way that keeps the classroom environment respectful of the rights of others. This means that, for example, students should not interrupt someone else who is talking regardless of whether that person is the instructor or another student. Students should not monopolize class time by repeatedly interrupting and asking questions in a manner which hinders the learning process of others.

Students are also expected to conduct themselves in ways which create a safe learning and teaching environment that is free from such things as violence, intimidation, and harassment. Talking on cellular telephones, sending or receiving instant messages, and/or listening to audio devices during class or laboratory is not consistent with a supportive and respectful learning environment.

Further information on behavioral expectations is available in the *Student Handbook*, and the *Student Code of Conduct* mentioned above.

ELECTRONIC MAIL -Student e-mail (montgomerycollege.edu) is an official means of communication for the College. It is expected that students check e-mail regularly and frequently, as students are responsible for information and announcements sent from the College.

For this class, student e-mail will be used only for situations where timing is essential. Most information is discussed in class and all assignments will be turned in as hard copy during regular class times. If students contact the instructor through e-mail, they must use the MC student e-mail account (rather than a personal account) so that the instructor will recognize this as a student communication. Please use the following line in the subject line: **STUDENT NAME with question in PHTH204.**

Important Student Information Link

In addition to course requirements and objectives that are in this syllabus, Montgomery College has information on its web site (see link below) to assist you in having a successful experience both inside and outside of the classroom. It is important that you read and understand this information. The link below provides information and other resources to areas that pertain to the following: student behavior (student code of conduct), student e-mail, the tobacco free policy, withdraw and refund dates, disability support services, veteran services, how to access information on delayed openings and closings, how to register for the Montgomery College alert System, and finally, how closings and delays can impact your classes. If you have any questions please bring them to your professor. As rules and regulations change they will be updated and you will be able to access them through the link. If any student would like a written copy of these policies and procedures, the professor would be happy to provide them. By

registering for this class and staying in this class, you are indicating that you acknowledge and accept these policies.

http://cms.montgomerycollege.edu/mcsyllabus/

COURSE SCHEDULE Martin and Kessler, Neurologic Intervention for Physical Therapy 3rd Edition; Fell, Dennis, Lifespan NEUROREHABILITATION

Tentative PTA 204/216 Course Schedule:

Date	Tuesday/Thursday	Book	Chapter	Activity
Unit 1: Foundations of Neuroanatomy and Physiology				
Aug 28	Orientation & Announcements	M&K Lescher	Ch. 2 Ch. 7	
Sept 7	Neuroanatomy with Professor Joyner: **No class today** *Normal structure and function of CNS & PNS*	M&K Lescher	Ch. 2 Ch. 7	Electronic Assignment – Basic Neuroanatomy Chart
Sept 14	Neuroanatomy with Professor Joyner: *Normal structure and function of CNS & PNS*	M&K Lescher	Ch. 2 Ch. 7	Quiz 1
Sept 21	Neuroanatomy with Professor Joyner			Quiz 2 **Due at Beginning of Class:** Neuroanatomy Chart (Written) No Electronic Copies accepted***. 10 point deduction of all electronic and late submissions.***
Sept 28	Neuroanatomy with Professor Joyner			Communicator 1
Oct 4	**Written Exam on Neuroanatomy**			**Due at Beginning of Class:** Neuroanatomy Chart (Written) No Electronic Copies accepted***. 10 point deduction of all electronic and late submissions.***
Unit II: Lifespan				
Oct 11	Intro to Motor Development: *Lifespan concept of development, relationship between cognition & motor development, Intro to spinal reflexes, developmental sequence,*	M&K Fell	Ch. 4 & 5 Ch. 13	**Quiz 3** Communicator #2

	Treatment theories, righting & equilibrium, Development – birth to five, 6-12, and older Pediatrics – *CP and Genetic Disorders*	 M & K	 Ch. 6-8	Pediatric group assignment (attached)
Oct 18	Overview of Neuro Exam and Intervention Examination & Intervention Procedures: *Functional training, Impairment training, Motor programs and Sensory retraining; Neuromuscular examination, bal., functional & impairment testing, pain assessment, participation* Intro to CVA and TBI	Fell Lescher M & K	Ch. 3 Ch. 7 Ch. 10 & 11	Assignment: Neuro Evaluation Quiz 4
Oct 25	Geriatrics: *Balance, Alzheimer's, sensory loss, Mini Mental Health exam*	Lescher	Ch. 14	In class assignment
Nov 2	**Unit II Neuro Exam & Lab practical/Skills Check**			

The instructor reserves the right to adjust class topics, lab skills, readings or assignments based on the learning needs of the students.

IMPORTANT DATES for **Fall Semester 2018:**

Classes start: August 28, 2018 Classes end: November 2, 2018
Final exam week: November 2, 2018

Check the following web sites for chapter and section meetings

www.apta.org	Open Membership and Leadership page, select Chapters and Sections
www.aptamd.org	APTA of Maryland, select Meetings
www.dcpta.com	APTA of Washington DC, select Meetings

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Pediatric Project

The purpose of this exercise is to offer the learner an opportunity to observe movement and how movement changes between persons.

Instructions:

A. In small groups which you will be assigned, design a gross motor activity for a small group of students ages 4-6. The activity should take into consideration the following:
   - take approximately 15 minutes and easily reset for next group
   - be age-appropriate
   - should include things to challenge their balance, eye hand coordination, following directions (simple one-step directions) and challenge or demonstrate their motor abilities (running, jumping, crawling, etc.), and teamwork if appropriate
   - be self-contained to either classroom or gym space – no playground equipment
   - be where more than one kid can participate at one time
     - Examples: relay race obstacle course, obstacle course, game (i.e. Mission Impossible)
     - There are no winners or losers – everybody is a winner.

In planning your activity, discuss the characteristic movement behavior (i.e. anti-gravity, transitional movements, weight shifts, mobility, skills, etc.) of typically developing children and children with impairment. Focus on the variations and similarities of movement across both types of students. Where do you see or find the skill tested easiest or difficult and what difficulties do you foresee them having? Plan your activity to focus on one or two areas to study and present to class (i.e. balance and coordination or eye hand coordination – ball skills)

B. Present to class your discussion in a PowerPoint and/or video presentation.

Group Assignments:

Group 1: Pukar, Caroline, Jennifer, and Courtney

Group 2: Jason, Raquel, Colleen, and Alex

Group 3: Tyler, Amy, Andrea and Jake

Group 4: Adrian, Ebony, Bradley, and Mona