

ANGELO STATE UNIVERSITY
Archer College of Health and Human Services
Doctor of Physical Therapy Program

PT 7331 Motor Control and Clinical Applications

Fall 2019
3 credits (3-1-0)

COURSE DESCRIPTION: This course introduces students to theories and fundamentals of motor control, motor learning, motor development, balance control, and current methods in human movement analyses. Appropriate test selection, interpretation, and their implications on evidence-based practice in physical therapy will be discussed.

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| COURSE COORDINATOR: | You-jou Hung, PT, MS, PhD, CSCS Associate Professor Office: HHS 224 N 325-942-2742 yhung@angelo.edu |
| OFFICE HOURS: | By appointment |
| COURSE INSTRUCTOR(S): | You-jou Hung, PT, MS, PhD, CSCS Charlotte Buhle, PT, DPT West Texas Rehabilitation Center cbuhle@wtrc.com |
| OFFICE HOURS: | By appointment |
| COURSE LOCATION: | Science Building III, Room 213 |
| MEETING HOURS: | Monday 8:00am – 10:00 am: Lecture & Lab. Wednesday 8:00am – 10:00 am: Lecture & Lab. |
| CLOCK HOURS: | 45 lecture hours 15 laboratory hours |
| COURSE PREREQUISITES: | Successful completion of previous DPT coursework |

COURSE OBJECTIVES: At the end of this course, the students will have demonstrated mastery of the subject by being able to:

1. Describe the anatomy and physiology of motor control and their relationship to various disturbances/abnormalities in motor functions (CAPTE Standard: 7A)
2. Compare and critique traditional and contemporary theories of motor control and motor learning (CAPTE Standard: 7D9)
3. Apply theories of motor control and motor learning to the development of physical therapy interventions (CAPTE Standard: 7D10)
4. Compare traditional and contemporary techniques for the measurement of motor performance (CAPTE Standard: 7D19)

5. Analyze clinical implications of motor control and motor learning research (CAPTE Standard: 7D9)
6. Compare normal and abnormal postural control and describe different strategies of postural control (CAPTE Standard: 7D19)
7. Correctly perform appropriate static and dynamic balance testing using the Biodex Balance System (CAPTE Standard: 7D19)
8. Discuss principles of motor control and motor learning to optimize acquisition, retention, and transfer of motor skills in a rehabilitation setting (CAPTE Standard: 7D10)
9. Discuss and evaluate different stages of motor development (CAPTE Standard: 7D19, 7D20)
10. Demonstrate service learning and community engagement by performing motor development screening tests to examine motor function for children at various ages at a local early childhood center (CAPTE Standard: 7D10, 7D19, 7D20)

TEACHING METHODS/PHILOSOPHY:

Lecture sessions will consist of traditional lectures supplemented by PowerPoint presentations, handouts, discussion of case studies and current literature, individual/group presentations, and reading assignments. Audiovisuals and computer-assisted instruction as appropriate will be included in learning activities. Blackboard will be used to post important announcements, grades, and reference materials.

Laboratory sessions will focus on the functional and clinical applications of the topics presented during lecture sessions. They will be imbedded within corresponding lectures. Depending on the topic, proper laboratory attire will be announced a week prior to the session.

TENTATIVE SCHEDULE: See attached.

REQUIRED TEXTS:

The following textbooks are “recommended” for this course.

1. Shumway-Cook A, Woollacott MH. *Motor Control Translating Research into Clinical Practice, 5th ed.* Philadelphia, PA: Lippincott, Williams and Wilkins, 2016.
2. Kandel ER, Schwartz JH, Jessell TM, Siegelbaum SA, Hudspeth AJ. *Principles of Neural Science, 5th ed.* New York, NY: the McGraw-Hill Companies, Inc. 2013.

GRADING/EVALUATIVE PROCEDURES:

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| Exam I | 20% |
| Exam II | 20% |
| Exam III | 20% |
| Quiz (3) | 20% |
| <u>Lab. Reports (3)</u> | <u>20%</u> |
| Total | 100% |

Lab reports: Feedback and feedforward lab: 5%
 Position sense lab: 5%
 Motor development lab: 10%

Time for test: 1 hour for quiz and 2 hours for exam

The final course grade will be assigned based on the cumulative percentage of points earned throughout the course:

A = 90-100

B = 80-89

C = 70-79

F = 69 or less

Students must score 80% or better in total (A or B grade) in order to meet mastery for this class. Exceptions may be sought by petition of the Academic Committee of the Physical Therapy Program and/or Course Coordinator who **may** require remediation and **may** be given the opportunity to repeat certain activities.

Examinations and quizzes may consist of multiple choice, true-false, matching, and short answers. Students are expected to take all written examinations on the day they are scheduled. Students may arrange to take the exam prior to the scheduled date with proper approved excuse. There will be no make-up examinations for unexcused absences.

ACADEMIC HONESTY:

Academic honesty policies and procedures are reinforced throughout all aspects of the professional program. Faculty and students should familiarize themselves with the Angelo State University Code of Student Conduct found in the ASU Student Handbook available on the ASU website (<http://www.angelo.edu/student-handbook/>). This document, in addition to the information listed below, will be utilized to identify and address academic dishonesty within the program. The Department of Physical Therapy bases student conduct on the APTA Code of Ethics, Guide for Professional Conduct and Standards of Practice (<http://www.apta.org/>) (**Appendix 8**), in addition to Professional Behaviors. Specifically, the Department of Physical Therapy aligns itself with Angelo State University procedures under the Code of Conduct located at <http://www.angelo.edu/student-handbook/code-of-student-conduct/>, and the Community Policies located at <http://www.angelo.edu/student-handbook/community-policies/>. Both of these documents are located in the Angelo State University Student Handbook <http://www.angelo.edu/student-handbook/> and fall under the guidance of the Office of Student Affairs and Enrollment Management. Please see the Dept. of Physical Therapy Student Handbook for further explanation.

ATTENDANCE/TARDINESS POLICY:

Attendance and promptness to classes, meetings, and future work obligations are considered professional behaviors. As this department is preparing potential professionals in the area of physical therapy, it is part of our expectation that student presence and timeliness will be held in highest regard. Tardiness is a disruption to the instructor and fellow students. A student is considered tardy if he/she arrives for class after the instructor has begun class activities. Please see the following related to implications from excessive lateness or absences without a reasonable excuse:

- a. First offense - verbal warning
- b. Second offense - second verbal warning, initiation of Disciplinary Tracking Form.
- c. Third offense - 1% off final course grade
- d. 1% off final course grade for each additional unexcused tardy or absence

Per the student handbook, **2 or more occurrences combined or mixed will result in the initiation of a Disciplinary Tracking Form.**

If a student has an unexcused absence during integrations it may lead to the removal of that student from that clinical environment. It is the responsibility of the student to contact the clinical site and give notice if they are ill, or have transportation issues.

If the student is unable to attend class, it is the student's responsibility to either call the PT office at 942-2545 or the office of the professor of the class directly. This notification should be made prior to commencement of said class.

Continued issues with tardiness/attendance across all courses will result in disciplinary probation and will be referred to the PT faculty for consideration of options, including program dismissal.

The PT faculty is not oblivious to doctor's appointments and other potential hazards and emergencies in daily life. Simply taking responsibility to notify the office or the professor if issues arise is considered professional behavior. Please do not rely on a classmate or other form of notification, as these have proven unreliable in years past.

ATTENDANCE AT ALL SCHEDULED EXAMINATIONS IS MANDATORY. Any unexcused absence from an examination will automatically result in a score of ZERO for that examination. Any student absent from examinations due to illness or injury must have a written justification from their physician. **Absence from an examination for any other reason must be excused before the time of the scheduled examination** or brought about by a very serious circumstance. For excused absences only, make-up examinations must be taken no later than one week after the student returns to class. Extended absences must be approved by the Program Director of Physical Therapy.

ACCIDENT/INCIDENT REPORTING:

Any student involved in a safety incident on ASU property or at an ASU related educational activity (e.g. accidental needle stick, fall, etc.) must immediately notify the course coordinator, clinical instructor and/or department chair. If the incident occurs after hours, all incidents must be reported to the University Police at 942-2071. A student Accident/Incident Report must be completed no matter how insignificant the incident may appear. [See Appendix 15 of the Student Handbook for the form.]

STUDENTS WITH DISABILITIES:

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu. For more information about the application process and requirements, visit the Student Disability Services website at www.angelo.edu/ADA. The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dallas Swafford
Director of Student Disability Services
Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu
Houston Harte University Center, Room 112

When a student states he or she could meet the program's technical standards with accommodation(s), the Office of Student Affairs will confirm that the stated condition qualifies as a disability under applicable laws. If the condition qualifies as a disability, the University will determine if it agrees that the student can meet the technical standards with reasonable accommodation; this includes a review of whether or not the accommodation requested is reasonable, taking into account whether or not the accommodation would jeopardize clinician/patient safety or the educational process of the student or the institution, including all course work, clinical educational experiences and internships deemed essential to graduation. Students are required to read and sign the DPT program's technical standards (DPT Program Student Handbook Appendix I) form and to update their responses on this form if their health status changes.

A student who requires accommodation to meet the technical standards must obtain verification by the Office of Student Affairs that proper reasonable accommodation is available for the student to meet the standard. The program will not provide accommodation without such written verification.

TENTATIVE SCHEDULE

| Date | Topic | Reading |
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| Week 1 | | |
| Aug. 26 | <i>Theoretical framework of motor control</i> Introduction of motor control | |
| Aug. 28 | The nature of movements Categories of movements Reflex | Shumway Ch.1 Kandel Ch.33,35 |
| Week 2 | | |
| Sept. 2 | Labor Day | |
| Sept. 4 | Reflex lab Voluntary movement Reaction time | Shumway Ch.16 Kandel Ch.33 Reaction time article |
| Week 3 | | |
| Sept. 9 | Feedback and feed-forward control Theories of motor control-part I | Shumway Ch.1,16 |
| Sept. 11 | Theories of motor control-part II Motor control theory lab | Shumway Ch.1,16 |
| Week 4 | | |
| Sept. 16 | Quiz 1 | |
| Sept. 18 | <i>Theoretical framework of motor learning</i> Introduction of motor learning Memory and motor learning Working memory lab | Shumway Ch.2,4 Kandel Ch.65 |
| Week 5 | | |
| Sept. 23 | Theories of motor learning | Shumway Ch.2 |
| Sept. 25 | Stages of motor learning Feedback and balance control | Shumway Ch.2 Kandel Ch.37, 38 |
| Week 6 | | |
| Sept. 30 | Exam I | |
| Oct. 2 | Recovery of function Clinical implication: motor control and motor learning of the ankle joint | JOSPT article |
| Week 7 | | |
| Oct. 7 | Feed-forward and feedback control lab (group 1, 2, 3) | |

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| Oct. 9 | Feed-forward and feedback control lab (group 4, 5, 6) | |
| Week 8 | | |
| Oct. 14 | Feed-forward and feedback control lab discussion Practice and motor learning | JOSPT article |
| Oct. 16 | Physiology of motor control H-reflex, M-wave, F-wave, and their clinical applications CNS function in motor control and motor learning Feed-forward and feedback control lab report due | Shumway Ch.2, 3 Kandel Ch.34,35 |
| Week 9 | | |
| Oct. 21 | Quiz 2 | |
| Oct. 23 | Motor systems and motor unit Voluntary control of muscle force Immobilization and training adaptation of skeletal muscles | Shumway Ch.3 Kandel Ch.22,35 |
| Week 10 | | |
| Oct. 28 | Sensory systems and their roles in motor control Position sense lab | Shumway Ch.5 PTJ article |
| Oct. 30 | Exam II | |
| Week 11 | | |
| Nov. 4 | Mechanoreceptors Other sources for proprioception Ascending sensory pathways Position sense lab report due | Kandel Ch.22,35 |
| Nov. 6 | Constraints on Motor Control: an overview of neurologic impairments Motor weakness Abnormal muscle tone Coordination abnormalities | Shumway Ch.5 |
| Week 12 | | |
| Nov. 11 | Infant Reflexes and Motor Development Infant reflexes, development milestones, and motor development assessment | Shumway Ch.8 |
| Nov. 13 | Motor development (Hung and Buhle) | Shumway Ch.8 |
| Week 13 | | |
| Nov. 18 9-11 AM Early Childhood Center (ECC) | Motor development lab (group 1) (Hung and Buhle) | |
| Nov. 20 | Quiz 3 | |
| Week 14 | | |
| Nov. 25 9-11 AM Early Childhood Center (ECC) | Motor development lab (group 2) (Hung and Buhle) Motor development lab report due for group 1 | |
| Nov. 27 | Thanksgiving holiday | |
| Week 15 | | |
| Dec. 2 | Postural control and posture evaluation Motor development lab report due for group 2 | Shumway Ch.8 |
| Dec. 4 | Postural control development The impact of aging on postural control | Shumway Ch.9 |
| Week 16 | | |
| Dec. 9 | Exam III (final exam): 8:00 am – 10:00 am | |

Laboratory components:

Lab 1: Reflex

Lab 2: Motor control theories

Lab 3: Working memory

Lab 4: Feed-forward and feedback control (**lab report required, 5% of the final score**)

Lab 5: Position sense (**lab report required, 5% of the final score**)

Lab 6: Motor development lab (**lab report required, 10% of the final score**)