PT 7330: Functional Biomechanical Relationships  Fall 2018
3 credits (3-1-0)

COURSE DESCRIPTION: This course offers a comprehensive study and systematic application of the biomechanics and pathomechanics of the human body with an emphasis on musculoskeletal tissues. In addition to assessing normal human movement, an introduction to postural assessments will be included in order to identify abnormal postural patterns. Additionally, an emphasis will be placed on normal and pathological components of gait. Furthermore, basic concepts of osteology, arthrology, neurology, and muscle activity are explored to better understand the interactions between joints and muscles. Clinical applications will be integrated throughout the course material. Laboratory will focus on the integration of lecture materials with practical clinical applications.

COURSE INSTRUCTOR(s): Lee Atkins, PT, PhD
Assistant Professor
Office: HHS Building 224S
325-486-6865
Lee.atkins@angelo.edu

OFFICE HOURS: By Appointment

COURSE LOCATION: Lecture: SIII 213
Laboratory: SIII 213, SIII 212 F, CAV 202

MEETING HOURS: Monday-Wednesday 1:00pm – 3:00pm [3 hr lec &1 hr lab/wk]

CLOCK HOURS: 48 lecture/16 lab

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

1. Define and use appropriate kinesiological terminology to describe musculoskeletal structures and functions, specific joint and segment motions, postural alignment, patterns of functional movement, and gait. CAPTE criteria: 7A, 7C, 7D19

2. Apply the basic kinesiological principles of kinematics and biomechanics to normal human motion by:
   A. defining and location the centers of mass [COG] in the trunk and extremities;
   B. identifying examples of levers in the body;
   C. identifying examples of Newton’s Laws of Motion at during common functional movements;
   D. drawing vector diagrams to assist in understanding the distribution of loading throughout the body;
E. discussing and understanding the relationship between mobility and stability in the production of normal movement. CAPTE criteria: 7A, 7C, 7D19

3. Apply kinesiological principles of kinematics and biomechanics to movement dysfunction. CAPTE criteria: 7A, 7C, 7D19

4. Describe the normative parameters and kinesiological structure and function related to the axial and appendicular skeleton. CAPTE criteria: 7A, 7C, 7D19

5. Discuss the role of each of the following when assessing movement dysfunction:
   A. muscle function – the following relationships will discussed as they pertain to skeletal muscle:
      1) characteristics associated with the passive, active, and total length tension curves;
      2) characteristics of the force-velocity relationship for concentric, isometric, and eccentric muscle activation types
      3) discuss concepts of positive and negative muscular power and work as they relate to common functional activities and injury risk
   B. joint range of motion;
   C. joint mobility;
   D. stabilization;
   E. innervation.
   F. balance
   CAPTE criteria: 7A, 7C, 7D19

6. Demonstrate appropriate techniques for observation and measurement of the surface landmarks, muscles, bony landmarks and joints of the axial and appendicular skeleton. CAPTE criteria: 7A, 7C, 7D19

7. Identify and describe each joint in the body according to its structural and functional characteristics and correlate these characteristics with activities of daily living such as walking and running gait. CAPTE criteria: 7A, 7C, 7D19

8. Discuss the influence of varying histologic makeup on the mechanical properties of muscle, tendon, ligament, and bone. CAPTE criteria: 7A

9. Identify and describe each of the following for each joint in the body:
   A. planes and axes of motion;
   B. close and open packed [resting] positions;
   C. rotatory and linear forces action during movement;
   D. innervation;
   E. attachments, innervations and actions of each muscle action at the joint;
   F. ligamentous and capsular structures.
   G. capsular patterns
   CAPTE criteria: 7A, 7C, 7D19

10. Examine human movement by:
    A. identifying the joint motions involved;
    B. describing each muscle's contribution to production of movement;
    C. describing the type of muscle contractions performed during the movement;
    D. discussing the internal and external forces acting on the joint[s];
    E. identifying the different effects of open versus closed chain activity on muscles and joints.
    CAPTE criteria: 7A, 7C, 7D19
11. Analyze postural alignment by:
   A. describing the position of the body’s gravity line in optimal erect posture using appropriate points of reference;
   B. identifying muscles and ligaments which counterbalance gravity in optimal erect posture;
   C. observe and record postural lignment.
   CAPTE criteria: 7A, 7C, 7D19

12. Identify and discuss muscle and joint dysfunction and other biomechanical consequences associated with altered skeletal integrity and postural abnormalities including, but not limited to: cubitus varus/valgus, abnormal acromion morphology, abnormal kyphotic and lordotic spinal curves, forward head/rounded shoulder sitting/standing posture, anterior/posterior pelvic tilt, coxa vara/valga, femoral retroversion and excessive femoral anteversion, altered acetabular alignment, and altered quadriceps angle.
   CAPTE criteria: 7A, 7C, 7D19

13. Discuss and describe biomechanical principles as they apply to maintaining static and/or dynamic balance during common functional tasks performed during sitting, standing, and walking.
   CAPTE criteria: 7D19d

14. Analyze gait by:
   A. identifying the determinants of gait;
   B. identifying each of the phases of the gait cycle;
   C. describing internal & external forces acting across joint during the phases of the gait cycle;
   D. describing and assessing the center of gravity, base of support, and spatiotemporal characteristics during gait;
   E. comparing and contrasting gait cycles during walking and running.
   CAPTE criteria: 7A, 7C, 7D19

TEACHING METHODS/PHILOSOPHY: Traditional lecture format supplemented by class handouts, group and individual presentations and/or discussion of case studies and current literature. Laboratory activities will focus on the practical use and clinical applications of skills and concepts discussed during. Audiovisuals and computer-assisted instruction as appropriate will be included in learning activities. Blackboard will be used to communicate between instructors and students.

TENTATIVE SCHEDULE: See attached.

REQUIRED TEXTBOOKS:

RECOMMENDED TEXTBOOKS:

GRADING/EVALUATIVE PROCEDURES:
Exam 1 13 points
Exam 2 16 points
Exam 3 16 points
Exam 4 16 points
Exam 5 16 points
Laboratory Activities 10 points
Professionalism 8 points
Quizzes 5 points
Total 100 points

DETAILED BREAKDOWN OF COURSE GRADE COMPONENTS

Exam: Exams will be comprehensive and based upon materials provided in lecture, assigned textbook readings, supplemental readings, and laboratory activities.

Laboratory Activities: The laboratory activities portion of the grade will be based upon student participation in all lab activities. Additionally, this grade may also be influenced by the quality of graded, outside-of-class activities that must be turned in.

Quizzes: Quizzes will be administered at the discretion of the professor and are intended to assist students in identifying their strengths and weaknesses regarding the material covered to date.

Professionalism: Students are expected to behave in a manner consistent with the ASU Honor Code (see below) and that expected of a professional clinician. As such, factors that influence the professionalism grade include, but are not limited to: tardiness, attendance, classroom interaction, interaction with professor and classmates, Academic Honesty policies and procedures, and compliance. Students must be present for all exams and quizzes.

Mastery for this course is set at 80%. There will be no curve.

GRADING:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90+</td>
<td>A</td>
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<tr>
<td>80-89</td>
<td>B, Mastery</td>
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<tr>
<td>70-79</td>
<td>C</td>
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<tr>
<td>&lt;70</td>
<td>F</td>
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</table>
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.

STUDENTS WITH DISABILITIES

University Statement on 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 Affairs is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability, and it is the student’s responsibility to initiate such a request by emailing ADA@angelo.edu, or by contacting:

Mrs. Dallas Swafford
Director of Student Disability Services
Office of Student Affairs
325-942-2047 Office
325-942-2211 FAX
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 verification.

RELIGIOUS HOLY DAYS

Faculty will provide accommodations for student absences for observance of a religious holy day(s) (OP 10.19). Students should make every effort to inform a faculty member at the beginning of the semester regarding these absences.
ATTENDENCE/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 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.]
<table>
<thead>
<tr>
<th>DATE (Mon/Wed)</th>
<th>LECTURE / LAB TOPICS</th>
<th>Location</th>
<th>REQUIRED READINGS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 27th (Monday)</td>
<td>Overview Syllabus Introduction to Biomechanics</td>
<td>SIII 213</td>
<td>Neumann Chapter 1 (pg. 3-26)</td>
</tr>
<tr>
<td>August 29th (Wednesday)</td>
<td>Basic Structure and Function of Human Joints</td>
<td>SIII 213</td>
<td>Neumann Chapter 2 (pg 28-44)</td>
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<tr>
<td>September 3rd (Monday)</td>
<td>LABOR DAY!</td>
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<tr>
<td>September 5th (Wednesday)</td>
<td>Skeletal Muscle Biomechanical Principles</td>
<td>SIII 213</td>
<td>Neumann Chapter 3 Neumann Chapter 4 (pg 77-83 &amp; 88-94)</td>
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<tr>
<td>September 10th (Monday)</td>
<td>Biomechanical Principles</td>
<td></td>
<td>Neumann Chapter 4 (pg 77-83 &amp; 88-94) Mueller and Maluf 2002 article</td>
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<tr>
<td>September 12th (Wednesday)</td>
<td>Exam 1</td>
<td>SIII 213</td>
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<tr>
<td>September 17th (Monday)</td>
<td>Shoulder</td>
<td>SIII 213</td>
<td>Neumann Chapter 5</td>
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<tr>
<td>September 19th (Wednesday)</td>
<td>Elbow and Forearm</td>
<td>SIII 213</td>
<td>Neumann Chapter 6</td>
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<td>September 24th (Monday)</td>
<td>Wrist</td>
<td>SIII 213</td>
<td>Neumann Chapter 7</td>
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<tr>
<td>September 26th (Wednesday)</td>
<td>Hand</td>
<td>SIII 213</td>
<td>Neumann Chapter 8</td>
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<tr>
<td>October 1st (Monday)</td>
<td>Anatomy Lab (UE Joint disarticulation)</td>
<td>Anatomy Lab</td>
<td>Handout</td>
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<tr>
<td>October 3rd (Wednesday)</td>
<td>Exam 2</td>
<td>SIII 213</td>
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<tr>
<td>October 8th (Monday)</td>
<td>SI Joint &amp; Lumbar Spine</td>
<td>SIII 213</td>
<td>Neumann Chapters 9 &amp; 10</td>
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<td>October 10th (Wednesday)</td>
<td>SI Joint &amp; Lumbar Spine</td>
<td>SIII 213</td>
<td>Neumann Chapters 9 &amp; 10</td>
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<td>October 15th (Monday)</td>
<td>Thoracic Spine</td>
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<td>Neumann Chapters 9 &amp; 11</td>
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<td>October 17th (Wednesday)</td>
<td>Cervical Spine</td>
<td>SIII 213</td>
<td>Neumann Chapter 9</td>
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<td>October 22nd (Monday)</td>
<td>Exam 3</td>
<td>SIII 213</td>
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<tr>
<td>October 24th (Wednesday)</td>
<td>Hip Joint</td>
<td>SIII 213</td>
<td>Neumann Chapter 12</td>
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<td>October 29th (Monday)</td>
<td>Hip Joint Knee Joint</td>
<td>SIII 213</td>
<td>Neumann Chapter 12 &amp; 13</td>
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<tr>
<td>Date</td>
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<td>October 31st</td>
<td>Knee Joint Foot and Ankle</td>
<td>SIII 213</td>
<td>Neumann Chapters 13 &amp; 14</td>
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<td>November 5th</td>
<td>Foot and Ankle</td>
<td>Anatomy Lab</td>
<td>Neumann Chapter 14</td>
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<td>November 7th</td>
<td>Anatomy Lab (LE Joint disarticulation)</td>
<td>SIII 213</td>
<td>Handout</td>
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<td>November 12th</td>
<td>Exam 4</td>
<td>SIII 213</td>
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<td>November 14th</td>
<td>Normal Gait</td>
<td>SIII 213</td>
<td>Perry Chapter 1-9</td>
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<tr>
<td>November 19th</td>
<td>Normal Gait</td>
<td>SIII 213</td>
<td>Perry Chapter 1-9</td>
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<tr>
<td>November 21st</td>
<td>THANKSGIVING BREAK!</td>
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<td>November 26th</td>
<td>Abnormal Gait</td>
<td>CAV 202</td>
<td>Perry Text (per notes)</td>
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<td>November 28th</td>
<td>Running Mechanics &amp; Footwear</td>
<td>CAV 202</td>
<td>Perry Chapter (TBA)</td>
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<td>November 30th</td>
<td>Make-up Day</td>
<td>SIII 213</td>
<td>Novachek Article</td>
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<td>December 3rd</td>
<td>EMG Lecture/Lab</td>
<td>SIII 213</td>
<td>Perry Chapter 21</td>
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<td>December 5th</td>
<td>Infrared Motion Analysis Lab</td>
<td>CAV 202</td>
<td>Group 1</td>
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<tr>
<td>December 10th</td>
<td>Infrared Motion Analysis Lab</td>
<td>CAV 202</td>
<td>Group 2</td>
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<tr>
<td>December 12th</td>
<td>Exam 5</td>
<td>SCI III</td>
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*The instructor reserves the right to modify the above schedule.

**Readings listed above are from the Neumann and/or Perry texts unless otherwise noted by course coordinator.*