Carroll University
Master of Occupational Therapy Program

OTH 515 Biomechanics, Human Movement and Occupational Performance
Fall 2017

Course Offering  3 Credit Hours

Prerequisites  Admission to the MOT Program.

Format  Lecture and Lab

Class Day/Time  Tuesday Lecture 1:00 pm to 3:50 pm
Thursday Lab, Section A 9:30 – 11:30 am
Thursday Lab, Section B 12:00 – 2:00 pm

Class Location  CGS 119
                CGS-LL16 Laboratory
                CGS 113

Faculty  Lecture: Sara Kotschi, DPT  Lab: Mitchell Voss, OTR
Office  CGS117  CGS117
Office Hours  Tuesdays 11:00 – 12:00 pm  Thursdays 8:30 – 9:30 am
Phone  (920) 312-0567  (920) 762-0081
Email  skotschi@carrollu.edu  mvoss@carrollu.edu

Course Description
This course intends to provide kinesiologic foundations for the practice of activity analysis at the core of occupational therapy, which strives to optimize the functional performance and self-actualization of human beings. It will favor reasoning based on mechanical analysis, assisting students in developing proper evaluation, clinical diagnosis, and treatment planning as it pertains to dysfunction of the musculoskeletal system, which may include restoration or adaptation of task or technique to support engagement in meaningful activities. Range of motion and manual muscle testing skills will be included in this course.

Course Rationale
A proper understanding of underlying biomechanical concepts including mechanics laws of movement and kinetic chain will allow students to analyze the impact of dysfunction on occupational performance and propose sound corrections or modifications of technique or environment based on scientific evidence for restoration of function.

Relationship to Curriculum Design
This course information builds on previously covered anatomical and physiological notions and provides additional assets for scientific analysis of movement which supports and prepares student for the more holistic activity analysis, embedded throughout the entire curriculum.
<table>
<thead>
<tr>
<th>Student Learning Objectives (At course conclusion, students are expected to:)</th>
<th>ACOTE Standards</th>
<th>Instructional Methods/ Learning Activities</th>
<th>Assessment Methods</th>
</tr>
</thead>
</table>
| 1. Describe the basic principles of kinesiology and laws of motion; | B.1.1 | • Readings  
• Lectures  
• Visual Aids  
• Lab  
• Problem-Based Learning  
• Class Discussion  
• Group Interaction  
• Self-Study | • Exams: multiple choice and short essay questions  
• Practical Exams |
| 2. Explain the concept of mechanical advantage and how it can be utilized to modify the degree of difficulty of a task; | B.1.1, B.2.10 | • Readings  
• Lectures  
• Visual Aids  
• Lab  
• Problem-Based Learning  
• Class Discussion  
• Group Interaction  
• Self-Study | • Exams: multiple choice and short essay questions  
• Practical Exams |
| 3. Analyze muscle and joint interactions taking place during function; | B.1.1, B.2.7 | • Readings  
• Lectures  
• Visual Aids  
• Lab  
• Problem-Based Learning  
• Activity Analysis Assignments  
• Class Discussion  
• Group Interaction  
• Self-Study | • Exams  
• Activity Analysis Rubric |
| 4. Distinguish arthrology and kinematics of the upper extremity, axial skeleton, trunk, and lower extremity and articulate the importance of how scholarly activities contribute to the development of a body of knowledge relevant to the profession of occupational therapy; | B.1.1, B.8.1, B.8.2 | • Readings  
• Lectures  
• Visual Aids  
• Lab  
• Problem-Based Learning  
• Class Discussion  
• Group Interaction  
• Self-Study | • Exams: short essay questions  
• Practical Exams  
• Group Presentation |
| 5. Apply principles of movement analysis when providing training in self-care, home management and work integration; | B.2.2, B.2.7, B.5.5, B.5.9, B.5.12 | • Readings  
• Lectures  
• Visual Aids  
• Lab  
• Problem-Based Learning  
• Activity Analysis Assignments  
• Class Discussion  
• Group Interaction  
• Self-Study | • Exams  
• Practical Exams  
• Activity Analysis Rubric |
Course Content and Relationship to ACOTE Standards

This course meets or partially meets the following standards of education for the Accreditation Council for Occupational Therapy Education (ACOTE). The student will:

- B.1.1 Demonstrate knowledge and understanding of the structure and function of the human body to include the biological and physical sciences. Course content must include, but is not limited to, biology, anatomy, physiology, neuroscience, and kinesiology or biomechanics.
- B.2.2 Explain the meaning and dynamics of occupation and activity, including the interaction of areas of occupation, performance skills, performance patterns, activity demands, context(s) and environments, and client factors.
- B.2.7 Demonstrate task analysis in areas of occupation, performance skills, performance patterns, activity demands, context(s) and environments, and client factors to formulate an intervention plan.
- B.2.10 Use clinical reasoning to explain the rationale for and use of compensatory strategies when desired life tasks cannot be performed.
- B.4.1 Use standardized and non-standardized screening and assessment tools to determine the need for occupational therapy intervention. These tools include, but are not limited to, specified screening tools; assessments; skilled observations; occupational histories; consultations with other professionals; and interviews with the client, family, significant others, and community.
- B.5.5 Provide training is self-care, self-management, health management and maintenance, home management, and community and work integration.
- B.5.9 Evaluate and adapt processes or environments (e.g., home, work, school, community) applying ergonomic principles and principles of environmental modification.
- B.5.12 Provide recommendations and training in techniques to enhance functional mobility, including physical transfers, wheelchair management, and mobility devices.
- B.8.1 Articulate the importance of how scholarly activities contribute to the development of a body of knowledge relevant to the profession of occupational therapy.
- B.8.2 Effectively locate, understand, critique, and evaluate information, including the quality of evidence.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Recognize abnormal movement or processes and provide appropriate correction or modification/adaptation as indicated;</td>
<td>B.1.1, B.2.10, B.5.9, B.5.12</td>
<td>Readings Lectures Visual Aids Lab Problem-Based Learning Activity Analysis Assignments Class Discussion Group Interaction Self-Study</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exams Practical Exams Assignments rubric</td>
</tr>
<tr>
<td>7. Perform range of motion and manual muscle testing.</td>
<td>B.1.1, B.4.1</td>
<td>Readings Lectures Visual Aids Lab Problem-Based Learning Group Interaction Self-Study</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exams Practical Exams</td>
</tr>
</tbody>
</table>
**Required Texts**

ISBN: 9780781747806


**Recommended Text**
ISBN: 978-0-9914666-2-7

**Readings**
Additional readings will be placed on the Canvas course page at the instructor’s discretion.

**Grading and Course Requirements**
Grading for this course will be based on a total possible accumulation of 1100 points, with letter grades applied to a percentage of this total as follows:

Grading Scale:  
93-100 % = A  
90-92.9% = A/B  
83-89.9% = B  
80-82.9% = B/C  
70-79.9% = C  
60-69.9% = D  
<60% = F

Progress will be evaluated through the following means:

<table>
<thead>
<tr>
<th>EVALUATION</th>
<th>POINTS</th>
<th>LINKED STUDENT LEARNING OBJECTIVES</th>
<th>LINKED ACOTE STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>150</td>
<td>1, 2, 3, 4</td>
<td>B.1.1, B.4.1, B.8.1, B.8.2</td>
</tr>
<tr>
<td>Exam 2</td>
<td>150</td>
<td>3, 4, 5, 6</td>
<td>B.1.1, B.4.1, B.8.1, B.8.2</td>
</tr>
<tr>
<td>Exam 3</td>
<td>200</td>
<td>1-7</td>
<td>B.1.1, B.2.2, B.2.7, B.2.10, B.4.1, B.5.5, B.5.9, B.5.12, B.8.1, B.8.2</td>
</tr>
<tr>
<td>Practical Exams (2)</td>
<td>200</td>
<td>1, 2, 4, 5, 6, 7</td>
<td>B.1.1, B.2.2, B.2.7, B.2.10, B.4.1, B.5.5, B.5.9, B.5.12, B.8.1, B.8.2</td>
</tr>
</tbody>
</table>
Participation/Attendance: Students are required to attend all classes and come prepared, having completed their assigned reading to allow for participation in group discussions as well as completion of the related course work.

Exams: These include a midterm and a final exam. These examinations are cumulative and contain multiple choice answers, short essays, and case studies to encourage integration of concepts introduced during the course and to strengthen the relationship between theory and practice.

Practical Exams: These exams require students to demonstrate proficiency in practical skills covered in this course, including:

- Palpation assessment of relevant structures used for orientation, including bony structures and differentiation of soft tissues and anatomy.
- Goniometry assessment of the upper and lower extremities, and axial skeleton.
- Manual muscle testing of the upper and lower extremities, trunk and neck.
- Mechanical principles: Construction of simple models illustrating mechanical concepts of lever, torque, fulcrum, balance and friction.
- Applied mechanical concepts to training in self-care, self-management, health management and community and work integration: Demonstration of mechanical constructs in ADL, IADL, and mobility.

Skill Checks: These exams require student to demonstrate proficiency in practical skills for each of the objective testing procedures covered in this class, including:

- Palpation assessment of soft tissues and bony structures
- Goniometric assessment of the upper and lower extremities and spine
- Manual muscle testing of the upper and lower extremities, head/neck, and trunk

Activity Analysis Projects (experiential learning activity): These assignments consist of 4 case studies conducted in the Living Laboratory, where students will apply principles of biomechanics to household routines. Students will be asked to analyze task-specific movements performed within the home environment and compare task performance using sound principles of body mechanics as well as explore the effect of faulty body mechanics for the same tasks. Students will be required to write a brief 2-to-3-page report of their analysis and comparison including discussion specific to levers, forces,
torques, fulcrum, as well as laws of motion and use those to justify their recommendations for correction, modification or adaptation as indicated, in order to optimize functional performance.

Analysis-1: Analysis of the different tasks involved in a simple meal preparation such as pasta dinner for two people for a 25 year old male paraplegic in a wheelchair.

Analysis-2: Analysis of bathroom transfers (in and out of the toilet and bathtub) for an elderly woman with balance problems, using a walker.

Analysis-3: Analysis of light housework such as washing dishes and sweeping the floor for a middle age women with multiple sclerosis.

Analysis-4: Analysis of grooming tasks such as shaving and brushing teeth for an elderly man with hemiplegia and flaccid affected upper limb.

Literature Critique: Biomechanical Model in OT Practice: There is evidence to suggest that the biomechanical model is the most widely used model in OT practice. What makes the biomechanical model unique in OT is the way biomechanical principles are applied to understanding and enhancing occupational performance and the use of occupations to influence changes in ROM, strength, and endurance. In groups of 3, students will locate a scientific study about rehabilitation using the biomechanical model. You will read and critically analyze the article and discuss the outcomes of this study, and based on the same study parameters, you will suggest a substitute intervention that is occupation-based with a focus. You will then extrapolate on how using an activity that is purposeful or meaningful affects things like therapy compliance, effort, fatigue, improvement in movement capacity, etc.

For example, advantages of a dance program over “normal” ROM exercises, adding imagery to movement v. rote exercise, perceived exertion when performing a task that is meaningful v. purposeless task in which same effort exerted, etc.

Each group will summarize their findings in a paper, and will give a class presentation. More details to come.

Course Overview

<table>
<thead>
<tr>
<th>DATES</th>
<th>LECTURE TOPICS</th>
<th>LAB</th>
<th>Required Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to Course Kinematics</td>
<td>Palpation - Shoulder &amp; Arm, Forearm</td>
<td>Neumann Chapt. 1</td>
</tr>
<tr>
<td>Sept. 12</td>
<td>Arthrokinematics vs. Osteokinematics, Closed vs. Open Chain, Concave-Convex Rule</td>
<td>(Biel Chapt. 1-2)</td>
<td></td>
</tr>
<tr>
<td>Week 2</td>
<td>Basic Structure &amp; Function of Joints</td>
<td>Palpation – Hand, Spine/Thorax, Head/Face</td>
<td>Neumann Chapt. 2 &amp; 3</td>
</tr>
<tr>
<td>Sept. 19</td>
<td>Muscles, Nerves, &amp; Connective Tissues</td>
<td>(Biel Chapt. 3-5)</td>
<td></td>
</tr>
</tbody>
</table>
### Week 3
**Sept. 26**  
**Biomechanics & Kinetic Chain**  
Laws of motion, forces, torque, levers  
*Palpation - Pelvic & Thigh, Leg & Foot*  
(Biel Chapt. 6-7)  
*Neumann Chapt. 1 & 4*

### Week 4
**Oct. 3**  
**EXAM #1**  
**Palpation Skills Check**  
Activity Analysis #1

### Week 5
**Oct. 10**  
Shoulder complex  
Elbow/Forearm  
*Goni Upper Extremity*  
(Norkin & White Chapt. 1-7)  
*Neumann Chapt. 5 & 6*

### Week 6
**Oct. 17**  
**FALL BREAK – NO CLASS!**

### Week 7
**Oct. 24**  
**Week 7**  
**Wrist & Hand**  
**Axial Spine**  
*Goni Lower Extremity/Spine*  
(Norkin & White Chapt. 8-13)  
*Neumann Chapt. 7-9*

### Week 8
**Oct. 31**  
**Hip & Knee**  
**Ankle/Foot Complex**  
**Goniometry Skills Check**  
Activity Analysis #2  
*Neumann Chapt 12-14*

### Week 9
**Nov. 7**  
**EXAM #2**  
**MMT Upper Extremity**  
(D&W Chapt. 5)

### Week 10
**Nov. 14**  
**Week 10**  
**Gait & Posture – Analysis and Training**  
**Motion Analysis**  
**MMT Spine**  
(D & W Chapt 3 & 4)  
*Neumann Chapt. 15*

### Week 11
**Nov. 21**  
**Muscle Pull**  
**Intro to CAT project**  
(Guest lecturer Prof. Stockwell)  
**MMT Lower Extremity**  
(D&W Chapt. 6)

### Week 12
**Nov. 28**  
**Ergonomics**  
(Guest lecturer)  
**MMT Skills Check**  
Activity Analysis #3  
*Posted readings*

### Week 13
**Dec 5**  
**Critically Appraised Literature Presentations**  
**LAB PRACTICAL #1**

### Week 14
**Dec 12**  
**Review!**  
**Activity Analysis #4**

### Week 15
**Dec 19**  
**EXAM #3**  
**LAB PRACTICAL #2**

### Modification to the Syllabus
The instructor and the University reserves the right to modify, amend or change the syllabus (course requirements, grading policy, etc.) as the curriculum and/or program require(s).

### Academic Progression and Proficiency
Academic progression in the MOT program requires a grade of C or better in all MOT courses. A student receiving a D, F, or U on any assignment or exam in any course must remediate and be reassessed to ensure competence. It is necessary for the student to demonstrate proficiency.
before progressing through the course. Successful remediation results in demonstration of competence NOT a change in the initial grade.
The minimum passing score for practical examinations and skill checks is 80%. If a student does not pass the exam in the initial attempt, remediation occurs and reassessment is performed to ensure competence. The recorded grade from the initial examination remains unchanged. The maximum number of attempts varies between courses/faculty and depends on examination content and faculty judgment. Failure to meet this standard results in a failing grade in the course and an inability to progress in the program.
In addition, students may be required to complete a learning contract in collaboration with faculty and MOT advisor. The learning contract is a method through which a student identifies potential barriers to learning and creates an action plan toward successful learning and performance.

Statement on Academic Integrity
The Carroll University Academic Integrity Policy is located in your student handbook on the University website. http://www.carrollu.edu/campuslife/. Please familiarize yourself with it. If a student is found in violation of the Carroll University Academic Integrity Policy, I reserve the right to fail the student on the assignment/exam or even FAIL the student in the course. Some examples of violations will be discussed on the first day of class. These will include:
(1) Plagiarism
   • Must use OWN words
   • If you copy more than two or three consecutive words from an author, then you are plagiarizing that author.
   • A student who uses an author’s words as her/his own will receive 0 points for that assignment. A second offense will result in failure in the course.
(2) Failure to return or removal of an exam
(3) Submitting work completed by another individual
   • A student who copies another student’s work and the student who allowed the other student to copy her/his work will each receive 0 points for that assignment. A second offense will result in failure in the course.
(4) Discussing quiz/exam questions with students who have not yet taken the quiz/exam.
(5) Any other forms of cheating

Core Professional Behaviors
1. PERSONAL RESPONSIBILITY
   • Student is punctual
   • Student completes assignments and tasks on time
   • Student attends all lecture and laboratory sessions
2. PERSONAL HONESTY & INTEGRITY
   • Student is honest in word and actions and is accurate in reporting all information
   • Student maintains positive learning environment
   • Student follows the University policies regarding academic integrity (i.e., cheating on exams, removal of an exam, passing exam information to peers)
3. RESPECT
• Student gives full attention to lecturer, does not talk in class, treats others with dignity
• Student refrains from the use of technology during class (cell phones, headphones, “surfing” the web on laptops)

4. TEACHABILITY/ADAPTABILITY
• Student takes responsibility for own actions and understands consequences of inappropriate actions
• Student behavior is appropriate during times of high stress

5. COMMUNICATION
• Student properly formats emails to instructors and with respect (i.e., correct punctuation and salutations)
• Student refrains from spreading rumors regarding instructors and course assessments
• Student follows appropriate procedures for discussion of course issues and concerns
  - 1st → Student contacts their lecture or laboratory instructor
  - 2nd → Student communicates concerns to course coordinator (should the need arise, the coordinator will direct the student to the Departmental Chair)

6. RELATIONSHIP WITH PEERS
• Student participates in class and small group discussions
• Student demonstrates ability to function within a group (i.e. student respects the opinions of others and can work collaboratively to solve problems).

7. PERSONAL APPEARANCE
• Student dresses appropriately for presentations and palpation
• Student will be expected to wear garment allowing for appropriate palpation or exposure of the body area under study.

CONSEQUENCES (SHOULD STUDENT NOT MEET EXPECTATIONS)
*At the discretion of the Instructor:
  - A deduction in course points (i.e., -10 pts for cell phone use)
  - Tardiness of required assignments, -5% per day late
  - Removal from class
  - Multiple offenses may result in a full letter grade deduction

Disability/Illness
Any student who feels s/he may need an accommodation based on the impact of a disability should contact the instructor privately to discuss the specific needs. Please contact the Office of Services for Students with Disabilities at 262-524-7335 in the Walter Young Center to coordinate reasonable accommodations for students with documented disabilities.

If you are ill and unable to attend a class, it is your responsibility to notify faculty in a timely fashion. In order to make up an assignment you must document that illness.
If a student misses >10% of class periods in a course (excluding laboratories as these must be made up) s/he must remediate or s/he will not meet progression standards. If a student’s absence is excused, every attempt to remediate will be made prior to beginning of the following semester.

**Extended illness may make it impossible for you to complete the class requirements.**

**Courtesy**

Course faculty will treat you with respect, while expecting the same in return. You are also expected to respect your fellow students. Therefore, please do the following:

1. Turn off your cell phone, beeper, or anything else that might make noise.
2. Do not converse while the teacher or a fellow student is speaking in class.
3. You are expected to arrive on time. If, because of some problem, you are forced to come in late, do come in. However, do so quietly and do not walk in front of the instructor while s/he is lecturing. **There is no excuse for chronic lateness.** Those who are routinely late will be invited to withdraw from the class and have points deducted from their class participation grade. If you have an emergency, please let me know.
4. Computer use policy: If you use a computer, it must be used ONLY for taking notes UNLESS specifically given permission otherwise. If you use a computer for any other purpose, you will permanently lose computer use privileges in the classroom.