College of Charleston  
EXSC 440-Biomechanics  
Spring 2013- 3 Semester Credit Hours  

TIME & PLACE:  
Tu-Th 1:40-2:55 PM  
Johnson Center-Rm 206

INSTRUCTOR:  
William R. Barfield, Ph.D., FACSM  
Professor

OFFICE HOURS:  
Tu-Th 9:25-10:40

OFFICE:  
#213 Silcox Physical Education & Health Center

PHONE/FAX:  
803/953-6746 / 803/953-6757

PREREQUISITE:  
Physics 101, Biology 202, & PEHD 330

GRADING:  
A, B+, B, C+, C, D, F

COURSE DESCRIPTION:  
This course will focus on the mechanical basis of human movement with some consideration given to the anatomical constraints that influence normal, athletic, and pathological movement. Topics covered will include linear and angular kinematics and kinetics of movement, equilibrium, and fluid mechanics.

COURSE TEXT:  
*Biomechanical Basis of Human Movement* – Third Edition  
Joseph Hamill & Kathleen M. Knutzen

STUDENT LEARNING OUTCOMES:  
1. Students will be provided a brief review of applied anatomy with particular reference to exercise and activity.  
2. Students will learn the value of solving human movement challenges from an athletic as well as from an injury and/or pathological perspective.  
3. Units of measurement, differences in scalar and vector quantities and two-dimensional and three-dimensional methods of measurement will be discussed and addressed.  
4. Linear kinematic quantities will be addressed as they apply to movement of the body as well as projectiles.  
5. Angular kinematics will be examined and understood, especially as it applies to creation of general planar motion.  
6. Newton's Laws of Motion with respect to linear and angular kinetics will be addressed as they have application to an understanding of inverse dynamics.  
7. Center of gravity, equilibrium and fluid mechanics will be discussed and examined.  
8. Students will have a greater understanding of various types of human motion and how these movements can be quantified.
REQUIREMENTS:

- Written Exams - 2 @25% each 50%
- Research Project 25%
- Final Exam 25%
- TOTAL 100%

DESCRIPTION OF PROJECTS:

1. In-class activities will include lecture/presentation, small group discussion, problem solving, written examinations, and in-class research projects.
2. Out-of-class activities will include readings, study and project preparation.
3. Class Project Description (25%). Each student will be responsible for presenting an in-class group project concerning how one of the mechanical constructs we examine during the semester influences normal, athletic, or pathological movement. The presentation should be planned for 30 minutes with 5 minutes at the end for questions and/or comment. A referenced, written paper will be turned in the day of presentation.

EXAMS:

Exam #1 (25%) will cover linear and angular kinematic quantities and how they relate to movement.

Exam #2 (25%) will cover linear and angular kinetic quantities, and equilibrium and how they relate to movement.

Final Exam (25%) will be comprehensive and will cover all information presented throughout the course including student projects.

EVALUATION SCALE:

- 90-100 A
- 88-89 A-
- 85-87 B+
- 80-84 B
- 78-79 B-
- 75-77 C+
- 70-74 C
- 68-69 C-
- 66-67 D+
- 64-65 D
- 62-63 D-
- <62 F

ATTENDANCE POLICY:

1. Students will be allowed two (2) unexcused absences, except during major evaluations. EACH UNEXCUSED ABSENCES in excess of two (2) will result in 2% being deducted from your final average. Students who miss more than 5 classes will be dropped from the course (WA).
2. Class will begin and end in a timely manner. You are expected to be prepared when class begins. Persistent tardiness will not be tolerated and may result in loss of points.
3. You are responsible for any work missed when you fail to attend class.
4. Two tardies will be the equivalent of one excused absence. Tardy means you are 1 minute late + for the start of class.

MAKE-UP POLICY:
1. Make-up exams will be given at the discretion of the professor when extenuating circumstances exist. It is the student’s responsibility to see the professor within three calendar days to request a make-up exam time and date.
2. Assignments that are not turned in at the designated time will be accepted at the discretion of the professor. Be aware that unusual circumstances must exist for acceptance of late assignments

CELL PHONE/PDA POLICY:
The use of all PDA devices, including cell phones and laptop computers are expressly forbidden in the classroom. Texting, receiving or sending messages, cell phone use, or the use of laptop computers will result in immediate loss of points from your final class average and an absence will be recorded. If there is a 2nd violation of the class policy you will be awarded an F. The first violation will result in a 20 point deduction from your final class average. The 2nd violation is another 20 points, therefore making it impossible to successfully complete the class with a passing grade. Students must keep these devices turned off and out of sight during class. It is a violation of this policy to keep such devices on your lap, in your pocket or on the floor by your desk. Any suspicion of your use on my part will result in loss of points.

ACADEMIC HONOR CODE:
Students will be expected to abide by the academic honor code found in the most current edition of the Student Handbook.

PROJECTED COURSE OUTLINE:
January 10   Introduction to Biomechanics
January 15   Biomechanics of Movement & Sport
January 17   Biomechanics of Movement & Sport
January 22   Review of Linear Kinematics
             vectors, resultants
January 24   Review of Linear Kinematics
             instantaneous velocity and acceleration
             kinematics of gait
             projectile motion
January 29   Linear Kinematics Review
January 31   Linear Kinematics Final Review
February 5   Introduction to Angular Kinematics
             axes of rotation and units of measurement
             angular motion and types of angles
February 7  Angular Kinematics
relationship between linear and angular kinematics

February 12  Angular Kinematics
angular kinematics of running

February 14  Angular Kinematics Review
Update #1 on Biomechanics Project Due

February 19  Guest Lecture on Biomechanics Applications

**Learning Activities: lecture, class discussion, in class problems and graphing.**

February 21  Review Day for Exam #1

February 26  Exam #1

February 28  Linear Kinetics
ground reaction forces
other contact forces

March 1  Laws of Motion

March 4-10  Spring Break

March 12  Free-Body Diagrams

March 14  Special Force Applications
pressure, mechanical work, energy, and power

March 19  Linear Kinetics Review and Summary

March 21  Introduction to Angular Kinetics
center of gravity and center of mass

March 26  Rotation and Leverage
lever classifications
moment of inertia

**Learning Activities: lecture, class discussion, in-class problem solving and article review.**

March 28  Angular Momentum
Update #2 on Biomechanics Project Due

April 2  Angular Analogs to Newton’s Laws of Motion

April 4  Torque Applications in Human Movement
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<tr>
<th>Date</th>
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<tr>
<td>April 9</td>
<td>Review for Quiz #2</td>
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<tr>
<td>April 11</td>
<td>Quiz #2</td>
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<td>April 16</td>
<td>Gait Analysis</td>
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<td>April 18 &amp; 23</td>
<td>Student Presentations</td>
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<td>April 30</td>
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