

PHED 4605**APPLIED BIOMECHANICS**

Semester Hours: 3

Semester/Year:

Instructor:

Office Location:

Office Hours:

Telephone:

E-mail:

Fax:

COURSE DESCRIPTION

Prerequisite: Admission to Teacher Education; PHED 2603

This course applies the core concepts of anatomy and mechanical physics to human motion. Kinematic (distance, speed, acceleration) and kinetic (force, momentum, torque) concepts related to motion along a straight line (linear motion) and around an axis of rotation (angular motion) are major themes of this course. The student will apply these concepts in analyzing exercise and sport skills. Applied activities engage students with fundamental concepts and principles of biomechanics that are essential to effective movement analysis.

CONCEPTUAL FRAMEWORK

The conceptual framework of the College of Education at the University of West Georgia forms the basis on which programs, courses, experiences, and outcomes are created. By incorporating the theme “Developing Educators for School Improvement”, the College assumes responsibility for preparing educators who can positively influence school improvement through altering classrooms, schools, and school systems (transformational systemic change). Ten descriptors (decision makers, leaders, lifelong learners, adaptive, collaborative, culturally sensitive, empathetic, knowledgeable, proactive, and reflective) are integral components of the conceptual framework and provide the basis for developing educators who are prepared to improve schools through strategic change. National principles (INTASC), propositions (NBPTS), and standards (Learned Societies) are also incorporated as criteria against which candidates are measured.

The mission of the College of Education is to develop educators who are prepared to function effectively in diverse educational settings with competencies that are instrumental to planning, implementing, assessing, and re-evaluating existing or proposed practices. This course’s

objectives are related directly to the conceptual framework and appropriate descriptors, principles or propositions, and Learned Society standards are identified for each objective. Class activities and assessments that align with course objectives, course content, and the conceptual framework are identified in a separate section of the course syllabus.

COURSE OBJECTIVES

Students will:

1. identify and define basic biomechanical terms
(*Adaptive; Decision Making; Knowledgeable; Leadership; Lifelong Learning; Proactive; Reflective; INTASC 1,5; PSC 4,14*)
(Floyd, 2007; Griffiths, 2006; Hall, 2007; Hamill, & Knutzen, 2003);
2. name, locate, and describe the muscles and ligaments that move and support the major joints, including the spine
(*Adaptive; Decision Making; Knowledgeable; Leadership; Lifelong Learning; Proactive; Reflective; INTASC 1,5; PSC 4,14*)
(Enoka, 2002; Floyd, 2007; Griffiths, 2006; Hall, 2007);
3. compare and contrast the principles of linear and angular kinetics and kinematics and employ these principles through applied laboratory experiences
(*Adaptive; Decision Making; Knowledgeable; Leadership; Lifelong Learning; Proactive; Reflective; INTASC 1,5; PSC 4,14*)
(Griffiths, 2006; Hall, 2007; Hamill, & Knutzen, 2003);
4. name and describe how knowledge of the laws of levers, motion, balance, and force can help improve physical performance and employ these principles through applied laboratory experiences
(*Adaptive; Decision Making; Knowledgeable; Leadership; Lifelong Learning; Proactive; Reflective; INTASC 1,5; PSC 4,14*)
(Enoka, 2002; Floyd, 2007; Griffiths, 2006; Hall, 2007; Hamill, & Knutzen, 2003); and
5. describe the mechanical concepts specific to different human movement activities and apply these concepts in analyzing sports and exercise skills
(*Adaptive; Decision Making; Knowledgeable; Leadership; Lifelong Learning; Proactive; Reflective; INTASC 1,5; PSC 4,14*)
(Enoka, 2002; Griffiths, 2006; Hall, 2007; Hamill, & Knutzen, 2003).

TEXTS, READINGS, AND INSTRUCTIONAL RESOURCES

Required Text

Hall, S. J. (2007). *Basic biomechanics* (5th ed.). New York: McGraw-Hill.

References

Adrian, M. J., & Cooper, J. M. (1995). *Biomechanics of human movement* (2nd ed.). Madison, WI: Brown & Benchmark.

Allard, P., Stokes, I. A., & Blanche, J. P. (1995). *Three-dimensional analysis of human movement*. Champaign, IL: Human Kinetics.

Carr, G. (1997). *Mechanics of sport*. Champaign, IL: Human Kinetics.

Enoka, R. M. (2002). *Neuromechanical basis of kinesiology* (3rd ed.). Champaign, IL: Human Kinetics.

Floyd, R. T. (2007). *Manual of structural kinesiology* (16th ed.). New York: McGraw-Hill.

Griffiths, I. W. (2006). *Principles of biomechanics & motion analysis*. Baltimore: Lippincott, Williams, & Wilkins.

Gowitzke, B. A., & Milner, M. (1980). *Understanding the scientific basis of human movement* (2nd ed.). Baltimore: Lippincott, Williams, & Wilkins.

Hamill, J., & Knutzen, K. M. (2003). *Biomechanical basis of human movement* (2nd ed.). Baltimore: Lippincott, Williams, & Wilkins.

Kreighbaum, E., & Barthels, K. M. (1996). *Biomechanics: A qualitative approach for studying human movement* (4th ed.). Boston: Allyn & Bacon.

Luttgens, K., & Hamilton, N. (1997). *Kinesiology: Scientific basis of human motion* (9th ed.). Dubuque, IA: Brown & Benchmark.

McComas, A. J. (1996). *Skeletal muscle: Form and function*. Champaign, IL: Human Kinetics.

McLester, J., & St. Pierre, P. (2008). *Applied biomechanics: Concepts and connections*. Belmont, CA: Thomson Wadsworth.

Mennell, M. M. (1991). *The musculoskeletal system: Differential diagnosis from symptoms and physical signs*. Gaithersburg, MD: Aspen.

Vaughn, C. L. (1988). *Biomechanics of sport*. Boca Raton, FL: CRC Press.

Watkins, J. (1999). *Structure and function of the musculoskeletal system*. Champaign, IL: Human Kinetics.

Wirhed, R. (1988). *Athletic ability and the anatomy of motion*. Boca Raton, FL: CRC Press.

Zatsiorsky, V. M. (1998). *Kinematics of human motion*. Champaign, IL: Human Kinetics.

ASSIGNMENTS, EVALUATION PROCEDURES, AND GRADING POLICIES

Link to Conceptual Framework. The primary goals of this course are as follows: 1) demonstrate an understanding of the basic terminology of the discipline; 2) demonstrate an understanding of the principles of linear and angular kinetics and kinematics; 3) name and describe how knowledge of the laws of levers, motion, balance, and force can help improve physical performance; and 4) demonstrate an understanding of mechanical concepts for studying human movement and apply these concepts in analyzing sports skills. At the completion of this course, students will have demonstrated achievement in the following areas *decision making*: choosing solutions to performance scenarios (**Assignments 2 and 4**); *leadership*: taking responsibility for ongoing inquiry (**All Assignments**); serving as a leader during in-class assignments (**Assignment 4**); *lifelong learning*: studying the various components and applications of biomechanics (**Assignments 2 and 4**); *knowledgeable*: drawing on acquired knowledge and demonstrating understanding (**All Assignments**); *adaptive*: implementing biomechanics principles to learning situations and modifying these principles when necessary (**Assignments 1 and 4**); *proactive*: implementing new strategies and presentation topics (**Assignments 1 and 4**); *reflective*: engaging in ongoing, continuous reflection of the primary principles in the field of biomechanics (**Assignments 1 and 4**).

Assignments

1. Applied Assignments (50 points total)

There will be a number of applied activities throughout the semester. These activities will concentrate on practical application of the current concepts being covered.

Course objectives: 3, 4, 5

2. Exams (150 points each)

Students will take a mid-term and final exam that will cover assigned readings and in-class lectures/discussions. Each exam will be comprehensive in nature. Questions will consist of multiple choice, true or false, or short answer.

Course objectives: 1, 2, 3, 4, 5

3. Quizzes (10 points each)

There will be 5 quizzes throughout the semester. Some of these will be announced while some will be unannounced. The quizzes will only cover recent material.

Course objectives: 1, 2, 3, 4, 5

4. Analysis Project (100 points)

Students will choose an activity to analyze using the mechanical principles that apply to that activity. The Dartfish computer program will be used to identify and pinpoint those portions of the activity in which the mechanical principles are depicted.

Course objectives: 3, 4, 5

GRADING POLICY

A=90-100%	450-500 points
B=80-89%	400-449 points
C=70-79%	350-399 points
D=60-69%	300-349 points
F=below 60%	below 300 points

CLASS POLICIES**Attendance**

Students are expected to attend and fully participate in all class meetings, arrive on time and remain until the discussion for that class period is complete. Absences will be excused with appropriate written documentation for the following reasons:

- a. Death or major illness in a student's immediate family;
- b. Participation in legal proceedings or administrative procedures that require a student's presence;
- c. Religious holy day;
- d. Illness that is too severe or contagious for the student to attend class (as determined by a physician);
- e. Required participation in military duties;
- f. Mandatory admission interviews for professional or graduate school which cannot be rescheduled; or
- g. Official representation of the University of West Georgia (athletic team, debate team, etc.).

E-mail

University of West Georgia students are provided a MyUWG e-mail account. The University considers this account to be an official means of communication between the University and the student. The purpose of the official use of the student e-mail account is to provide an effective means of communicating important University related information to UWG students in a timely manner. It is the student's responsibility to check his or her email.

Professional Disposition

The student is expected to demonstrate professional dispositions in all courses, field experiences, and other settings in which the student represents the university. Professional dispositions include but are not limited to attitude, dress, language, collegiality, preparedness, and punctuality. Professional disposition assessments are a significant part of the student's permanent file and will be used to determine the student's progress and continuation in the program. In addition, disposition assessments will help determine whether a student is ready to enter the internship experience.

All students seeking teaching certification through the Department of Physical Education and Recreation will be reviewed by all instructional faculty members during the thirteenth (13th) week of fall and spring semesters regarding their professional dispositions. Additional reviews will be conducted as needed. This holistic evaluation will determine students' continuation in the certification program.

Foliotek

This course will require students to save course assignments. The course assignments will be uploaded to the student's electronic portfolio (foliotek).

Work Credit

No material prepared to meet requirements in one course may be used to fulfill the requirements in another course without prior permission of the instructor.

Americans with Disabilities Statement (ADA)

The ADA is a federal anti-discrimination statute that provides comprehensive civil rights for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of his/her disabilities. If you believe you have a disability requiring an accommodation, please contact the Disability Services Office in Room 272 of the Student Development Center located in Parker Hall. The phone number is (678) 839-6428, and the fax number is (678) 839-6429.

Academic Integrity and Honor Code Pledge

At the University of West Georgia we believe that academic and personal integrity are based upon honesty, trust, fairness, respect, and responsibility. Students at West Georgia assume responsibility for upholding the honor code. West Georgia students pledge to refrain from engaging in acts that do not maintain academic and personal integrity. These include, but are not limited to, plagiarism, cheating, fabrication, aid of academic dishonesty, lying, bribery, or threats, and stealing.

Pledge:

Having read the Honor Code for UWG, I understand and accept my responsibility to uphold the values and beliefs described and to conduct myself in a manner that will reflect the values of the institution in such a way as to respect the rights of all UWG community members. As a West Georgia student, I will represent myself truthfully and complete all academic assignments honestly. I understand that if I violate this code, I will accept the penalties imposed,

should I be found guilty of violations through processes due me as a university community member. These penalties may include expulsion from the University. I also recognize that my responsibility includes willingness to confront members of the University community if I feel there has been a violation of the Honor Code.

**If plagiarism or another act of academic dishonesty occurs, a grade of zero will be given for the course assignment and, if further actions are warranted, the misconduct will be dealt with in accordance with the academic misconduct policy as stated in *The Student Handbook*, the *Undergraduate Catalog* and *Graduate Catalog*.

CLASS OUTLINE

Week	Topic	Chapter
1	Basic Principles of Biomechanics	1
2	Kinematic Concepts	2
3	Kinetic Concepts	3
4	Biomechanics of Muscle	6
5	Linear Kinematics	10
6	Linear Kinematics	10
7	Angular Kinematics	11
8	Angular Kinematics	11
9	Linear Kinetics	12
10	Linear Kinetics	12
11	Equilibrium	13
12	Equilibrium	13
13	Angular Kinetics	14
14	Angular Kinetics	14
15	Fluids	15
16	Final Exam	