

KIN 330 - Course Syllabus
Structural and Mechanical Analysis
of Physical Activity
Fall 2007

Instructor: Dr. D. Ulibarri
Office No.: Rm. 101 IM-Circle
Phone No.: 355-4733

If you call, please leave your name, a number at which you can be reached and times you may be reached at that number.

Email Address: ulibarri@msu.edu

Office Hrs.: Wednesday: 9:30 – 11:30 a.m. and

Thursday: Immediately after class at 2:30 in Anthony Rm 1279. If you wish to see me after class on Thursdays, please let me know ahead of time. Prior to scheduled quizzes and exams, I will be in the classroom approximately 30 minutes prior to the beginning of the class, to answer questions or to review the material, and, By Appointment during non-scheduled office hours. Please see me before or after class to make an appointment at a time other than during office hours. Please view office hours as a time to clarify points made in class, to talk about biomechanics as it relates to your interests, or to discuss any concerns you may have relative to the class. Crises are not prerequisite for making productive use of these hours.

Class: Tuesday and Thursday (both sections)

Section 001: Time: 8:00 – 9:50 a.m. Room: Agriculture Hall: Room 008

Section 002: Time: 12:40 – 2:30 p.m. Room: Anthony Hall: Room 1279

Recommended Text:

Hall, S.J. (2007). Basic biomechanics (5th ed.). St.Louis, MO: Mosby-Year Book, Inc.

Additional Suggested Textbooks:

Griffing, D.F. (1987).The dynamics of sports: Why that's the way the ball bounces. (3rd ed.) Oxford, OH: The Dalog Company.

Hay, J.G. (1985). The biomechanics of sports techniques. (3rd ed.). Englewood Cliffs, N.J.:Prentice-Hall, Inc.

Luttgens, K. and Wells,K.F. Kinesiology: Scientific basis of human motion. (7th ed.).Philadelphia: Saunders College Publishing.

Nordin, M. and Frankel,V.H. (1989). Basic biomechanics of the musculoskeletal system. (2nded.) Lea & Febiger: Philadelphia.

Ulibarri, V.D. (1984).An introduction to high-speed cinematographic procedures and analyses...or...You ought to be in pictures. Unpublished manuscript.

Course Description

Biomechanical analysis of human movement based upon musculoskeletal structure and function. mechanical principles.

Course Overview

This course focuses upon the development of techniques of human movement analysis from structural and functional points of view and incorporates principles of mechanics as they apply to the analysis of human motion. Examples will be drawn from joint movements and sport skills to illustrate these types of analyses.

It is expected that the student will: (a) build sound images of efficient physical activity skills; (b) recognize necessary individual variation in performance; (c) recognize unnecessary individual variations in performance; and (d) approach analysis of human movement from an analytical point of view. More specifically, it is expected that the student will: (a) acquire knowledge and experience necessary to structurally, functionally, and mechanically analyze the performer and performance of physical activities; (b) make appropriate recommendations about modifying performance; (c) demonstrate how bones, joints, and muscles serve as components of human levers, acting in accordance with the laws of mechanics; (d) demonstrate the application of knowledge of joint structure, joint stability factors and those factors influencing joint range of motion to the selection of developmental exercises for muscle strengthening, treatment and prevention of sport/athletic injuries;(e) demonstrate the basic principles of mechanics as they apply to the analysis of human movement; and (f) be able to approach physical education, rehabilitation, and/or coaching from an analytical point of view.

Course Content

I. Introduction

- A. Course procedures
- B. Assignments
- C. Grading plan
- D. The role of the course in the total undergraduate curriculum.
- E. Reasons for studying structural, functional, and mechanical principles.

II. Tissue

- A. Bone
- B. Tendon and Ligament
- C. Muscle
- D. Cartilage

III. Structural/Functional Analysis

- A. Planes and axes of movement
- B. Joint structure/function
- C. Bone, ligament, tendon, cartilage, and muscle characteristics
- D. Types of muscular contraction – Olson's Laws
- E. Load and force of contraction
- F. Roles of Muscles

IV. Movements at Specific Joints

- A. Shoulder and Shoulder Girdle
- B. Elbow and Forearm
- C. Wrist and Hand
- D. Trunk and Spine
- E. Hip
- F. Knee
- G. Ankle
- H. Patterns of movement

V. Analysis of Motor Skills

- A. Center of Gravity
- B. Static Balance and Dynamic Equilibrium
- C. Pattern Recognition and Usage
- D. Skill Analysis
- E. Skill Error Analysis and Correction

VI. Force

- A. Definitions
- B. Muscular force
- C. Forces as Vectors
- D. Components of force using trigonometric functions
- E. Law of Gravitation

VII. Kinematics

- A. Definition of Motion
- B. Motion as a relative concept
- C. Videographic procedures and analyses
- D. Displacement, velocity and acceleration graphs
- E. Motion having two simultaneous components of velocity
 - 1. Velocities as vectors
 - 2. Components of velocity using trigonometric functions
 - 3. Projectile Motion

VIII Kinetics

- A. Newton's Three Laws of Motion
- B. Centripetal Force and Centrifugal Reaction
- C. Special cases of resistance to motion
 - 1. Friction
 - a. Coefficient of Friction
 - b. Static Friction vs. Kinetic Friction
 - 2. Drag
 - 3. Magnus Effect
- D. Momentum and Law of Conservation of Momentum
- E. Impact
 - 1. Coefficient of restitution
 - 2. Elastic and non-elastic collisions
 - 3. Direction of movement after impact
 - 4. Impact in contact sports

IX. Work

- X. Power
- XI. Energy
- XII. Curvilinear Motion
 - A. Centripetal Force and Centrifugal Reaction
 - B. Angle of Lean
 - C. Pendular Motion
- XIII. Rotation
 - A. Angular displacement, velocity and acceleration
 - B. Period of Revolution
 - C. Radial Acceleration
 - D. Torque
- XIV. Simple Machines
 - A. Levers
 - B. Pulleys
 - C. Inclined Planes

Course Requirements

Each student is expected to:

1. complete assigned readings prior to each class (see course schedule),
2. actively participate in all class activities,
3. complete and submit each assignment/lab when due,
4. successfully complete all labs, assignments, quizzes and examinations, and
5. computer generate/type, in double spaced format, all submitted work.

Class Procedures

You should be thoroughly familiar with all class procedures. Refer to these materials whenever a question arises concerning the conduct of the course. The class will consist of lecture, discussion and labs. Students will be divided into small base groups during the 2nd week of class. Base groups are designed to provide academic and social support. Formal and informal groups will be formed throughout the term for lab and assignment work. Power point notes for the tissue section are available to students under Handouts (web). These notes are provided to assist the students in note taking, small group work and studying for quizzes and exams.

Reading Assignments are listed in the Class Schedule. Assigned readings are limited to designated sections in the required textbook, and/or to handouts, labs and assignments found in the KIN 330 web address. By completing the reading assignments before class, you will be better able to address questions posed to small groups.

Homework Assignments

The homework assignments will be limited to questions and problems based upon the subject matter indicated in the class schedule. Questions concerning homework problems will be covered in class. Solutions to the word problems in the Word Problems section are posted on the web.

Review Worksheets

Review worksheets are located on the web, under Handouts. These worksheets provide an excellent review of the material in preparation for quizzes and exams. Answers to these questions will act as springboards for deeper group discussion. Questions concerning these worksheets will be covered in class.

Laboratory Assignments

Laboratory assignments are designed to give the student more detailed experiences on selected topics. Five lab assignments will be given during the term. Please see instructions for each lab. Each laboratory assignment will be worked on in class and is worth 10 points, for a total of 50 points.

Small Group Work

Use of formal and informal groupings will be used to help uncover information introduced in the readings and lecture. Several small group assignments will be given throughout the semester.

Make ups for Labs and Other Assignments

Make ups for missed in-class assignments follow the makeup policy for exams and quizzes found later in this syllabus.

Use of Electronic Devices in Class:

All cell phones must be turned off at the beginning of class as one means of demonstrating respect for fellow students.

You may use computers and/or PDA's during lectures and labs. During any quiz or exam, you may not use calculators that are part of computers, PDA's, cell phones, watches or any other electronic device. Stand alone calculators only, that is, devices whose only function is to perform mathematical calculations may be used during quizzes and exams. Students may not share calculators, other electronic devices, or anything else (erasers, pencils, pens, paper, etc.) during any testing period. If sharing of calculators, or anything else, occurs during any testing period, all students involved with sharing will receive a zero (0) on that test and in the class. Further action may be taken.

During quizzes, exams and pop quizzes (to be referred to as "tests"):

1. Students may not share verbally, by written word, text messaging or in any other manner ANY information during tests;
2. Students may have on their desks only the test, calculator, pencils/pens and eraser. Water bottles, coffee cups, pop bottles, breakfast, etc. may not be on the desks.
3. All material needed for the test, such as pens/pencils, erasers, and calculators must be removed from pockets, backpacks, attaché cases, purses, cases or any other carrying device PRIOR to the test.
4. All backpacks, attaché cases, or any other carrying device must be closed and placed under the owner's chair.

5. Baseball style hats, or any brimmed hat must be removed and placed inside backpacks, or other carrying devices. If no carrying device were brought to the test, the hat must be placed underside down under the owner's chair.

Pop Quizzes

Pop quizzes will be given from time to time within the class period. These points will be totaled and counted as extra credit points in the lab/quiz portion of the grade. There are no make ups for these pop quizzes.

Quiz and Examination Test Construction

All quizzes and examinations are constructed so that 80% of the questions come from material presented/discussed in class and readings. The remaining 20% of questions are written to address higher cognition levels. In this manner, a student can do well in this class if they demonstrate knowledge of the material as presented in lectures, readings and labs. The student who can take this information and demonstrate that they can apply, analyze, synthesize and evaluate will do exceptionally well in KIN330.

Quizzes

Three quizzes are given during the semester. Each quiz is worth 30 raw-score points. Check the class schedule for dates. The quizzes will be limited to questions and problems based upon the subject matter from the lecture and corresponding readings following the previous quiz through the lecture preceding the current quiz, unless otherwise announced. All quizzes will contribute to the final course grade. No quiz score will be dropped. Therefore, every effort should be made to avoid missing any given quiz/exam. An equation sheet will be furnished for quizzes when appropriate.

Examinations

Three examinations worth 100 raw-score points each, will be given. Check the class schedule for dates. The student is responsible for material covered in class and reading/computer assignments. Quizzes and laboratory assignments will serve as a good review of the material. An equation sheet will be furnished for exams when appropriate.

Final Examination

The final examination will be worth 175 raw-score points. This exam is cumulative and is divided roughly into thirds, covering information from each of the exams. An equation sheet will be furnished for this exam.

Policy on Makeup Assignments/Labs, Quizzes and Examinations

Makeup for missed in class assignments/labs, quizzes or exams will be given under any one of the following conditions:*

1. Illness. A medical excuse signed by one's physician must be presented to the instructor. All excuses will be verified by the instructor.
2. Athletic or other M.S.U. sponsored trips. Travel dates and times accompanied by a signed memo from the group's advisor must be presented to the instructor prior to the travel dates.
3. Extenuating circumstances. It will be the prerogative of the instructor whether or not the student will be allowed to take the makeup.

*In all of the above cases, the instructor must be notified of the absence prior to the class assignment/lab, quiz, or exam. Call the instructor's office and leave a message or e-mail the instructor in cases 1 and 3 above, before the class assignment/lab, quiz or exam is to be given. Case 2 always requires pre-notification of the instructor. The policy for final examination makeup follows the University's Final Examination Policy.

Movement Analysis Paper

The class will be divided into small groups and each group will research a particular sport skill. The results of this effort will be presented as a paper. The content and format of this paper is explained in more detail in the section on the Movement Analysis Paper.

Grading

Laboratory assignments, small group assignments, and quiz scores (25%), examination scores (30%), a final examination score (25%), and an analysis paper score (20%) will be obtained for each student. These four raw scores will be weighted as indicated in the parentheses above, and summed. There is no extra credit opportunity in this class. The grading scale will be as follows:

Areas:		Total Points	(*)
Weighting	=		Weighted Points
Labs/Quizzes		140	
.25	=	35.0	
Exams		300	
.30	=	90.0	
Final		175	
.25	=	43.75	
Paper		200	
.20	=	40.0	
Total Weighted Points =		208.75	

Grading Plan

Weighted Points	Percent	Grade
187	90	4.0
177	85	3.5
167	80	3.0
156	75	2.5
146	70	2.0
135	65	1.5
125	60	1.0
< 125	< 60	0.0

To calculate your grade as you progress through the class, set up a ratio of your earned weighted points to the number of possible weighted points (to date) and multiply by 100. An example of how to calculate your grade is given under the Handouts section.

Academic Dishonesty

Academic dishonesty is an extremely serious offense which includes but is not limited to cheating on examinations and plagiarism. The definition of plagiarize, according to Webster's Ninth New Collegiate Dictionary*(1983) is: "to steal and pass off (the ideas or words of another) as one's own: use (a created production) without crediting the source: vi: to commit literary theft: present as new and original an idea or product derived from an existing source" (p. 898). Academic dishonesty will not be tolerated in this class. If academic dishonesty is proven, the student will receive a 0.0 in this course.

*Merriam-Webster, A. (1983). Webster's Ninth New Collegiate Dictionary. Springfield, MA.: Meriam-Webster Inc.

Class Schedule

Please refer to the Class Schedule link.

CAATE Competencies and proficiencies covered in this class:

DI-C4 Explain directional terms and cardinal planes used to describe the body and the relationship of its parts.

DI-C5 Describe the principles and concepts of body movement including functional classification of joints, arthrokinematics, normal ranges of joint motion, joint action terminology, and muscle groups responsible for joint actions (prime movers, synergists), skeletal muscle contraction, and kinesthesia/proprioception.