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**EXRS 3600: Applied Biomechanics****SYLLABUS*****Instructors'  
Information***

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**Course Description:** This course is intended for physical education, dance and other non-exercise science majors, focusing on:

- Biomechanical principles of human motion and the structure of the human body.
- Laws of mechanics and tissue biomechanics concepts are applied to sport, dance, daily living activities, physical training and injury etiology and prevention.

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**Text:** McGinnis, P.M. (2005). *Biomechanics of Sport and Exercise*. 2nd edition. Champaign, IL: Human Kinetics.

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**Overall Course Objectives:** The student will be able to apply biomechanical principles to various human movement situations using a movement analysis model to:

1. Assess movement technique to diagnose effectiveness and prescribe improvements.
  2. Evaluate the mechanics of exercises and movements to determine their effectiveness and safety.
  3. Perform an original research experiment to answer a question of interest.
  4. Evaluate external devices used for activities of daily living, exercise and sport.
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**Evaluation:** Grade scale: A-B-C-D = 89.5 - 79.5 - 69.5 - 59.5%

Evaluation tools	Proportion of grade
<a href="#">Quizzes and Assignments</a>	20%
<a href="#">Test #1</a>	20%
<a href="#">Test #2</a>	20%
<a href="#">Test #3</a>	20%
<a href="#">Project</a>	20%
<a href="#">Extra Credit</a>	(max 2%)

[Click here to see detailed information.](#)

There are other documents you need to download from WebCT

**Important Dates:** Listed by week, lecture topics, major event dates (tests, assignments), and readings.

**Module Learning Objectives/Readings:** In "Course Notes", course material is broken into modules. For a given module, the first document listed will be the learning objectives/readings. Read this FIRST before you do a text reading. (The other documents are lecture notes, when provided).

**[Information for Success:](#)** Here it is- everything else you need to know to do your best!

This is a document that contains detailed information on:

- All of the evaluation tools, e.g., test question formats, assignment expectations, instructions, forms, etc.
- Professional standards and ethics (including academic honesty) expected of all students as everyone is in the professional preparation phase of their studies.
- How to be successful: study hints, practice test questions, how to solve lecture questions, test taking strategies, etc.
- My teaching philosophy and expectations of your skills.

**[You are responsible for all content contained in Information for Success document](#)**

## INFORMATION FOR SUCCESS

<a href="#"><u>Strategies to maximize success</u></a>	<a href="#"><u>A career on the line</u></a>	<b>Quizzes &amp; Assign.</b> <a href="#"><u>Quizzes</u></a>   <a href="#"><u>Assignments</u></a>
<a href="#"><u>Tests</u></a>	<a href="#"><u>Extra credit</u></a>	

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### STRATEGIES TO MAXIMIZE YOUR SUCCESS

**\* PHILOSOPHY: My role is a facilitator; my responsibility is to assist you in methods of constructing your knowledge.**

Learners are responsible for their learning. I do not just lecture and expect memorization. As you have valuable knowledges and skills, you will add to your knowledges and skills using biomechanics only when you are engaged in processing and applying knowledge.

**\* MOST IMPORTANT: Understand the concepts as we go through them.**

Understanding the concepts and being able to apply the information to any movement situation is the MAIN GOAL. (Just reading the book and notes and memorizing things is a poor use of your time.)

If you understand and apply the concepts every day to your own movements, movements and tasks of others as we go through the material, you shouldn't have to study very much just prior to the test!!!

**\* For a given course topic/lecture:**

***Prior to class:***

a) Check WebCT home page for lecture announcements, e.g., bring a handout for class, assignments due.

b) Check the course schedule for the course objectives and the day's topic. These objectives should ALWAYS be thought of as APPLIED TO MOVEMENT SITUATIONS.

c) Do the reading for that topic listed in course objectives/outline/topics. Put the relevant info into your notes- use of concept maps or some form of organizational structure will be best- write information in your own words and/or pictures. Leave room in your pre-class concept maps/notes for additional information to be added either during class or later.<Note- I expect people to have done the reading- I ask questions & expect to move quickly through the lecture part when we're defining a concept in order to have more time to apply it>.

***During class:*** please always feel free to get clarification or ask for examples. Be sure it makes sense as we go along. Self test your understanding- restate concepts in your own words, think of a new situation and see if the concept fits.

***Prior to the next class:***

a) go through the class notes- still make sense? Need to add concept maps or drawings, modify old ones? Test your understanding of the topic- try stating the concepts in your own words; apply the concept (s) to new examples not listed in book/notes.

b) Between class meetings, make it a habit to apply that day's concept (and prior concepts) to as many movements as you can. Spend time assessing performers' movements as often as possible- at tennis courts, sports events, clinics, gym; observe people walking, lifting weights, performing rehab, etc. While you do daily tasks, consider the biomechanics of your movements.

c) Get together in small study groups- pay attention to the processes that other people use to solve movement problems as well as their interpretation/application of the concepts. I'm happy to help with you establish more effective problem solving strategies.

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## **A CAREER ON THE LINE...**

We expect that you are preparing for an occupation working with clients whose health/safety is in your hands or supervising individuals who do have responsibility for health/safety of employees and/or clients.

In addition, as a professional, you will belong to one or more professional organizations that expects you and its other members to abide by their proscribed professional ethics.

Therefore, the School of Health and Performance faculty expect you, as an emerging professional, to develop and adhere to ethical standards as a contributing member of this class.

### **Expectations:**

~***Academic honesty*** in all work: See "Towards a Culture of Honesty," the UGA handbook on academic

honesty. I will take action according to policies described in this handbook for situations involving academic dishonesty.

Example: Referencing outside material (notes, books, professionals, videotapes, websites, etc.) properly is required when using other people's information in your work. Failure to do so is plagiarism. So, give credit to authors when making statements taken from their material.

Giving credit where credit is due:

"Farley (1996) stated that the primary cause of spiral humeral fractures during baseball pitching is..."  
"The primary cause of spiral humeral fractures is .... (Farley, 1996)."

~**Ethical treatment of people related to this class**, e.g., regard for the health and safety of your research project participants and your lab partners; contributing to your group project as much as other project members; contributing to a supportive learning environment; etc.

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## TESTS:

- a) **What to bring to test:** #2 pencil, eraser; for some tests, bring: calculator, protractor (optional)
- b) **Format:** primarily multiple choice and some short answer questions.
- c) **Higher level cognitive skills required:** Application, synthesis. Focused on application of concepts to various movement situations, not regurgitation.

Often for a given movement, two situations are given- you are asked to compare them using a biomechanical principle. Example:

"Two identical twins (same mass, height, etc.) were going to race each other on a grass field. Given: The *only factor different* between the two twins in this situation is that they had footwear whose soles had different compositions. At the start of the race, both performed identical movements, and pushed in the posterior direction with 1200 N of force and downwards in the vertical direction with 600 N of force. Twin A was able to move forward, Twin B slipped and fell. Based on the factors that influence static friction, what must be true about Twin B's situation compared to Twin A's?"

- a. Twin B's shoes had a lower coefficient of static friction.
- b. Twin B had a lower maximal value of static friction than Twin A.
- c. Twin B had less normal force.
- d. a, b
- e. a, b, c

### d) How to study:

~**Use Course Outline, Objectives and Outline handout** to review how you are required to demonstrate

mastery of material.

Example. If an objective states that you must be able to determine what type of muscle action is occurring at a joint for a given movement situation, then expect that is how the question will be framed. Could look like this:

"On the diagram shown for a participant performing the down phase of a squat exercise, what is the type of muscle action for the quadriceps muscle group about the knee joint?

a. concentric b. eccentric c. isometric d. isodynametric"

~Generally speaking, ***use your notes as the primary foundation***, with your laboratory and the book to a lesser degree, UNLESS the material is noted to be covered on your own or in lab, then the reading or lab material becomes primary. (Note. The outline tells you location of primary source of information- "on own" = you learn material on own from assigned reading; "lab only", etc.)

~***Lab techniques, methods, other materials*** that aren't really biomechanical principles, per se, ***are integrated into the questions***. Example of a question (this question relates to the lab that requires you to collect and analyze force platform data and apply biomechanical principles to the movement question/problem).

"Based on the diagram that shows a graph of the anteroposterior ground reaction forces exerted on a runner during the right foot support phase, what must be true based on the impulse-momentum principle?

a. The runner lost more momentum during the braking phase than was gained during the propulsive phase.  
b. Compared to the instant in time just at foot contact, at the instant of takeoff, the velocity of the runner was slower."

~***Study with a small group by***: making up examples to practice based on the course objective for the topic, using questions at the end of the chapter, practice examples given in class, practice review sheet questions BEFORE the review session (if such is provided).

~***Understand/practice the material as we go along***. Practice, practice, practice observing and applying your knowledge during your everyday and professional life. (if you do it right, you should have very little studying to do the night before the test, as it's not about memorization)

e) **Tests are given only at the scheduled dates/times**. Exceptions will apply only for extreme emergencies, i.e., major illness, death in family. Make arrangements PRIOR to missing test if feasible.

f) **Test taking strategies:**

~***Look through entire test*** before starting to gauge your time.

~***As you come to a question***, if you can answer it without much thinking, complete the answer. If you can figure some of it out, but are not sure and find yourself spending much time on it, write notes to yourself on the test, put a big "?" in margin, go on. Do not spend too much time stuck on one question- oftentimes, you'll become unstuck when you come back.

~***If something doesn't make sense***, you're not sure about what is being stated or asked, or suspect that

there's an error, A) check the whiteboard for corrections, B) ASK!!!

~**Before answering a question, determine** \*what principle is being applied; \*what quantities/ information are "given"; \*keep the question and known information simple- assume other factors unrelated to the quantities in a principle are fixed or not relevant (or you'll go crazy); \*write on the test- formula or principle- below, leave room to write information about what you know about each quantity in the formula, and how the quantities vary between the 2 given situations; and \* before STARTING to answer the question, draw a free body diagram (FBD)!!!

Example of keeping life simple: Go back to question about the Twins running a race on grass. Steps-

~Identify Principle: "The greater the coefficient of friction and/or the normal force, the more static friction can be generated before slipping (high max. static friction value).

!Identify Formula: maximum static friction = (coefficient of friction) x (normal force). Thus, you're interested in information that directly influences friction, particularly the maximal value of static friction.

~Draw one/two free body diagrams: a) system of interest, b) draw all external forces acting on system- by drawing one for Performer A and one for Performer B it is easy to determine what forces are similar and which are different between the 2 performers.

~Determine given information: The key statement about what quantities are "given", "relevant" and/or fixed/ same for both twins: "Given: all quantities except the following are the same for both twins' situations...." This tells you DON'T agonize about information that ain't there, like "was the grass the same for both people?" (Grass is same because it was given that everything is same except for the footwear.)

~ Notes you might write to yourself when writing down given information and information you deduce:

" Max static friction possible = coeff. fric. x normal force

Twin B vs A: max. static friction: higher; coeff. friction ?? don't know yet; normal force is same "

KEEP IT SIMPLE- DO NOT OVERANALYZE.

~Oftentimes, in the answer choices, ***I'll underline the key element(s)*** that you are evaluating.

Example answer option:

"...a. The predominant muscle group acting at the knee joint at time at 10 s. is the hamstrings."

The underlined word, "hamstrings," tells you that you're trying to determine if it is true that the hamstrings muscle group is the correct answer to the question, "the predominant muscle group is \_\_\_\_\_."

**g) BONUS PTS!!** If you've read all of the above, you deserve to know about bonus pts on tests!

How to get them during a test: \*be first to find an error of content, and/or \*answer the bonus question(s) at end of test.

\*First test: will give extra 2% (not pts, %!) if I can recall your name *when you turn in your test to me*.

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## QUIZZES:

a) **how often:** No more than 1/ every other week.

No quiz will be given during the week of a test or when a sizeable assignment is due.

b) **length:** Approximately 10 min. Most often at beginning of class; sometimes at end of class.

c) **material on quizzes:** Course outline topics covered/assigned since last quiz/test AND simple knowledge of that day's lecture topic.

d) **what resources you CAN use:** your notes, including whatever information you write in your notes, handouts given in class or downloaded from WebCT that are part of a lecture.

e) **resources NOT usable:** text, lab manual, any form of material from other people's efforts.

f) **format:** Mostly multiple choice, true/false; some short answer questions, completing diagrams.

g) **NO makeups are given.** The lowest quiz/assignment grade will be dropped; hence if you need to miss one quiz, it will not hurt your grade. (Note. Sometimes opportunities to win a free quiz pass come up, too).

h) **For some quizzes,** you may be given the choice of working with a partner (that means NO MORE THAN 2 PEOPLE) or alone.

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## ASSIGNMENTS:

**Practice, practice, practice the concepts,** and you'll do great in the course (and not need to cram the night before a test => recipe for failure). That's the purpose of the assignments.

a) **Several assignments** will be completed- some in class, others outside of class.

b) **Check announcements** on WebCT for assignment information; **check your grades** on WebCT *often* for accuracy.

c) **Values of assignments:** All assignments/quizzes are listed in percentages. As some assignments require more/less work, assignments and quizzes are weighted. A simple assignment has a weight of 1. A quiz generally has a weight of 3. More intellectually rigorous assignments are weighted more (e.g., maybe a weight of 3, therefore worth 3 times the points of a simple assignment) and evaluated more stringently.


**d) Late assignments** - accepted only under extreme circumstances. The score is reduced by 10%, 20% and 30% of grade if turned in late on same day as due date, one day, and two days, respectively. Nothing will be accepted after two days (Sat. & Sun. also are considered days). Turn late assignments in to my mailbox.

**e) Assignments** that are not done in class or submitted via WebCT must be typed (figures can be hand drawn), stapled, contain full name(s) of participant(s), and contain the name of the assignment.

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## EXTRA CREDIT

**Up to 2% extra credit** added to your grand total (as expressed in percent) may be obtained through a variety of opportunities, including ideas of your own that are related to biomechanics or professional growth in exercise science.



[Extra  
credit  
information  
& form](#)