BME 271 Assignment: Biomechanics of Movement
http://rrg.utk.edu/resources/BME271

Objective of Assignment

This assignment will give you a chance to deepen your knowledge in an area of biomechanics that interests you. We expect that you will remember what you learn from writing this paper long after the class is over. This assignment will get you into the literature where you can see for yourself the results of biomechanics research. This paper may also serve as a springboard for your future independent studies or research projects. The assignment will help hone your critical reading and writing skills, which are helpful in many endeavors. This will also give you some team project experience.

Overview of Assignment

Survey the literature on a specific topic in the field of movement biomechanics. Describe the current state-of-the-art and suggest areas that require further research. Then briefly describe how you would investigate a specific problem yourself.

Some general areas from which you can choose a topic include: sports biomechanics, measurement of muscle strength, development of muscle strength, motion and gait analysis, dynamic simulations of movement, biomechanics of surgical reconstructions, functional neuromuscular stimulation, joint biomechanics, electromyography, muscle biology and mechanics, muscle models, muscle injury, motion analysis equipment and techniques, animal locomotion, neural control of movement, robotics, computer-assisted surgery, medical imaging, biomedical computation and visualization, computer animation, digital creatures, evolution of gait, or other areas related to biomechanics of movement. From these general areas you should choose a specific topic to investigate. Some topics and titles are listed below.

Example Topics and Titles

Gait analysis for surgical planning: benefits and limitations
The influence of energy storing prosthetic feet on knee motion in below knee amputee walking
The variation of muscle physiologic cross-sectional areas with aging
Optimization techniques for calculating muscle forces
Strength of muscles crossing the shoulder and elbow
Surgical planning using medical imaging
The role of muscles in providing joint stability
Robots that walk and hop
Quantification of spasticity
Effects of bone lengthening on muscle
Three-dimensional models of muscle
Computer-assisted surgery
Adaptation of muscle with immobilization
Computer-assisted design of functional neuromuscular stimulation systems
The influence of dynamic coupling on motor planning in the upper limb
Animation of body motion: from biomechanics to entertainment
Biomechanics of bicycling: the role of two-joint muscles
Effects of bone deformities on muscle moment arms
Robot-assisted surgery knee surgery
Muscle-tendon adaptation with immobilization
Scaling in musculoskeletal structures
In vivo imaging of joint kinematics
Molecular motors: the engines of life
Wrist joint replacements: successes and failures
Muscle strength and its development
Force-feedback devices: why fool the CNS?

Format of the Paper

The written paper should include the following sections:

1. TITLE

2. INTRODUCTION & BACKGROUND
   Briefly describe your topic and why it is important. Relate the anatomical, biological, clinical, or business framework of your topic.

3. PREVIOUS INVESTIGATIONS
   List several sources that relate to your topic. For each paper try to state:

a. Goal(s) of the previous paper
b. How it relates to your topic
c. Major conclusions
d. Major shortcomings
e. The next step in this research

Do not simply review a number of individual papers, but try to synthesize what has been done. This section should be in a form such that the current state-of-the-art is easily appreciated. State the shortcomings in our current knowledge, and suggest areas that require further research.

4. PROPOSED RESEARCH

From areas suggested at the end of the previous section, state concisely and specifically a particular problem that you propose to address. In broad terms, describe how you might investigate this problem with experiments, computer simulations, or both. Point out the difficulties that you may expect to encounter in this research. State what you believe will be the significance of your proposed research. Provide a realistic timetable for the completion of the work.

5. REFERENCES

Your paper should be referenced using primarily journal articles. References and reference citations should conform to the style of the *Journal of Biomechanics.* The following sources may be useful:

Index Medicus	*J. of Orthopaedic Research*	*IEEE Trans. on Biomedical Eng.*
PubMed	*Science Citation Index*	*Clinical Orthopaedics and Related Research*
Google Scholar	*Medical Eng. & Physics*	*J. of Bone and Joint Surgery*
J. of Physiology	*J. of Biomechanical Eng*	*J. of Biomedical Material Research*
J. of Biomechanics	*Biological Cybernetics*	…… and many others

Your outline is due to Mrs. Lyndsay Bowers (311 Perkins) AND electronically to Dr. Jeff Reinbolt (reinbolt@utk.edu) on Wednesday, October 10, 2012 by 4 pm.