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

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<tr>
<th>Gait analysis for surgical planning: benefits and limitations</th>
<th>Computer-assisted design of functional neuromuscular stimulation systems</th>
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<td>The influence of energy storing prosthetic feet on knee motion in below knee amputee walking</td>
<td>The influence of dynamic coupling on motor planning in the upper limb</td>
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<td>The variation of muscle physiologic cross-sectional areas with aging</td>
<td>Animation of body motion: from biomechanics to entertainment</td>
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<td>Optimization techniques for calculating muscle forces</td>
<td>Biomechanics of bicycling: the role of two-joint muscles</td>
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<td>Strength of muscles crossing the shoulder and elbow</td>
<td>Effects of bone deformities on muscle moment arms</td>
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<td>Surgical planning using medical imaging</td>
<td>Robot-assisted surgery knee surgery</td>
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<td>The role of muscles in providing joint stability</td>
<td>Muscle-tendon adaptation with immobilization</td>
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<td>Robots that walk and hop</td>
<td>Scaling in musculoskeletal structures</td>
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<td>Quantification of spasticity</td>
<td>In vivo imaging of joint kinematics</td>
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<td>Effects of bone lengthening on muscle</td>
<td>Molecular motors: the engines of life</td>
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<td>Three-dimensional models of muscle</td>
<td>Wrist joint replacements: successes and failures</td>
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<td>Computer-assisted surgery</td>
<td>Muscle strength and its development</td>
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<td>Adaptation of muscle with immobilization</td>
<td>Force-feedback devices: why fool the CNS?</td>
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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:
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
- PubMed
- Science Citation Index
- Google Scholar
- Medical Eng. & Physics
- J. of Physiology
- J. of Biomechanical Eng
- J. of Biomechanics
- Biological Cybernetics
- IEEE Trans. on Biomedical Eng.
- Clinical Orthopaedics and Related Research
- J. of Bone and Joint Surgery
- J. of Biomedical Material Research
- …… 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.**