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Office Hours: By Appointment  
Location & Time: MAC 223, Wednesday 5:00 – 9:50 PM  

Course Description: Application of Newtonian mechanics to human movement analysis. Biomechanical models using three-dimensional video and force plate data will be used to analyze human movement.  


Objectives of the Course:  
The student should be able to:  
1. Demonstrate knowledge of research techniques in force plate analysis by collecting, analyzing and writing a paper on force plate data collection and answering questions pertaining to force plate techniques on a written exam.  
2. Demonstrate knowledge of research techniques in video analysis by collecting, analyzing and writing a paper on video data collection and answering questions pertaining to video techniques on a written exam.  
3. Demonstrate knowledge of research techniques in isokinetic force analysis by collecting, analyzing and writing a paper on isokinetic force data collection and answering questions pertaining to isokinetic force techniques on a written exam.  
4. Demonstrate knowledge of inverse dynamics by computing joint reaction forces and muscle moments.  
5. Demonstrate knowledge of research techniques in EMG force and EMG fatigue relationships by collecting, analyzing and writing a paper on EMG force/fatigue.  

Course Content:  
Selected Readings on the following topics:  
Smoothing and filtering of biomechanical data  
Ground reaction forces in running  
Vertical jump ground reaction forces  
Postural Control using force plate  
Electromyographic data collection and analysis  
Video data collection methods  
Isokinetic data collection and analysis  
Power and work dynamometers
Use of goniometers, accelerometers and force transducers

Grading:

Grades in this course will be based on the following percentages:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Midterm</td>
<td>40%</td>
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<tr>
<td>Research Presentation</td>
<td>10%</td>
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<tr>
<td>Research Paper</td>
<td>30%</td>
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<tr>
<td>Date</td>
<td>Task</td>
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</tbody>
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| 1-15  | Analog – Digital Conversion  
Laboratory Device Introduction  
Collect Pezzack similar data.  
Create a Matlab function to compute derivatives and plot position, velocity & acceleration. |
| 1-22  | Chapter 1  
Wood, and Pezzack PDFs  
Analyze position, velocity & acceleration of our Pezzack data.  
Cavanagh: Ground reaction forces  
Munro: Ground reaction force  
Wood Smoothing & Filtering  
Pezzack Data |
| 1-29  | Read Chapter 3, Anthropometrics  
Read pages 92 – 102, Cavanagh PDF, Munro PDF  
Introduction to Force Plate Methods  
AMTI Force Plate |
| 2-5   | Read Chapter 5  
Link Segment Model Introduction  
2D Video Data Collection Techniques: Capture Volume & Camera Calibration.  
Vertical Jump Data Collection in 2D |
| 2-12  | Chapter 5  
Link Segment Model II  
Interpretation of Joint Moments  
Link Segment and Biodex Torque |
| 2-19  | Chapter 2 and 7  
3D Video Data Collection Techniques: Model Selection & Marker Tracking |
| 2-26  | Chapter 2 and 7  
3D Video Data Collection Techniques: Model Selection & Marker Tracking |
| 3-5   | Data Analysis using Visual 3D |
| 3-9 to 3-15 | SPRING BREAK |
| 3-19  | Read Chapter 8  
EMG Methods Deluca, Merletti  
EMG – Force/Fatigue Relationships |
| 3-26  | Biodex Data Collection & Analysis, Read p 104-108  
Torque-Angular Velocity (Force – Velocity)  
Torque – Angle (Force – Length) |
| 4-2   | Mid Term Exam |
| 4-9   | Research Project Data Collection |
| 4-16  | Research Project Data Collection |
| 4-23  | Research Project Data Analysis |
| 4-30  | Research Presentations |
| 5-3   | Research Paper Due |
Selected Readings


