KINE 5350 Applied Biomechanics Syllabus

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Course Website: [http://wweb.uta.edu/faculty/ricard/Classes/KINE-5350/KINE-5350.html](http://wweb.uta.edu/faculty/ricard/Classes/KINE-5350/KINE-5350.html)

Office Hours:  By Appointment
Location & Time: MAC 213, Thursday  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 on a written exam.
5. Demonstrate knowledge of research techniques in EMG force and EMG fatigue relationships by collecting, analyzing and writing a paper on EMG force/fatigue and answering questions on EMG on a written exam.

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 NeuroCom and force plate
- Electromyographic data collection and analysis
- Video data collection methods
- Isokinetic data collection and analysis
Power and work dynanometers
Use of goniometers, accelerometers and force transducers

Grading:

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

- Mid-Term Exam: 50%
- Final Exam: 50%

| <--- | Tentative Course Schedule | ---< |
| 1-19 | Computing Derivatives & Integrals in Excel  
Analog – Digital Conversion  
Introduction to Force Plate  
AMTI Force Plate  
Enoka Chapter 1 |
| 1-26 | Cavanagh: Ground reaction forces  
Munro: Ground reaction force  
Enoka Chapter 2 |
| 2-2 | Link Segment Model Introduction  
2D Video Data Collection Techniques: Capture Volume & Camera Calibration  
Vertical Jump Data Collection in 2D  
Enoka Chapter 3 |
| 2-9 | Link Segment Model II  
Interpretation of Joint Moments  
Link Segment and Biodex Torque  
3D Video Data Collection Techniques: Model Selection & Marker Tracking  
Enoka Chapter 4 |
| 2-16 | Vaughan: Dynamics of Human Gait  
Walking Data collection |
| 2-23 | Biodex Data Collection & Analysis  
Torque-Angular Velocity (Force – Velocity)  
Torque – Angle (Force – Length) |
| 3-1 | Mid-Term Examination |
| 3-8 | Introduction to EMG  
DeLuca: The use of surface EMG  
Merletti: Surface EMG  
Enoka Chapter 5 |
| 3-10 to 3-18 | SPRING BREAK |
| 3-22 | Enoka Chapter 6: Muscle and Motor Units  
EMG Fatigue |
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<thead>
<tr>
<th>3-29</th>
<th>Lay: The effects of sloped surfaces. EMG Force</th>
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<tbody>
<tr>
<td>4-5</td>
<td>Enoka Chapter 7: Voluntary Movement</td>
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<tr>
<td>4-12</td>
<td>Hasan: Effect of loss of balance on biomechanics platform measures of sway. EMG Reflex using NeuroCom</td>
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<td>4-19</td>
<td>Enoka Chapter 8: Acute Adaptations</td>
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<td>4-26</td>
<td>Enoka Chapter 9: Chronic Adaptations</td>
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<td>5-3</td>
<td>Review for Final Exam</td>
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<td>5-10</td>
<td>Final Examination</td>
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Selected Readings


