BIOMECHANICAL ANALYSIS TECHNIQUES

Fall 2015
KIN 575 (18368)  M 16:00-17:45 &  Location: CR5209 KIN575L (18369)  W 16:00-17:45  RE276 & RE174

Instructor: Konstantinos “Dino” Vrongistinos, Ph.D.  
Office: KN281  
Office Hours: M 2:00-3:00, & by appointment  
e-mail: kv61497@csun.edu  
Phone: (818)-677-7567  
http://www.csun.edu/~kv61497

Required Text:  
Notes, Moodle material and reading assignments  
Reference books  
Biomechanics and Motor Control of Human Movement by David A. Winter ISBN 047144989X

Course Prerequisites:  
KIN 345 and/or instructor’s consent

Course Description:  
Biomechanical analysis techniques for collecting and analyzing quantitative human movement data from high-speed film, video, dynamography and electromyography. Course include two and three dimensional analysis, data-smoothing methodologies.

Course Objectives:  
To provide students with the knowledge and skills to be able to:
1. Apply mechanical laws and principles of applied mechanics to anatomical structures
2. Describe how musculoskeletal structures influence human movement
3. Apply kinematics & kinetics descriptors and measures to human movements
4. Calculate two-dimensional and three-dimensional kinematics
5. Analyze the biomechanical correlates of specific skills and techniques
6. Analyze selected injury and performance mechanisms
7. Utilize vector algebra, and Newtonian mechanics to solve problems relating to human movement.
8. Utilize forward and inverse dynamics in two and three dimensions
9. Analyze biological signals during human movement
10. Apply biomechanical principles to the daily activities of normal and special populations, including individuals with disabilities, throughout the lifespan.
11. Write a paper reviewing current biomechanics literature on a selected topic.
12. Learn the basics of Biomechanical Instrumentation
13. Collect data on a group-project related to Biomechanics
14. Make a group presentation to the class on a topic of current interest in biomechanics.
15. Learn to program with a matrix scripting language like Matlab.

Evaluation:  
Course grades will be based on the following point distribution

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Projects-Reports Homework</td>
<td>200 pts</td>
<td>20%</td>
</tr>
<tr>
<td>Term Group Paper/Project Presentation</td>
<td>200 pts</td>
<td>20% (10%+10%)</td>
</tr>
<tr>
<td>Midterm Exam + Quizzes</td>
<td>300 pts</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam + Quizzes</td>
<td>300 pts</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>1000 pts</td>
<td>100%</td>
</tr>
</tbody>
</table>

The same grade is assigned for both the lecture (575) and the lab (575L)

Assignment of grades will be based on the following ranges:
A = 900-1000 pts;  B = 800-899 pts;  C = 700-799 pts;  D = 600-699 pts;  F = less than 600 pts.
Assignment of plus/minus grade adjustments to the above scale will be determined by the final class point distribution.
Examination Policies & Miscellaneous Information
1. Students will not be allowed to leave the room during exams. Please attend to any personal needs before the exam.
2. Make-up exams will be considered only under exceptional circumstances.
   (Note: "I overslept", "I'm tired", "I'm not prepared", etc. are not exceptional circumstances!) Any student who fails to contact the instructor prior to any missed exam may not be allowed to makeup the exam.
3. Absence for medical reasons requires written verification by a physician.
4. Exams will not be rescheduled based on a student’s personal work/school schedule. Please plan ahead.
5. Questions/concerns regarding grading for any exam must be resolved with the instructor within one week of the date graded exams are returned to the student.
6. All exams are non-circulating.
Each student is expected to be familiar with, and abide by, the conditions of student conduct, as presented in the CSUN Catalog (Appendix C), with emphasis on sections: Student Conduct Code, Academic Dishonesty, Faculty Policy on Academic Dishonesty, and Penalties. Any student engaging in academic dishonesty (e.g., cheating, fabrication, facilitating academic dishonesty, plagiarism) is subject to discipline, which may include a failing grade in the course, and may also be subject to more severe discipline by the University.
A. Time Elements Class begins promptly on the hour
B. Behavior Treat other students and the instructor with respect and civility. Free discussion, inquiry, and expression is encouraged in this class. Classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of students to benefit from the instruction is not acceptable. Examples may include routinely entering class late or departing early; use of beepers, cellular phones, or other electronic devices; repeatedly talking in class without being recognized; talking while others are speaking; or arguing in a way that is perceived as “crossing the civility line.” Eating food or chewing ice during lecture or discussion time is unacceptable.
C. Cheating will not be tolerated. Severe penalties will be imposed including an F on the exam, and potentially an F in the course, and may also be subject to more severe discipline by the University. Please review the Student Conduct on Academic Dishonesty in the current Schedule of Classes and in the University Catalog.
D. Assignments turned in one day late will receive 50% credit. After one day, no credit will be given.

Note: Students with exceptional needs: This instructor, in conjunction with California State University Northridge, is committed to upholding and maintaining all aspects of the federal Americans with Disabilities Act (ADA) of 1990 and Section 504 of the Rehabilitation Act of 1973. If you are a student with a disability and wish to request accommodations, please contact the Disability Resources and Educational Services located in Student Services Building BH 110, or call (818) 677-2684 for an appointment. http://www.csun.edu/dres/index.php, dres@csun.edu, Phone: (818) 677-2684, Fax: (818) 677-4932.
Any information regarding your disability will remain confidential. Because many accommodations require early planning, requests for accommodation should be made as early as possible. Any requests for accommodations will be reviewed in a timely manner to determine their appropriateness for this class.

Links www.csun.edu/~kv61497 moodle.csun.edu www.csun.edu/hhd www.csun.edu/hhd/kin www.csun.edu/webmail
Attention: Last day to drop is Friday of the 3rd week of classes

Reading Assignments

Please Note:
The reading assignments listed below are intended to supplement the lecture materials. Some of the material in the text will not be covered in lecture but may be included on the exams. By the same token, all of the information given in lecture will not be found in the text, but may also be included on the exams. Students are expected to have read the assigned sections in the text before the scheduled lectures to which they apply. (Reading assignment schedule subject to change with appropriate notice).

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Terminology - Project Designs/Examples</td>
</tr>
<tr>
<td>2</td>
<td>Data Acquisition – Data Smoothing  Introduction to Videography</td>
</tr>
<tr>
<td>3</td>
<td>Introduction to Matlab/Freemat  Analyzing Biological Signals</td>
</tr>
<tr>
<td>4</td>
<td>Videography Analyzing two-dimensional data</td>
</tr>
<tr>
<td>5</td>
<td>Transducers and Force Plates</td>
</tr>
<tr>
<td>6</td>
<td>Two-dimensional Kinetics, Catch-up</td>
</tr>
<tr>
<td>7</td>
<td>Inverse dynamics – Forward Dynamics</td>
</tr>
<tr>
<td>8</td>
<td>Midterm Test  EMG Data Collection</td>
</tr>
<tr>
<td>9</td>
<td>Intro analyzing three-dimensional data</td>
</tr>
<tr>
<td>10</td>
<td>Three-Dimensional Kinetics</td>
</tr>
<tr>
<td>11</td>
<td>Special Topics (e.g. Wheelchair Propulsion / Vibrations)</td>
</tr>
<tr>
<td>12</td>
<td>Dynamic Theory Approaches in Biomechanics</td>
</tr>
<tr>
<td>13</td>
<td>Catch-up Day</td>
</tr>
<tr>
<td>14</td>
<td>Group Presentations</td>
</tr>
<tr>
<td>15</td>
<td>Group Presentations</td>
</tr>
<tr>
<td>Final</td>
<td>(Lecture) 12/14/2015, Monday 5:30PM - 7:30PM Chaparral Hall 5209</td>
</tr>
</tbody>
</table>

Schedule is tentative and subject to changes