Department of Biomedical Engineering

BME 671
Biomechanics of Human Movement

Fall 2012

Course Syllabus

Instructor
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Office Hours: Monday 3:00-4:30 PM. Sign-up sheet on office door. Other times by appointment

Textbooks
Research Methods in Biomechanics, Robertson, et. Al.
Dynamics of Human Gait 2nd Edition, Christopher Vaughn, Brian Davis, and Jeremy O'Connor (download from **http://www.kiboho.co.za/GaitCD/gaitbook.htm**)

Other Information
Please check the website of the International Society of Biomechanics,
http://www.isbweb.org for announcements of conferences, software, employment and internships. Also check the website of the American Society for Biomechanics at
http://asb-biomech.org/

MATLAB and Simulink will be used extensively in this course. This software may be downloaded at no cost from the NJIT Website. A number of online tutorials are available. An excellent reference is Mastering MATLAB 7 by Hanselman et. al

Course Requirements:
Homework- assignments may be done collaboratively --10%
Exam 1   --30%   (open book, open notes)
Exam 2   --30%   (open book, open notes)
Final   --30%   (open book, open notes)

Homework will be submitted via Moodle
Questions may be emailed. Please include **BME 671** in the subject

Exams will require completion and understanding of all homework assignments.
Some handouts, assignments and sample data will sent via email and Moodle to the addresses contained in NJIT's list of registered students. Unfortunately, no substitute address can be used.

Honor Code

The NJIT Honor Code will be strictly enforced. Any violation will be reported to the Dean of Students for resolution.

Course Schedule

9/6	Biomechanics of human movement	Articles on Oscar Pistorius	MATLAB
9/10	Models, data and instrumentation	R Ch.1 Vaughn Ch. 3	HW 1
9/13	Filtering and processing of kinematic data	R Ch 11 Handout	HW 2
9/17	Numerical computation of velocity and acceleration	R Ch 1	HW 3
9/20	Anthropometry	R Ch 3 Handout	HW 4
9/24	Data collection and experiment	Handout (data collection in class)	HW 5
9/26	Human Gait	Vaughn Ch 2	HW6
10/1	Kinetics-ground force reactions and joint moments	R Ch 4 &5 Vaughn Ch 3	HW6.3
10/4	Kinetics-continued		HW6.7
10/8	**Exam 1**		
10/11	Demonstration of gait instrumentation	Handout (small group work to be scheduled)	
10/15	Forward Modeling-Newtonian Solutions	Handout	HW 6
10/18	Forward Modeling-Newtonian Solutions		HW 7
10/22	Forward Modeling- Parameter optimization		HW 7.5
10/25	Lagrangian Solution of equations of motion	R Ch 10 & appendix G Handout	
10/29	Simulation of Multi-degree of Freedom Systems	Appendix G	HW 8
11./1	Mechanical work, energy and power	R Ch 6	HW 9
11/3	Mechanical work, energy and power		
11/8	3D Biomechanics	R Ch 2 & 7	
1112	**Exam 2**		
11/15	Muscle Mechanics and EMG	Handout Vaughn Ch. 4	HW 10
11/19	Muscle Mechanics and EMG	Handout	
11/20	Muscle modeling (SIMM)	Handout	
11 /26	Posture and balance	Handout	HW 11
11 /29	Posture and balance	Handout	
12/3	Ambulation of Humans and Animals	Vaughn Ch. 2	HW12
12/6	Clinical and pathological movement analysis	Handout	HW13
12/10	Clinical and pathological movement analysis	Handout	

Changes in Schedule will be made only with the approval of the class.

Course Software

This course requires the use of MATLAB and Simulink. Homework assignments will be structured so that each produces functions that will comprise a new, personal MATLAB toolbox for biomechanics that can be used in later assignments.

Both MATLAB and Simulink can be downloaded from NJIT's website at no cost for registered students http://ist.njit.edu/software/download.php . During installation, MATLAB and Simulink, as well as the signal processing, optimization, Simulink 3D Animation and data acquisition toolboxes should be selected. For those who are unfamiliar with MATLAB, an excellent book is available in the NJIT bookstore. Mastering MATLAB 7 Duane C. Hanselman, Bruce L. Littlefield can be found in the bookstore under BME 675. Optional tutorials will be offered if needed. MATLAB 2012a 32-bit version is known to be compatible. Use the 64-bit version at your own risk. If you downloaded MATLAB 2011a or 2011b from NJIT last academic year, it will suffice for this course. You should follow the directions on the above URL to renew your license.