

# BE 597: Research Methods in Biomechanics

Applied Biology & Biomedical Engineering  
**Rose-Hulman Institute of Technology**  
Winter Quarter 2005-2006 Course Info & Syllabus

## **INSTRUCTORS**

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## **OFFICE HOURS**

'Official Hours': MTRF 3<sup>rd</sup>  
Walk-ins welcome!  
Call or e-mail for an appointment

## **COURSE DESCRIPTION:**

This course will focus on the wide range of research methods used in the field of biomechanics. Current literature will be reviewed to analyze the advantages and disadvantages of various research methodologies. Topics will vary based on student interests, but may include topics such as motion/force analysis, soft tissue and bone mechanics, joint biomechanics, analysis of joint replacements, and fracture fixation. Laboratory activities will reinforce the lecture topics and students will have the opportunity to investigate a biomechanics research topic in their area of interest.

## **COURSE OBJECTIVES:**

Upon successful completion of this course, students will be able to:

- *Evaluate* the scope and practice of the field of musculoskeletal biomechanics, both past and present
- *Evaluate* the basic experimental and computational tools used in musculoskeletal biomechanics research
- *Identify* and *select* appropriate tools for specific biomechanics applications
- *Apply* state-of-the-art musculoskeletal biomechanics research techniques toward real-world scenarios
- *Demonstrate* proficiency in *designing* and *conducting* a musculoskeletal biomechanics research project incorporating the above objectives.
- *Compile* experimental results into a coherent form suitable for presentation in the form of a written paper.
- Assess experimental results for reliability and integrity based on evidence presented in accompanying literature.

## **LECTURE/LAB LOCATION AND TIMES**

*Lecture:* MTR 11:45 – 12:35 in O105

*Lab:* Friday 10:50 – 1:30 in M203

## **TEXTBOOK**

Robertson, D.G. (2004). *Research Methods in Biomechanics* (1<sup>st</sup> ed). Human Kinetics.

## **ATTENDANCE**

Students are expected to attend every class and laboratory. Students who miss more than three classes without a valid excuse provided within one week of each absence will receive a reduced grade for the course.

## **VALID EXCUSES**

Students who fail to complete an assignment and who provide a valid excuse may arrange to complete the assignment/project at a later date. A valid excuse consists of written communication from the Dean of Students on institutional letterhead. Plant trips, job and graduate/professional school interviews, attending scientific conferences and Institute-sponsored activities are also valid excuses provided that the student notifies us in writing and at least one week in advance of the event. Illness and other unexpected circumstances are also considered valid excuses with a confirming memo from the Dean of Students.

## **HOMEWORK & READING ASSIGNMENTS**

Homework will be assigned during the class period. The assignments will be due at the start of the class when the homework is due. All homework should be done in a neat and professional manner, i.e. using straight-edges, computer generated graphs, etc.

When assigned, reading assignments should be completed prior to class.

## **ACADEMIC INTEGRITY**

Rose-Hulman Institute of Technology values its reputation for moral leadership as much as its reputation for academic excellence and expects all persons associated with it to maintain this reputation. The Institute's Code of Ethics is simple and direct: Rose-Hulman expects its students to be responsible adults and to behave at all times with honor and integrity.

All students are expected to abide by this Code and to aid in its enforcement by reporting violations of it.

## **ACADEMIC ACCOMMODATIONS**

I understand that "invisible" disabilities (learning and attention deficit disorders, chronic fatigue syndrome, clinical depression, etc.) can significantly affect a student's academic performance. I strongly encourage students to document special academic needs with staff at the Office of Student Affairs, and then to contact me as soon as possible so that we can work together to provide recommended academic accommodations while protecting your privacy.

## **GRADING**

Homework/Quizzes/Misc.	15%
Labs	20%
Written Final Project	25%
Oral Project Presentation	5%
Exams	<u>35%</u>
	100%

**ELECTRONIC DEVICES AND OTHER THINGS THAT GO BEEP:**

I am aware that many of us would like to 'be connected' to the outside world at all times, however, please turn any and all devices off so that they don't "beep", "ring", "sing", or "scream" in class.

**THE FINE PRINT:**

The instructor reserves the right to alter course content, calendar, policies, etc. outlined in this syllabus, subject to extenuating circumstances. Updates to the course schedule will be provided as needed.

**TENTATIVE COURSE CALENDAR: ( SOME CHANGES ARE LIKELY TO OCCUR)**

Week	Date	Topic	Reading	Assignment
1	Nov 28	Course Admin & Intro Material		
	Nov 29	Planar Kinematics	Chapter 1	
	Dec 1	Planar Kinematics		
	Dec 2	Lab #1		
2	Dec 5	3-D Kinematics	Chapter 2	Quiz #1
	Dec 6	3-D Kinematics		
	Dec 8	3-D Kinematics		
	Dec 9	Lab #2		
3	Dec 12	Body Segment Parameters	Chapter 3	Quiz #2
	Dec 13	Anthropometry		
	Dec 15	Forces	Chapter 4	
	Dec 16	Lab #3		
4	Dec 19	Forces		Quiz #3
	Dec 20	Forces		
	Jan 5	Forces		
	Jan 6	Lab #4		
5	Jan 9	<b>Exam #1</b>		
	Jan 10	2-D Inverse Dynamics	Chapter 5	
	Jan 12	3-D Inverse Dynamics	Handouts	
	Jan 13	Lab #5		
6	Jan 16	Energy, Work, and Power	Chapter 6	Quiz #4
	Jan 17	Energy, Work, and Power		
	Jan 19	Energy, Work, and Power		
	Jan 20	Lab #6		
7	Jan 23	3-D Kinetics	Chapter 7	Quiz #5
	Jan 24	3-D Kinetics		
	Jan 26	3-D Kinetics		
	Jan 27	Lab #7 – Project Time!		
8	Jan 30	EMG	Chapter 8	Quiz #6
	Jan 31	EMG		
	Feb 2	Muscle Modeling	Chapter 9	
	Feb 3	Lab #8 – Project Time!		
9	Feb 6	<b>Exam #2</b>		
	Feb 7	Computational Modeling	Handouts	
	Feb 9	Computational Modeling		
	Feb 10	Lab #9 – Project Time!		
10	Feb 13	Special Topics	Articles	Quiz #7
	Feb 14	Special Topics	Articles	
	Feb 16	Special Topics	Articles	
	Feb 17	Presentations		
	TBD	Final Exam		