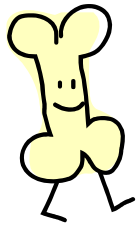


# BE 597: Orthopaedic Biomechanics



**Applied Biology & Biomedical Engineering**  
**Rose-Hulman Institute of Technology**  
**Winter Quarter 2004 Syllabus**



## *INSTRUCTOR*

Renee Rogge, Ph.D.  
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## *OFFICE HOURS*

'Official Hours': MTRF 7<sup>th</sup> hour  
  
Walk-ins welcome!  
Call or e-mail for an appointment

## *COURSE DESCRIPTION AND GOALS:*

This course addresses the mechanics of the human musculoskeletal system with emphasis on the unique biological criteria involved in biomechanical engineering design. Specific topics include musculoskeletal anatomy; composition and mechanical behavior of orthopaedic tissues (bone, cartilage, tendon, ligament, and muscle); design/analysis of artificial joint and fracture fixation prostheses; the biomechanical effects of implants on the musculoskeletal system; and analysis of forces in biological structures under complex static and/or dynamic loading.

## *COURSE OBJECTIVES:*

After completing this course students will be able to:

1. Identify functional anatomy of the human body and apply appropriate anatomical terminology.
2. Apply the principles of statics, dynamics, and mechanics to the human body, i.e. joints, muscles, bones, etc.
3. Explain the physical and mechanical properties of bones, muscles, tendons, etc.
4. Identify the failure mechanisms of biological material.
5. Apply the principles of design needed for the development and testing of implants.
6. Conduct a basic finite element analysis of a structure, including pre-processing and post-processing.
7. Understand the ethical obligations and the need for lifelong learning of the biomedical engineer as related to design issues
8. Perform a critical review of a current research article in biomechanics and assess the validity/appropriateness of the techniques employed.

*LECTURE LOCATION AND TIMES*

MTRF 8<sup>th</sup> hour, Room B108

*COURSE PRE-REQUISITES*

EM 120 (Engineering Statics) & Junior Standing

*TEXTBOOKS*

GL Lucas: A Primer of Biomechanics. Springer-Verlag, NY, 1999. ISBN: 0-387-98456-9

JH Dirckx: Stedman's Concise Medical Dictionary for the Health Professions. Lippincott, Williams & Wilkins, NY, 2001. ISBN: 0-7817-3012-0 (recommended)

*HOMEWORK*

Homework will be assigned during the class period. The assignment 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, one problem per page, etc. when appropriate.

*EXAMS & QUIZZES*

- There will be three exams given during the normal class period. Each exam will be closed book and closed notes.
- Unannounced or announced quizzes may be given. They will cover reading assignments or previous lecture information.

*GRADING*

Homework	20%
Quizzes	10%
Exams(3)	30%
Final Exam	20%
Journal Article Critique	10%
Labs	<u>10%</u>
	100%

**TENTATIVE COURSE CALENDAR: (CHANGES MAY OCCUR)**

<b>Date</b>	<b>Topic</b>	<b>Assignment</b>
Nov 29	Introduction ( <i>or, why we love Biomechanics!</i> )	
Nov 30	Terminology + Skeletal Anatomy	
Dec 2	Anthropometry	
Dec 3	---	Article Discussion
Dec 6	Bone	
Dec 7	More Bone	
Dec 9	Guess what? Even More Bone!	
Dec 10	---	Article Discussion – Team 1
Dec 13	Cartilage	
Dec 14	More Cartilage	
Dec 16	Tendons & Ligaments	
Dec 17	---	Article Discussion – Team 2
Jan 3	Tendons & Ligaments	
Jan 4	Muscles	
Jan 6	Joints	
Jan 7	---	Exam #1
Jan 10	Statics & Biomechanics	
Jan 11	Statics & Biomechanics	
Jan 13	Kinematics	
Jan 14	---	Article Discussion – Team 3
Jan 17	Kinematics	
Jan 18	Motion Analysis	
Jan 20	Motion Analysis	
Jan 21	---	Article Discussion – Team 4
Jan 24	Fractures	
Jan 25	Fracture Fixation	
Jan 27	Arthroplasty	
Jan 28	---	Article Discussion – Team 5
Jan 31	Arthroplasty	
Feb 1	Finite Element Techniques	
Feb 3	Finite Element Techniques	
Feb 4	---	Exam #2
Feb 7	Knee Biomechanics	
Feb 8	Knee Biomechanics	
Feb 10	Wrist Biomechanics	
Feb 11	---	Article Discussion – Team 6
Feb 14	Wrist Biomechanics	
Feb 15	Spine Biomechanics	
Feb 17	Spine Biomechanics	
Feb 18	---	Article Discussion – Team 7
<b>Final Exam</b>	<b>TBD</b>	

Team 1:

Kristen Bailey  
Aaron Baldauff  
Megan Whitaker  
Bryan Woodard

Team 5:

Timothy Zier  
Michael Morschauser  
Laura Telezyn  
Cristy Cvetan

Team 2:

Neil Harrison  
David Breiding  
Bernadette Brown-Clerk  
Sarah Jorgensen

Team 6:

Thomas Drochner  
Joshua Haarer  
Kara Jackson  
Adam Haste

Team 3:

William Mansard  
James Merk  
Rachel Logan  
Kiley Wallace

Team 7:

Benjamin Leonard  
Andrew Shold  
Joshua Markham  
Laura Krause

Team 4:

Michelle Witt  
Christopher Meyer  
Gregory Lyons  
Jonathon Fruchte