ROSE-HULMAN INSTITUTE OF TECHNOLOGY
Department of Applied Biology and Biomedical Engineering
BE 200 – Introduction to Biomedical Engineering
Spring 2005

INSTRUCTOR

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LECTURE LOCATION AND TIMES

Section 1
Lecture: MTR, 3rd in O105
Lab: F, 1st - 3rd in M203

Section 2
Lecture: MTR, 4th in O105
Lab: W, 4th – 6th in M203

COURSE DESCRIPTION

This course surveys the three tracks available in Biomedical Engineering at RHIT: bioinstrumentation, biomaterials, and biomechanics. Laboratory work involves the solution of open-ended problems by student teams.

ATTENDANCE

The cumulative nature, complexity, and fast pace of the courses at Rose-Hulman make regular classroom attendance a necessity. There are also important benefits to be gained from entering into classroom discussion, learning to express one's own ideas and to benefit from the ideas of others. Excessive absence from class will results in a lower course grade.

HOMEWORK

Homework will be assigned during the class period. Assignments will be due at the start of the class when the homework is due. Late homework will not be accepted except for medical reasons or prior arrangements with the instructor.

Each homework set should consist of a cover page followed by the homework problems arranged in the order they were assigned.

- Put your name and box number in the top right corner of each page
- Use only one side of each page.
- Clearly identify final answers and important intermediate answers
- All problems should be worked (legibly) on standard engineering problem paper.
- Show all your work and explain the logic behind any assumptions that are made

EXAMS & QUIZZES

There will be three exams and 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.

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.

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.

GRADING

Homework/Quizzes/In-Class Activities	25%
Exams(3)	50%
Labs	25%
	100%

COURSE OBJECTIVES:

After completing this course students will be able to:

1. **Recall** some of the basic concepts important to
    a. biomedical transducers
    b. biomedical optics
    c. fundamentals of materials science
    d. metals, ceramics and polymer science
    e. viscoelasticity
    f. mechanical properties of soft tissue and bone
    g. joint biomechanics
    h. applied biomechanics

2. **Apply** analysis and design techniques related to
    a. DC circuits
    b. signal conditioning filters
    c. data acquisition
    d. testing of biological tissues

3. **Demonstrate** the ability to
    a. design, build and troubleshoot a functioning electric circuit for measuring biopotentials.
    b. make measurements of biomechanical function from humans and tissue samples.
    c. test biomaterials in an appropriate setting.
    d. conduct a motion analysis study.
    e. work as a member of a team, taking on different roles as needed.

TENTATIVE *COURSE CALENDAR: (CHANGES MAY OCCUR)*

Date	Topic
Mar 6	Introduction stuff and teaming intro
Mar 7	Teaming: brainstorming, creativity and communication
Mar 9	DC circuit analysis
Week 1 Lab	*Teaming*
Mar 13	Frequency analysis and filter design
Mar 14	Introduction to the EMG--electrodes, amplifiers and filters
Mar 16	Fundamentals of data acquisition
Week 2 Lab	*Building a biopotential amplifier*
Mar 20	Biomedical Transducers – displacement & force
Mar 21	Transducers – Pressure & Temperature, X-rays & CTs
Mar 23	Biomedical imaging – CT
Week 3 Lab	*Data acquisition using Matlab*
Mar 27	Biomedical Optics
Mar 28	Speaker/Project Time
Mar 30	**Exam I – Bioinstrumentation**
Week 4 Lab	*Soldering, wire-wrapping, and subject testing!*
Apr 3	Introduction to Biomaterials; Basic concepts
Apr 4	Materials science
Apr 6	Materials science
Week 5 Lab	*Tensile Testing*
Apr 17	Polymers
Apr 18	Polymers/Metals
Apr 20	Metals
Week 6 Lab	*Viscoelasticity Lab*
Apr 24	Ceramics
Apr 25	Tissue Engineering
Apr 27	Future Directions in Biomaterials
Week 7 Lab	*PMMA characteristics*
May 1	**Exam II -- Biomaterials**
May 2	Biomechanics of Tissues and Structures
May 4	Biomechanics of Tissues and Structures
Week 8 Lab	*Tissue testing*
May 8	Biomechanics of Tissues and Structures
May 9	Biomechanics of Joints
May 11	Biomechanics of Joints
Week 9 Lab	*Anthropometry and Range of Motion (ROM)*
May 15	Biomechanics of Joints
May 16	Applied Biomechanics
May 18	Applied Biomechanics
Week 10 Lab	*Force Plates & Motion Analysis*
Final Exam	**Exam III -- Biomechanics**