New Jersey Institute of Technology
Department of Biomedical Engineering

Course Syllabus
BME 301 – Section H01 - Introduction to Biomedical Engineering I - Fall 2006

Instructor:

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Textbook:
Milton Gussow, Schaum's Outline of Theory and Problems of Basic Electricity, McGraw-Hill, ISBN: 0-07-025240-8.

Other References:
John G. Webster (Editor), Medical Instrumentation, Third Edition. John Wiley & Sons, Inc. New York, 1998. ISBN: 0-471-15368-0

Course Description:

This course is the first semester of a comprehensive introduction to Biomedical Engineering. Course lectures and laboratories will address important issues covering bio-electric signals, biomedical instrumentation, computer software for data collection and processing, computer hardware and interfacing. Laboratory work will provide hands-on experience in all of these topics and more.

This course is in a different style than courses that you may have taken at NJIT in the past. If you have taken BME 302, you will find this format to be very similar. If you were not in BME 302, you are in for something unique. It is a four-credit course that normally requires 3 hours of lecture and 3 hours of laboratory per week. This course will be offered in Studio format, requiring 4-5 hours per week.

Studio format is a new style of teaching that has been pioneered by RPI, and is being adapted for use at NJIT. It involves the integration of lectures and labs into one highly participatory structure. All of our classes will be held in this Studio. Unlike traditional courses, there will be a short introduction by the instructor followed by small-group activities that will be highly interactive and open-ended. You and your group members will be free to explore the concept that was introduced and go beyond what would normally be a standard laboratory experience. The session will close with a group discussion of the explorations. It is essential that you participate in the Studio sessions since 1/4 of the grade depends on those sessions. The exams will draw heavily from the studio sessions as well.

This course should not only be different, but it should also be very interesting for you.

Homework must be returned on the date that it is due. There will be a penalty for the late homework. Handwritten homework is acceptable, however, write legibly!!!

Studio Reports are due in one week from the day of the experiment. Studio sessions will be conducted in 2 or 3 person groups. Lab reports will be submitted **individually**. A template will be provided for the studio reports by the instructor. Reports should be typed.

Final exam is comprehensive. There will be two exams and a final along with some homework assignments.

Attendance: You need to come to each class to keep up with the material since this is a studio style class. There will not be make up sessions for the missed studios.

Academic Dishonesty: In accordance with the Academic Honor Code, an evidence of cheating may result in an "F" grade in this course.

Honor Code Violations/Disruptive Behavior: NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted. No eating or drinking is allowed in class. Cellular phones must be turned off during the class hours.

Important Note: The best way to reach the instructor for any reason is via e-mail. Check your email every day for messages from the instructor as a part of this class.

Class Grading:

Exam #1:	15%
Exam #2:	15%
Final:	20%
Lab Reports:	25%
Homeworks:	25%

LEARNING OUTCOMES

By the end of the course you should be able to do the following:

1. Develop a firm understanding of passive circuits with resistors and capacitors. Standard laboratory equipment such as the oscilloscope, amplifier, signal generator, multimeter, etc. will also be practices while building circuits.
2. Learn the principles of operation for the electrodes and various kinds of sensors to acquire biopotentials and other biomedical signals.
3. Learn the origin of biopotentials and their characteristics in time and frequency domain.
4. Develop introductory level knowledge of processing biopotentials both in the analog and digital domain. Basic skills to collect biomedical signals into a computer LabView and analyze them in Matlab and other software will be acquired. Some analog circuitry will be introduced.

BME 301: Learning Outcome Summary

Outcome # 1. Develop a firm understanding of passive circuits with resistors and capacitors		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Theory and practical aspects are covered in class lectures, homework, and studio laboratory assignments.	A,E,D,G,K	Tests, homework, and laboratory reports that are graded.
Outcome # 2. Learn the principles of operation for the electrodes and various kinds of sensors to acquire biopotentials and other biomedical signals.		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Student will have hands on experience with the electrodes and sensors, be able to use them in experiments and understand their working principles from the class lectures.	A,B,D,E,G,K,N,O	Tests, homework, and laboratory reports that are graded.
Outcome # 3. Learn the origin of biopotentials and their characteristics in time and frequency domain.		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Lectures, demonstrations and hands on experience with recording the biopotentials and acquiring them into computer.	A,B,D,E,K,L,N,O	Tests, homework, and laboratory reports that are graded. There will also be demos by the instructor.
Outcome # 4. Develop introductory level knowledge of processing biopotentials both in the analog and digital domain		
Strategies & Actions	**Program Outcomes**	**Assessment Methods**
Learning how to use some of the pre-programmed software such as LabVIEW VIs and Matlab code will broaden their knowledge in this area. Sample analog circuitry will also be discussed.	A,B,D,E,K,N	Tests, homework, and laboratory reports that are graded. Students will do introductory level programming in Matlab and return as an assignment.

ABET Outcomes expected of graduates of BME BS program by the time the students graduate:

(A) an ability to apply knowledge of mathematics, science, and engineering
(B) an ability to design and conduct experiments, as well as to analyze and interpret data
(C) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(D) an ability to function on multi-disciplinary teams
(E) an ability to identify, formulate, and solve engineering problems
(F) an understanding of professional and ethical responsibility
(G) an ability to communicate effectively
(H) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(I) a recognition of the need for, and an ability to engage in life-long learning
(J) a knowledge of contemporary issues
(K) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
(L) an understanding of biology and physiology
(M) the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve problems at the interface of engineering and biology
(N) an ability to make measurements on and interpret data from living systems
(O) an ability to address problems associated with the interaction between living and non-living materials and systems