



New Jersey Institute of Technology  
Department of Biomedical Engineering

## **BME 301 – Section H01 – Course Syllabus**

### **Electrical Fundamentals of Biomedical Engineering - Fall 2009**

#### **Instructors:**

Mesut SAHIN, PhD  
Associate Professor, Biomedical Engineering Department, NJIT  
Fenster Hall, Room 617  
Office Hours: 4 hours on Mondays from 2:6pm  
(973) 596-5573 (office)  
(862) 368-1450 (Cell)  
E-Mail: [sahin@njit.edu](mailto:sahin@njit.edu)

Abhishek Prasad, Research Assistant  
Fenster Hall, Room 690  
(973) 596- 5364  
E-Mail: [ap277@njit.edu](mailto:ap277@njit.edu)

#### **Textbooks:**

Douglas Christensen, Introduction to Biomedical Engineering Part II, 2009, ISBN: 9781598298444,  
[www.morganclaypool.com](http://www.morganclaypool.com),

Robert M. Stern, William J. Ray, and Karen S. Quigley, Psychophysiological Recording, second edition, Oxford University Press, 2001, ISBN: 0-19-511359-4

#### **Other References:**

John Enderle, Bioinstrumentation, 2007, ISBN: 9781598291322, [www.morganclaypool.com](http://www.morganclaypool.com)

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

#### **Course Description:**

Course lectures and laboratories will address important issues for biomedical engineers at the introductory level; covering the origins of bio-electric signals and the instrumentation involved in collection of biopotentials from the electrodes to processing of the signals on the computer. Some other topics included are the transducers/sensors and modern engineering software used in bio-instrumentation. Laboratory work will provide hands-on experience in all of these topics. The course will also address practical issues in design of medical devices such as noise, resolution, linearity, and saturation. This course is offered in Studio format.

Studio format 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 lecture 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 the exams will include concepts from the studio sessions as well.

**Homework and Studio Reports** must be returned on the date that is due, which is usually one week after the date that they are assigned. There will be a penalty for a late submissions (5 points a day out of 100). Handwritten homework is acceptable, however, should be written legibly!!!

**Studio Reports** should be **typed** and submitted **individually**. Studio sessions will be conducted in 2 or 3 person groups. A template will be provided for the studio reports.

**Final exam** is comprehensive. There will be two more exams during the semester.

**Attendance:** You need to come to each class to keep up with the material since this is a studio style class. ***There will be no 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.***

Finally, the best way to reach the instructors for any reason outside the office hours is via e-mail. Also, check your email every day for messages, homework assignments, etc. from the instructors as a part of this class.

**Class Grading:**

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

**Course Objectives:**

In general terms this course is designed to accomplish the following:

1. Understand basic electric circuits and their usage for amplification and filtering of biological signals
2. Learn the principles of interfacing with the living systems for collection of biological signals
3. Learn the origins of biopotentials and their characteristics in time and frequency domain
4. Apply modern engineering tools to collect, analyze and interpret biological signals
5. Work in groups and develop written communication skills

**Learning Outcomes:**

By the end of the semester you will have acquired the following knowledge and skill set:

1. Developed a firm understanding of passive circuits with resistors and capacitors; became familiar with standard laboratory equipment such as the oscilloscope, amplifier, signal generator, multimeter, etc.
2. Learned the principles of operation for the electrodes and various kinds of sensors to acquire biopotentials and other biomedical signals.
3. Learned the origin of biopotentials and their characteristics in time and frequency domain.
4. Developed introductory level knowledge of processing biopotentials both in the analog and digital domain; attained basic skills to collect biomedical signals into a computer using LabView and analyzed them in Matlab and other software.