

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Electrical and Computer Engineering
 Bachelor of Science in Electrical Engineering

Course Syllabus

1. General Information:	
Alpha-numeric codification: INEL 5208 Course Title: Principles of Biomedical Instrumentation Number of credits: 4 Contact Period: 3 hours of lecture and 2 hours of laboratory per week Elective in INEL	
2. Course Description:	
English: Theoretical and practical aspects of the methods used to measure physiological events with emphasis in the cardiovascular, pulmonary and nervous systems. Spanish: Aspectos teóricos y prácticos relacionados a los métodos utilizados para medir eventos fisiológicos, con énfasis en los sistemas cardiovascular, respiratorio y nervioso.	
3. Pre/Co-requisites and other requirements:	
INEL 4202 or consent of Department Head	
4. Course Objectives:	
-Recognize and understand the basic anatomy and physiology of the cardiovascular, respiratory, and nervous system. -Gain a theoretical and practical perspective of the techniques used to measure physiological events. -Apply engineering concepts to solve medical problems.	
5. Instructional Strategies:	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input checked="" type="checkbox"/> computation <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input checked="" type="checkbox"/> workshop <input type="checkbox"/> art workshop <input type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input type="checkbox"/> special problems <input type="checkbox"/> tutoring <input type="checkbox"/> research <input type="checkbox"/> other, please specify:	
6. Minimum or Required Resources Available:	
Personal computers with data acquisition boards and software. Electrical measurements equipment, tissue stimulators, force transducers, electronic components and miscellaneous equipment and materials.	
7. Course time frame and thematic outline	
Outline	Contact Hours
Introduction: biomedical engineering, organization of the human body	3
Biopotentials: origin, measurement (amplifiers, sensors, signal processing)	10
Cardiovascular System: anatomy and physiology, ECG, measurement of arterial blood pressure and cardiac output, cardiac arrhythmias, fibrillation and defibrillation	10
Pulmonary System : anatomy and physiology, measurements of the respiratory system	6
Nervous System: anatomy and physiology, the electroencephalogram (EEG), nerve impulse propagation	7
Medical Imaging Systems	3
Electrical Safety	3
Exams	3
LABORATORIES	
Introduction to LabVIEW Programming	2
Advanced LabVIEW Programming	2
Measurement of Physiological Events (Calibration, gain adjustment, offset	2

adjustment, etc.)	
Practical Aspects of Data Acquisition Systems	2
Electrodes	4
ECG Measurement System	4
Indirect Measurement of Blood Pressure	4
Stimulation of Excitable Tissue (Strength-Duration Curves)	4
Measurements in the Respiratory System	6
Total hours: (equivalent to contact period)	75

8. Grading System

Quantifiable (letters) Not Quantifiable

9. Evaluation Strategies (Suggested): The faculty member teaching the course will provide the student with the evaluation strategy he/she will be using throughout the semester. This will be done within the first week of classes.

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2	30
<input checked="" type="checkbox"/> Final Exam	1	15
<input type="checkbox"/> Short Quizzes		
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input type="checkbox"/> Projects		
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Homework Laboratory Reports	Variable Variable	10 45
TOTAL:		100%

10. Bibliography:

J. G. Webster, Medical Instrumentation: Application and Design, 4th edition, 2007, John Wiley & Sons, Inc.
 S. Chaterjee, Biomedical Instrumentation Systems, 2008, Cengage Delmar Learning.
 L. A. Geddes, Principles of Applied Biomedical Instrumentation, 3rd edition, New York, 1989, Wiley Interscience.
 A. C. Guyton, Textbook of Medical Physiology, 10th edition, 2000, W. B. Saunders.

11. According to Law 51

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

12. Contribution of Course to meeting the requirements of Criterion 5:

Math	Basic Science	General	Engineering Topic
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13. Course Outcomes

Map to Program Outcomes

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| 1. Apply knowledge of mathematics, science, and engineering to understand the principles of operation of various types of medical instruments. | (a) |
| 2. Design and conduct experiments related to the measurement of at least three of the following: electrocardiograms, arterial blood pressure, respiratory flows and volumes, nerve conduction velocity, stimulation thresholds for tissue, and cardiac force of contraction. | (b) |
| 3. Analyze and design signal conditioning circuits and data acquisition systems to perform physiological measurements. | (c) |
| 4. Use modern engineering tools (MATLAB, LabVIEW, PSPICE...) for the design and implementation of an electronic instrument. | (k) |

Person(s) who prepared this description and date of preparation: Eduardo J. Juan. Submitted by: Eduardo J. Juan, June, 18, 2008