JEFFERSON COLLEGE
COURSE SYLLABUS

BET230

THERAPEUTIC INSTRUMENTATION SYSTEMS

3 Credit Hours

Prepared by: Scott Sebaugh
Date: 2/20/2012

Mary Beth Ottinger, Division Chair
Elizabeth Check, Dean, Career & Technical Education
BET230  Therapeutic Instrumentation Systems

I. CATALOGUE DESCRIPTION

A. Prerequisite: reading proficiency and BET200 Electronic Control Technology

B. Credit hour award: 3

C. Description: This is a special topics course on specific equipment related to therapeutic Biomedical Instrumentation Systems. Topics covered in other courses may be covered in more depth in this special topics course. Projects may be undertaken in a related area to the program. Projects on the specific topic(s), require objectives, plan of instruction, and evaluation criteria; approved by the Department/Division Chair and or instructor. (S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

<table>
<thead>
<tr>
<th>Expected Learning Outcomes</th>
<th>Assessment Measures</th>
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<tr>
<td>Define the processes in the lungs that are involved in the exchange of gases between the blood and the atmosphere.</td>
<td>Class Lecture Summative Examination</td>
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<tr>
<td>Describe the mechanical behavior of the respiratory system as a combination of pneumatic and mechanical elements.</td>
<td>Class Discussion/Activity Written Project/Paper Summative Examination</td>
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<tr>
<td>Describe the basic principles of a differential pressure sensor.</td>
<td>Class Discussion/Activity Summative Examination</td>
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<tr>
<td>Describe the various elements and functions of a mass-spectrometer system.</td>
<td>Class Discussion/Activity Summative Examination</td>
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<td>Name three instruments for monitoring changes in thoracic volume and cite the physical dimension from which each infers volume change.</td>
<td>Class Discussion/Activity Written Project/Paper Summative Examination</td>
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<tr>
<td>Describe some of the existing and emerging roles in the Therapeutic Biomedical Instrumentation Systems profession.</td>
<td>Class Discussion/Activity Written Project/Paper Summative Examination</td>
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<tr>
<td>Locate various resources for Therapeutic Biomedical Instrumentation Systems professional development, including, but not limited to AAMI publications, the Internet web site of AAMI, other related web sites, and the Biomedical instruction videos</td>
<td>Class Discussion/Activity Written Project/Paper Summative Examination</td>
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<td>Describe the arrangement of a PCO2 electrode. Explain briefly how it works.</td>
<td>Class Discussion/Activity Summative Examination</td>
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<td>Describe what effects the response time of the CO2 electrode. Describe what effects the response time of the O2 electrode.</td>
<td>Class Discussion/Activity Written Project/Paper Summative Examination</td>
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<tr>
<td>Description</td>
<td>Class Discussion/Activity Summative Examination</td>
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<tr>
<td>Describe the major sections of a hospital department that performs clinical pathology or the department of laboratory medicine.</td>
<td>Written Project/Paper</td>
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<td>Identify the basic principles of a spectrophotometer and detail the characteristics of each subsystem.</td>
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<td>Describe what tests the Beckman-Coulter Synchron LXi 725 can perform. Describe devices based on electrophoretic principles used in a laboratory environment.</td>
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<td>Describe two major classes of electronic devices for measuring blood characteristics.</td>
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<td>Draw and label a block diagram of an asynchronous cardiac pacemaker</td>
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<td>Describe why a pacemaker is either of the unipolar or bipolar type.</td>
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<tr>
<td>Draw and label a block diagram of a synchronous cardiac pacemaker</td>
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<td>Describe a transcutaneous RF-powered electric stimulator and its uses.</td>
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<td>Describe the cochlear prosthesis in a block diagram.</td>
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<td>Describe how a half-wave rectifier is used in Capacitive-Discharge DC Defibrillators.</td>
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<td>Describe why in a Cardioverter, the defibrillation pulse must be synchronized with the R wave of the ECG.</td>
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<td>Describe the two basic units in a Hemodialysis system.</td>
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<td>Describe the ultrasonic transducer used in kidney stone removal.</td>
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<td>Discuss high-frequency ventilation principles put into practice.</td>
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<td>Draw and label a block diagram of a proportional temperature controller used to maintain the temperature of air inside an infant incubator.</td>
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<td>Draw and label a block diagram of the electronic control system for a fluid or drug delivery pump.</td>
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<td>Describe the component of a insulin-delivery system.</td>
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<td>Describe three sections of a typical anesthesia machine.</td>
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<td>Describe the high-frequency power used to produce an arc in a basic electrosurgical unit.</td>
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<td>Describe the functions of each block in a diagram of a typical electrosurgical unit.</td>
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<td>Describe various therapeutic applications of Lasers.</td>
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III. OUTLINE OF TOPICS

A. Measurements of the Respiratory System
   1. Modeling the Respiratory System
   2. Measurement of Pressure
   4. Lung Volume
   5. Respiratory Plethysmography
   6. Some Tests of Respiratory Mechanics
   7. Measurements of Gas Concentration
   8. Some Tests of Gas Transport

B. Chemical Biosensors
   1. Blood-Gas and Acid-Base Physiology
   2. Electrochemical Sensors
   3. Chemical Fibrosensors
   4. Ion-Selective Field-Effect Transistor
   5. Immunologically Sensitive Field-Effect Transistor
   6. Noninvasive Blood-Gas Monitoring
   7. Blood-Glucose Sensors
   8. Electronic Noses
   9. Lab-on-a-Chip

C. Clinical Laboratory Instrumentation
   1. Spectrophotometry
   2. Automated Chemical Analyzers
   3. Chromatology
   4. Electrophoresis
   5. Hemoatology

D. Therapeutic and Prosthetic Devices
   1. Cardiac Pacemakers and Other Electric Stimulators
   2. Defibrillators and Cardioverters
   3. Mechanical Cardiovascular Orthotic and Prosthetic Devices
   4. Hemodialysis
   5. Lithotripsy
   6. Ventilators
7. Infant Incubators  
8. Drug Delivery Devices  
9. Surgical Instruments  
10. Therapeutic Applications of the Laser  

IV. METHOD(S) OF INSTRUCTION  
A. Lecture/ instructional videos  
B. Readings from textbook/ industry company manufacture website  
C. Supplemental handouts for hand-on exercises  
D. Peer interactive activities/discussions in classroom  

V. REQUIRED TEXTBOOK:  

VI. REQUIRED MATERIALS  
A. Textbook  
B. A computer with internet access (available through the Jefferson College Labs)  
C. Paper, notebooks, pens, pencils with erasers, Jump drive electronic storage  

VII. SUPPLEMENTAL REFERENCES  
A. Class handouts  
B. Current internet resources  
C. On-line reference materials  

VIII. METHOD OF EVALUATION  
A. Summative Written Examinations: 20%  
B. Oral Presentation(s): 25%  
C. Quizzes: 20%  
D. Written Assignments: 25%
E. Attendance/Participation: 10%

F. Grading Scale:

   A=92-100%
   B=84-91.9%
   C=75-83.9%
   D=65-74.9%
   F=64.9% and below

IX. ADA AA STATEMENT

   Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Library: phone 636-797-3000, ext. 3169)

X. ACADEMIC HONESTY STATEMENT

   All students are responsible for complying with campus policies as stated in the Student Handbook. (see College website, http://www.jeffco.edu/jeffco/index.php?option=com_weblinks&catid=26&Itemid=84)