EET-2400: BIOMEDICAL INSTRUMENTATION I

Cuyahoga Community College

Viewing: EET-2400 : Biomedical Instrumentation I

Board of Trustees:
May 2023

Academic Term:
Fall 2023

Subject Code
EET - Electrical/Electronic Engineer

Course Number:
2400

Title:
Biomedical Instrumentation I

Catalog Description:
First course in the Biomedical Engineering Technology Instrumentation sequence. Study of general hospital equipment such as safety analyzers, medtesters, ECGs, patient monitors, simulators, and centrifuges. Determine performance of equipment and verify that the equipment performs to specifications using simulators and analyzers. Equipment is evaluated using preventative maintenance procedures and operating procedures found in the equipment manuals.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
EET-2120 Electronics I or concurrent enrollment.

Outcomes

Course Outcome(s):
Use electronic test equipment like analyzers, oscilloscopes, and Digital Multmeters (DMMs) to test and/or troubleshoot Biomedical Test Equipment.

Objective(s):

a. Measure power supply voltages on ECGs with DMMs.
b. Generate ECG waveform at different heart rates and amplitudes and verify the operation of ECG at those heartrates and amplitudes with an ECG analyzer.
c. Generate patient monitor waveforms including heart rate, SPO2, temperature, and blood pressure (Invasive) with a simulator.
d. Measure Non-Invasive blood pressure with a patient monitor.
e. Verify ECG waveform with an Oscilloscope.
f. Measure RPM on a centrifuge with a photo tachometer and then calculate Relative Centrifugal Force.

Course Outcome(s):
Use Biomedical Equipment manuals to determine if the Biomedical Test Equipment is functioning properly.

Objective(s):

a. Measure case leakage current on ESUs, IV pumps, and patient monitors with Safety Analyzer and Medtester.
b. Configure safety analyzer to measure case leakage and power cord resistance with user manual.
c. Reference ECG manual to understand all of the ECG waveforms including Lead I, Lead 2, and Lead 3.
d. Calculate heart rate and amplitude from the ECG chart based on guidelines found in the ECG manual.
e. Configure patient monitor to measure and display ECG Lead II waveform, measure heart rate, measure SPO2, and temperature based on guidelines found in patient monitor manual.
f. Confirm operating speed of Centrifuge based on guidelines found in photo tachometer manual and Centrifuge manual.

Course Outcome(s):

Write a professional report on biomedical equipment operation and preventative maintenance checks.

Objective(s):

a. Write a report which includes objectives, detailed lab results (including test data, pictures, and graphs) and conclusions.
b. Create and import graphs that relate to the biomedical project.

Methods of Evaluation:

a. Quizzes
b. Homework
c. Laboratory reports
d. Midterm examination
e. Final examination

Course Content Outline:

a. Introduce Biomed Program
   a. Terminology
   b. Organization of the hospital
   c. Hospital safety
   d. Role of a BMET (Biomedical Equipment Technician) in the hospital
b. Patient simulators
   a. Pronk Technologies Sim Slim, Sim Cube
   b. Dynatech Nevada 214, 215
c. Medtesters
   a. Dynatech Nevada 5000
   b. Fluke 5000
d. ECG
   a. GE MAC 6
   b. GE MAC 5000
   c. Anayze PT waveform
   d. Measure Amplitudes of Electrocardiograph
   e. Principle of operation
   f. Measure period of Electrocardiograph and calculate heart rate
e. Patient monitors
   a. GE Dash 3000, and Dash 4000
   b. Phillips MP 30
   c. DataScope
   d. Spacelabs
   e. Display Lead I, Lead, II or Lead III ECG waveform
   f. Measure heart rate
   g. Measure SPO2
   h. Measure Invasive Blood Pressure (IBP)
   i. Measure temperature
   j. Measure Non-Invasive Blood Pressure (NIBP)
f. Centrifuges
   a. Sorval
   b. Baxter
   c. Drucker

d. Use photo tachometer to measure RPM
e. Calculate relative centrifugal force

Resources

Joseph Carr, and John Brown. *Introduction to Biomedical Equipment Technology*. 4th ed. Wiley, 2000. 6/9/2000.

Barbara L. Christe. *Introduction to Biomedical Instrumentation: The Technology of Patient Care*. 2nd ed. New York, NY: Cambridge University Press, 2017. 12/27/2017.

R.S. Khandpur. *Biomedical Instrumentation, Technology and Applications*. 1st ed. New Delhi: Tata McGraw-Hill Publishing Company Limited, 2004. 11/26/2004.

Institute For Career Research. (2018) (4/21/2018) *Careers as a Biomedical Equipment Technician*, Createspace Independent Publishing Platform.

Lawrence Street. (2022) (4/10/2022) *Introduction to Biomedical Engineering Technology*, CRC Press.

NEDU. (2021) (5/22/2021) *EKG | ECG Interpretation Made Easy: An Illustrated Study Guide For Students To Easily Learn How To Read & Interpret ECG Strips*, NEDU LLC.

Resources Other

a. Technical Service Manual on Centrifuges.
b. Technical Service Manual on McGaw Infusion Pump.
c. Technical Service Manual on ValleyLab Electrosurgery Unit.

Top of page
Key: 1674