

FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER:	EST 2438
COURSE TITLE:	Biomedical Instrumentation II
PREREQUISITE(S):	EST 2436
COREQUISITE(S):	None
CREDIT HOURS:	3
CONTACT HOURS/WEEK:	4
CONTACT HOUR BREAKDOWN:	
Lecture/Discussion:	2
Laboratory:	2
Other _____:	
FACULTY WORKLOAD POINTS:	3
STANDARDIZED CLASS SIZE ALLOCATION:	12

CATALOG COURSE DESCRIPTION: This course, a continuation of the study of biomedical instrumentation, introduces students to the remaining biomedical equipment of significance typically utilized in the health care setting, i.e. in the operating room, the labor and delivery room, radiology, nuclear medicine, radiation therapy and clinical laboratory. Students will learn external operation of devices, their internal electronic circuitry and the clinical environment in which they are used. Students will utilize these concepts in the lab to verify device performance, to perform calibration and to learn preventive and corrective maintenance techniques.

SUGGESTED TEXT(S): Carr and Brown, Introduction to Biomedical Equipment Technology; Wiley and Sons, Inc., 1981.

Webster, J.G. Medical Instrumentation. Houghton and Mifflin, 1978.

IMPLEMENTATION DATE: June 25, 1984

REVIEW OR MODIFICATION DATE: Fall Term, 2002 (20031)

COURSE TOPICS	CONTACT HOURS <u>PER TOPIC</u>
I. Operating Room Systems I	4
A. Surgery	
B. Types of Surgery	
C. OR Personnel	
D. Sterilization	
E. Heart-Lung Machines	
F. Hypo/hypermia Devices	
G. Suction Devices	
II. Operating Room Systems II	4
A. Therapeutic Applications of the Laser	
B. Fiberoptics - Scopes, Light Sources	
C. Cryosurgery	
III. Anesthesia Machines	4
A. Stages of Anesthesia	
B. Anesthetic Gases	
C. Anesthesia Machines	
1. Circuits - Block Diagram	
2. Vaporizers	
D. Nerve Stimulators	
IV. Electrosurgery Devices	4
A. Electrosurgery Machines	
B. Electrosurgery Circuits	
1. Spark-Gap Circuits	
2. Vacuum Tube Circuits	
3. Solid-State Circuits	
C. Safety	
D. Testing Electrosurgery Units	
V. Medical Ultrasound Systems	4
A. Physics of Sound Waves	
1. Wavelength and Velocity	
2. Reflection and Refraction Phenomena	
3. Acoustical Impedance	
B. Absorption of Ultrasound Energy	
C. Biological Effects of Ultrasound	
D. Ultrasonic Transducers	
E. Transcutaneous Doppler Flow Detectors	

COURSE TOPICS* (CONTINUED)

CONTACT HOURS
PER TOPIC

- F. Flow Meters
- G. Ultrasonic Blood Pressure Measurement

VI. Fetal Monitoring Systems 4

- A. Concepts of Fetal Distress and Monitoring
- B. Intrauterine Pressure, Fetal ECG, and Fetal Heart Rate Measurements
- C. Internal Monitoring System (Block Diagram)
- D. External Monitoring System (Block Diagram)
- E. Troubleshooting and Maintenance

VII. Hemodialysis Machines 4

- A. Basic Renal Physiology
- B. Renal Failure
- C. Peritoneal Dialysis
- D. Hemodialysis
- E. The Hemodialysis Machines
- F. Electrical Safety Precautions
- G. Typical Faults, Troubleshooting and Maintenance
- H. Summary

VIII. Radiation Measurement 4

- A. Nature and Origins of X-Rays and Nuclear Radiation
- B. Units for Measuring Radioactivity
- C. Radiation Producing Devices
- D. Radiological Safety

IX. Medical Imaging Systems 4

- A. Information Content of an Image
- B. Modulation Transfer Function
- C. Noise Equivalent Bandwidth
- D. Photography
- E. Television Systems
- F. Radiography
- G. Thermography
- H. Nuclear Medicine
- I. Ultrasonic Scanning
- J. Computer-assisted Tomography

COURSE TOPICS * (CONTINUED)

CONTACT HOURS
PER TOPIC

X. Human Nervous System and Brain Instrumentation	4
A. Organization of the Nervous System	
B. The Neuron	
C. The Structure and Function of the Central Nervous System	
D. Peripheral Nervous System	
E. Autonomic Nervous System	
F. Brain Parameter Measurement Devices	
1. Augiography	
2. X-Ray	
3. CT Scan	
4. Ultrasound	
5. EEG	
XI. Overview of Clinical Instrumentation	4
A. Spectrophotometry	
B. Chromatography	
C. Electrophoresis	
D. Hematology	
E. Autopipettors, Dilutors, Ph Measurement	
XII. Blood Cell Counters	4
A. Aspiration System	
B. Analysis Cell	
C. Pulse Shaping and Triggering circuitry	
D. Counting Circuitry	
E. Output	
XIII. Laboratory Temperature Control Devices	4
A. Temperature Control and Measurement	
B. Water Baths	
C. Cetrifuges - Standard, Refrigerated	
XIV. Laboratory Automation Systems	4
A. Continuous VS. Discrete Systems	
B. Automated Chemistry Analyzer	
C. Sequential Multiple Analyzer	

COURSE TOPICS* (CONTINUED)

CONTACT HOURS
PER TOPIC

XV. Computers in Biomedical Equipment

4

- A. Introduction
- B. Computer Hardware and Software
- C. Computer Programming Languages
- D. Microprocessor/Microcomputer System
- E. Interface Between Analog Signals and Digital Computers
- F. Computers in Biomedical Equipment
- G. Summary

LABORATORY TOPICS

1. OR Devices
2. Anesthesia Machines
3. Electrosurgery Devices
4. Ultrasound Devices
5. Fetal Monitors
6. Dialysis Machines
7. Radiation Measurement Devices
8. Imaging Systems
9. EEG Systems
10. Laboratory Devices
11. Blood Cell Counters
12. Temperature Control Devices
13. Automated Devices
14. Computer Systems