SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number:	BMT-250	Department:	Computer Systems		
Course Title:	Biomedical Systems II	Semester:	Spring	Year:	2019

Objectives/Competencies

Course Objective	Competencies
Operating Room Familiarization • Describe the functions of the Operating Room (OR) • Describe the protocols involved in working in the Operating Room • List the duties of the personnel employed in the Operating Room (e.g.: the nursing staff, biomedical technician, surgeon, etc.) • List the special equipment used in the OR • List the functions of the equipment used in the OR • Describe why anesthetics are used and what types are commonly used • List the safety precautions observed in the OR • List the different methods of sterilization • Define terms used in surgery. e.g.: antiseptic, suture thread, autoclave, orderlies, sterilization spore strip, etc. • Describe different methods of sterilization (steam, ETO, etc.) **Electrosurgery Generators and Lasers** • Describe the function of the Electrosurgery (ESU) generator • Describe the operation of the Electrosurgery generator • Sketch the block diagram and related waveforms of an Electrosurgery generator • List the safety measures to be adopted when using the Electrosurgery generator • Describe the type of waveforms generated (coagulate, cut) • List the frequencies commonly used by Electrosurgical scalpels • Describe “REM” • Describe testing requirments for Electrosurgery Units • Describe the different types of lasers • Describe the propagation modes in fiber optics **Clinical Laboratory** • State the main functions and composition of blood • List the instruments used in the medical laboratory (calorimeters, photometer, spectrophotometer, pH analyzer, autoanalyzer, chromatograph, dialyzer)	• Students will be able to use an electrical safety analyzer for electrical safety measurements • Students will be able to use various required analyzers and simulators to test, calibrate and service medical equipment and systems • Students will be able to inquire, understand and follow established testing standards • Students will be able to participate in the clinical application design of selecting and layout/design of the installation of medical equipment and systems • Students will be able to participate in the installation of new medical equipment and systems • Students will be able to perform the acceptance testing for medical equipment and systems • Students will be able to work with technicians • Students will be able to participate and work on teams • Students will be able to use equipment management software and documentation systems • Students will participate in presentations by medical device suppliers • Students should be able to investigate education and training schedule of the clinical engineering department • Students will be able to investigate the entry requirements, length and costs of training schools for medical equipment and systems • Students will be able understand the clinical engineering department risk based preventative maintenance system • Students will be able understand the clinical engineering department performance indicators • Students will be able to use an electrosurgical analyzer • Students will present well written engineering reports on various medical devices • Student will understand the basic functions of the human body: o Blood (composition and pH)

- State the maintenance procedures for the following medical lab instruments:
    - Blood Gas Analyzers
    - Co-Oximeters
    - Centrifuges
    - Microscopes
    - Cell Counters
    - Chemistry Analyzers

Medical Ultrasound Instruments

- Describe applications of medical diagnostic ultrasound (cardiology, ob/gyn, general radiology, etc.)
- Explain the purpose of ultrasound in medical applications
- Define the terms associated with ultrasound (e.g.: wavelength, acoustics, reflection, refraction, piezo effects, echocardiography, doppler effects)
- Explain the physics of sound waves wavelength, velocity, period, frequency, reflection, refraction and resonator
- Explain the biological effects of ultrasound
- Describe the operation of the instruments used in delivering ultrasound (Doppler flow
- meter, blood pressure monitor, fetal monitor, echocardiography and echoencephalography)
- Describe the operation ultrasound instruments
- List safety precautions regarding the maintenance and use of ultrasound instruments
- Describe the types of transducers used in medical diagnostic ultrasound
- Distinguish between “sector” scans and “linear” scans
- Define “axial resolution” and “lateral resolution”
- Define “dead zone” as it applies to ultrasound
- Describe the “front end” of an ultrasound scanner
- Define “scan conversion”
- Distinguish between “Spectral Doppler” and “Color Flow Doppler”
- Define and describe a DICOM system
- Explain the components of a video signal

Hemodialysis Equipment

- Describe the functions of the kidneys
- Define terms used in the study of the kidneys (e.g.: dialysis, renal, dialysate, etc.)
- Explain why kidney failure requires hemodialysis treatment
- State the functions of the dialysis machine
- Sketch the main function blocks of a dialysis machine (e.g.: power supply, pressure monitor, blood pump, temperature system, bath delivery system, drain system, circulating system and control panel)
- Explain the function of each block or section of the machine
- State the special safety precautions associated with the wet environment of a dialysis machine (e.g.: magnetically coupled motor shaft impeller system, ground fault interrupters)
- State some of the common problems with dialysis machines
- List a weekly maintenance schedule for a dialysis machine
    - Circulatory system
    - Heart chambers and valves
    - Cardiac physiology
    - Bio-potentials
    - Electro-conduction system of the heart
    - Lungs
- Students will be able to perform basic preventive maintenance tests and have a basic functional knowledge of the following medical devices:
    - Electrosurgical units
    - Minimally invasive surgical systems (scopes, light source, insulflators, video)
    - Physical therapy equipment (tractions, ultrasounds, exercise equipment)
    - Anesthesia machines
    - Multi-parameter physiological monitors (surgical suites)
    - Surgical lights
    - Surgical lasers
    - Dialysis units
    - Water treatment systems for dialysis (RO and DI systems)
    - Diagnostic ultrasound units
    - Radiology systems (general radiology, fluro, portable devices)
    - CT Scanners
    - Cath Labs
    - Angio-graphic systems
    - MRI Scanners
    - Picture Archive Capture (PACs) systems for imaging systems
    - Nuclear medicine scanners and networks
    - Laser imaging systems for imaging modalities
    - Sterilizers (steam and low temperature)
    - Patient information systems (connected to medical equipment for data input)
    - Linear accelerators & treatment planning systems
    - Clinical laboratory equipment

Radiology

- List the main functions of an X-ray machine
- Describe the therapeutic applications of X-ray machines
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- State the diagnostic (measurement) function of an X-ray machine
- State the different categories of X-ray machines (e.g.: still picture, continuous picture and motion picture)
- List the dangers associated with X-rays
- Name the units used for measuring radioactivity (e.g.: curie, Roentgen, Dose rate)
- Explain the terms used in the study of radiology (e.g.: gamma, beta and alpha rays, nuclear radiation, etc.)
- Sketch the circuit diagram of an X-ray tube
- Sketch the circuit diagram of a Geiger-Mueller tube
- Explain how the X-ray tubes work
- Discuss the safety precautions associated with the handling of X-ray tubes
- List common problems/faults of X-ray tubes
- Sketch the circuit diagram of an X-ray machine

Certification

- Describe the purpose of certification
- List the qualifications required for certification
- List the components of the exam.