ACI (AAMI Credentials Institute):
CRES - Certification for Radiological Equipment

RADIOLOGICAL SERVICE TRAINING INSTITUTE

Introduction

AAMI's ACI (AAMI Credentials Institute) offers independent certification testing in the areas of biomedical, Clinical Lab, and Radiology. The radiological endorsement is called CRES (Certification for Radiological Equipment Specialist. The test consists of 150 multiple choice questions divided into 5 sections. Up to 6 hours are allowed for completing the exam. This course is designed to teach the experienced service professional the requisite knowledge necessary to successfully pass the CRES test. The subjects include radiation physics, radiation safety, anatomy, physiology, x-ray equipment use, CDRH compliance testing, electronics, and troubleshooting. The CRES certification testing is given 4 times a year in over 100 cities. Depending on the testing site, the application must be submitted up to 8 weeks in advance.

Prerequisites

Attendees must possess the knowledge acquired through attendance of RSTI's Phase I, II, and III Certificate Series courses or the equivalent electronics and service experience. The ICC typically requires a minimum of 2 years of radiological experience before taking the CRES test.

Objectives

At the conclusion of this course, attendees will have successfully completed the 5 major areas of study needed for CRES certification and will be fully prepared, along with their experiential learning, to pass the CRES test.

- Anatomy and Physiology.
- Radiologic physics and safety.
- Electricity and electronics.
- Radiologic equipment applications.
- Technical problem solving.

Course Outline

Day 1

- Radiation safety
- Radiographic physics
  - The electromagnetic spectrum
  - X-ray production
    - Bremsstrahlung radiation
    - Characteristic radiation
    - Characteristics of the x-ray beam
- Radiographic system
  - Production of x -rays
  - Evaluation of factors affecting image quality
  - The formation of the x-ray image- focal spot, filtration, collimation, and grids
  - Film, screens, and processing
- Aerial image formation
  - Photoelectric effect
  - Compton effect
  - Beam quality
- Intensifying screens effects
- X-ray film
  - Sensitometric properties
  - Hurter and Driffield Curves
  - Transmittance
- Use and evaluation of technique charts
- Heat unit calculations - single/multiple exposures
- X-ray film processing - effects of time and temperature on image quality
- Other x-ray properties and parameters
  - Capacity current
  - Space charge effects
  - Tomograghic image evaluation
  - Grid ratio
- Image quality terminology
  - Density
  - Contrast
  - Sharpness
  - Detail visibility
  - Resolution
- Factors affecting image quality

Day 2

- CDRH Compliance testing
  - Reproducibility
  - Linearity
  - Max R
  - KV, mA, time, mAs accuracy
  - Actual versus indicated SID
  - Accuracy of x-ray field size
  - Light field definition
  - Minimum source to object distance
  - Half value layer
- NCRP guidelines

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Hands-On Training Course
Course Length: 1 Weeks
CEU's Awarded: 4 CEU's
State of Ohio Registration No. 93-09-1377T

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- National Electrical Code guidelines
- Image intensifier
  - Construction and operation
  - Factors affecting image quality
  - Common I.I. problems
  - Typical image intensifier input doses for fluoro, photospot, and cine
  - Magnification factor / inverse square law
  - Minification
  - Modulation transfer function
- TV camera and video
  - Vertical and horizontal deflection circuits
  - Vertical and horizontal amplifier circuits
  - Video waveform analysis
- Anatomy terminology - prefixes and suffixes
- Anatomy systems, organs, cells, diseases
  - Endocrine
  - Respiratory
  - Integumentary
  - Digestive
  - Musculoskeletal
  - Reproductive
  - Excretory
  - Circulatory
  - Neural

Day 3

- Physiology
  - Normal functions of cells and organs
  - Abnormal functions of cells and organs
  - Anabolism and catabolism
  - Cardiac waveform analysis- diastolic, systolic, and blood flow
- Patient positioning and terminology
- Electronic laws and equations
  - Kirchoff's voltage and current law
  - Norton analysis
  - Thevenin's analysis
  - Lenz's law
  - Boolean equations
- Electronic circuits
  - Transistor biasing
  - Series and parallel waveform analysis
    - Resistive, capacitive, and inductive
    - Combination circuits
  - Operational amplifier circuits
  - Digital circuits
  - Vacuum tube circuits
- Formulas and calculations
  - Impedance calculations
  - Phase shift calculations
  - Time constants
  - Transistor gain calculations
  - Resonant frequency calculations
  - Conductor impedance calculations
  - Hysteresis losses
- Conversions
  - Decimal to binary and binary to decimal
  - Voltage, current, and power gain for AC and DC circuits

Day 4

- Healthcare Information Technology
  - Regulatory & Safety
    - Medical Device Data Systems
    - IEC 80001 – Risk Management for IT
    - HIPAA
    - DMCA
  - Foundations
    - Hardware
      - ☐ Topology
      - ☐ PC's/Laptops/Servers
      - ☐ Wiring
      - ☐ Switches/Hubs/Routers
      - ☐ Wireless
    - PACS
    - HIS/RIS
    - MWL
  - SW/Applications
    - EMR/HER
    - HIS/RIS
    - Network Protocols
    - Operating Systems
  - Test Equipment
  - Security
  - Problem Solving

Day 5

- Technical problem solving
- Waveform analysis
- Common problems
- System review
- Final exam! sample CRES questions
- Course critique

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