

Fundamentals of Servicing Diagnostic Imaging Systems - Level I

Course length: 2 Weeks
CEU's Awarded: 8

COURSE INTRODUCTION

Fundamentals of Servicing Diagnostic Imaging Systems - Level I is designed to teach the new service professional the skills necessary to build an excellent foundation in the servicing of diagnostic imaging systems. The program provides in-depth coverage of the different systems used in the radiology department.

DAY 1

- I. Introduction to diagnostic x-ray imaging systems
 - A. Radiographic imaging system
 - B. Tomographic imaging system
 - C. Fluoroscopic imaging system
 - D. Special procedures imaging system
 - E. Cardiac imaging system
 - F. Computed Tomography imaging system
- II. Introduction to other diagnostic imaging systems
 - A. Nuclear medicine imaging system
 - B. Ultrasound imaging system
 - C. Magnetic Resonance Imaging system
- III. Radiation safety
 - A. Radiation physics
 - B. Radiation measurement
 - C. Methods of reducing occupational and patient exposure

LAB ACTIVITIES

- I. Operate radiographic and fluoroscopic systems
 - A. Conventional exposures
 - B. Automatically controlled exposures
- II. Load and unload films
- III. Operate film processor

DAY 2

- I. Common radiographic/fluoroscopic studies
 - A. Terminology
 - B. Positioning
 - C. Anatomy
 - D. Common studies
- II. Basic radiographic physics
 - A. History of x-ray imaging
 - B. The electromagnetic spectrum
 - C. X-ray production
 1. Bremsstrahlung radiation
 2. Characteristic radiation
 3. Characteristics of the x-ray beam
- III. Radiographic system measurements
 - A. Measuring quantity
 - B. Measuring quality
 - C. Measuring KV
- IV. Basic radiographic system overview
 - A. Production of x-rays
 - B. Formation of the x-ray image
 - C. Film, screens and processing

LAB ACTIVITIES

- I. Radiographic system components location
 - A. The x-ray tube
 - B. The high voltage transformer and cables
 - C. The beam limiting devices
 - D. The grid mechanism
- II. Radiographic system measurements
 - A. Measuring quantity
 - B. Measuring quality
 - C. Non-invasive KV measurement

DAY 3

- I. Fluoroscopic system overview
 - A. The x-ray tube
 - B. The image intensifier
 - C. Imaging optics
 - D. TV cameras
- II. Fluoroscopic system measurements
 - A. Maximum "R"
 - B. Image quality

COURSE OBJECTIVES

At the conclusion of this course, attendees will be able to:

- Define X-rays and how they are produced and controlled.
- State and follow radiation safety procedures as they apply to all personnel in radiology.
- Identify the various equipment in the radiology department and define their uses.
- Define the factors which affect radiographic quality and state how each affects the image.
- Define film, screen, and processing parameters and state how each affects radiographic quality.
- Troubleshoot the normal R/F system to the major subassembly level with 80% accuracy.

LAB ACTIVITIES

- I. Fluoroscopic system component location
 - A. The x-ray tube
 - B. The shutters
 - C. The image intensifier
 - D. The imaging optics
 - E. The TV camera system
- II. Fluoroscopic system measurements
 - A. Maximum "R"
 - B. Image quality checks

DAY 4

- I. Image quality terminology
 - A. Density
 - B. Contrast
 - C. Sharpness
 - D. Detail visibility
 - E. Resolution
- II. Factors affecting radiographic image quality
 - A. X-ray production and control
 - B. Formation of the x-ray image
 - C. Film, screens and processing

LAB ACTIVITIES

- I. Evaluation of factors affecting image quality
 - A. KV
 - B. mAS
 - C. SID/OID
 - D. Focal spot

DAY 5

- I. X-ray production and control
 - A. The x-ray tube
 1. Operation and Construction
 2. Installation
 3. Evaluation
 4. Common problems
 5. Tube rating charts
 6. X-ray tube selection
 - B. High voltage cables and terminations
 1. Construction
 2. Common problems
- II. Single phase high voltage transformers
- III. Three phase power fundamentals
 - A. Wye and Delta
 - B. Six pulse configuration
 - C. Twelve pulse configuration
- IV. Measuring mA

LAB ACTIVITIES

- I. X-ray tube evaluation
 - A. Filament resistance
 - B. Stator resistance
 - C. Anode rotation and speed
 - D. Focal spot size and resolution
- II. Measuring mA

DAY 6

- I. The x-ray control
 - A. KV control circuits
 - B. mA control circuits

PREREQUISITES FOR ADMISSION

Attendees must possess an associates degree in electronics, or equivalent electronics and service experience.

- C. Time control circuits
- D. Tube protector circuits
- E. Control logic circuits

II. System evaluation and troubleshooting

LAB ACTIVITIES

- I. Identify the KV control circuits
- II. Identify the mA control circuits
- III. Verify tube protector calibration
- IV. Invasive KV measurement
- V. Troubleshooting

DAY 7

- I. Formation of the x-ray image
 - A. Photoelectric effect
 - B. Compton effect
 - C. Geometry
 - D. Beam quality
 - E. Beam limiters
 - F. Grids
 - II. Use and evaluation of technique charts
 - III. Introduction to Automatic Exposure Control
- #### LAB ACTIVITIES
- I. Effect of grids on radiographic image quality
 - II. X-ray tube central ray alignment
 - III. X-ray field to light field alignment
 - IV. Troubleshooting

DAY 8

- I. X-ray film
 - A. Construction and Types
 - B. Sensitometric properties
 - C. Hurter and Driffield Curves
 - D. Effects on image quality
- II. Intensifying screens
 - A. Construction and Types
 - B. Effects on image quality
 - C. Screen selection, care and maintenance
- III. X-ray film processing
 - A. The processing cycle
 - B. Effects of time and temperature
 - C. Processor quality control

LAB ACTIVITIES

- I. Plot and evaluate Hurter and Driffield curves
- II. Evaluate x-ray screen's effects on image quality
- III. Perform film screen contact check
- IV. Troubleshooting

DAY 9

- I. Filmless radiography
 - A. Stimulable phosphor
 - B. PACS
 - C. Teleradiology
- II. Circle of Quality Assurance
 - A. Acceptance Testing
 - B. Performance Evaluation
 - C. CDRH Compliance Testing
 - D. Image Quality Assurance
 - E. Preventive Maintenance
 - F. Service Programs
 - G. Continuing Education
- III. Overall course review

LAB ACTIVITIES

- I. Troubleshooting

DAY 10

- I. Final exam
- II. Final exam critique
- III. Course evaluation
- IV. Parts sourcing