



Western Technical College

10605205 BioMedical Networking Applications

Course Outcome Summary

Course Information

| | |
|----------------------------|--|
| Description | A course studying the operation and maintenance of medical equipment networked information systems of a modern hospital within the HTM (Healthcare Technology Management) arena. The major topics covered are: medical networking applications, HL7, PACS, DICOM, HIS, RIS, EMR, command prompt skills, networking, telemetry, RFDI, virtualization, remote access, Linux, security topics, and medical network troubleshooting. |
| Career Cluster | Science, Technology, Engineering and Mathematics |
| Instructional Level | Associate Degree Courses |
| Total Credits | 2 |
| Total Hours | 54 |

Pre/Corequisites

| | |
|--------------|--|
| Prerequisite | 10150101 IT Hardware/Software Fundamentals |
| Prerequisite | 10150110 Cisco 1: Networking Fundamentals |
| Prerequisite | 10605100 Intro to BioMed Technology |

Textbooks

No textbook required.

Success Abilities

1. Cultivate Passion: Enhance Personal Connections
2. Cultivate Passion: Expand a Growth-Mindset
3. Cultivate Passion: Increase Self-Awareness

4. Live Responsibly: Develop Resilience
5. Live Responsibly: Embrace Sustainability
6. Live Responsibly: Foster Accountability
7. Refine Professionalism: Act Ethically
8. Refine Professionalism: Improve Critical Thinking
9. Refine Professionalism: Participate Collaboratively
10. Refine Professionalism: Practice Effective Communication

Program Outcomes

1. Manage medical equipment and systems
2. Identify the function and operation of various types of imaging equipment
3. Demonstrate a competency with computers and networks used in medical equipment
4. Apply principles of anatomy, physiology, and medical terminology
5. Demonstrate safety precautions and practices with medical equipment
6. Demonstrate professionalism

Course Competencies

1. Explain medical equipment computer applications.

Assessment Strategies

- 1.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.
- 1.2. Skill demonstration in simulated or actual situations.
- 1.3. Objective tests.

Criteria

You will know you are successful when

- 1.1. you describe what CMMS is used to accomplish.
- 1.2. You identify different commercial CMMSs and their characteristics.
- 1.3. you define typical terminology used for computers, data management, and networking.
- 1.4. You utilize appropriate terminology when describing the function of computers with medical equipment.
- 1.5. You explain the use of computer systems as a component of a medical device and/or as a tool for maintaining the medical device.
- 1.6. You compare and contrast the roles HTM vs Healthcare IT departments and personnel typically fulfil related to medical equipment computers and data.

Learning Objectives

- 1.a. Explain CMMS, medical equipment database, utilization.
- 1.b. Explain terminology related to CMMS, medical databases, and networks.
- 1.c. Explain the use of computer type systems in the maintenance of medical equipment.
- 1.d. Explain the interaction between HTM and Healthcare IT departments and personnel.

2. Apply Windows and Linux/Unix type operating systems activities as used with medical equipment.

Assessment Strategies

- 2.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.
- 2.2. Skill demonstration in simulated or actual situations.
- 2.3. Objective tests.

Criteria

You will know you are successful when

- 2.1. You compare and contrast characteristics of Windows vs Linux/Unix operating systems.
- 2.2. You identify which Windows vs Linux/Unix operating system is best suited for general and medical computer applications.
- 2.3. You define terminology for operating systems, networking, command prompt, virtualization, and remote operation.
- 2.4. You operate computers with different Windows/Linux/Unix operating systems.
- 2.5. You perform file management and networking activities at command line.
- 2.6. You access computers remotely using remote desktop and remote assistance.
- 2.7. You setup virtual operating systems.
- 2.8. You select the appropriate actions to take in various simulated scenarios with medical equipment computer systems.

Learning Objectives

- 2.a. Explain Windows and Linux/Unix operating systems.
- 2.b. Define computer terminology.
- 2.c. Describe how operating systems are used with medical equipment.
- 2.d. Practice command prompt skills.
- 2.e. Practice the use of remote computer operation.
- 2.f. Implement virtual operating systems.
- 2.g. Practice simulated operating systems activities for medical equipment in both the Windows and Linux/Unix environments.

3. Apply basic computer and network security for medical equipment and systems.

Assessment Strategies

- 3.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.
- 3.2. Skill demonstration in simulated or actual situations.
- 3.3. Objective tests.

Criteria

You will know you are successful when

- 3.1. You describe computer/network security related to HIPPA and other medical field requirements.
- 3.2. You investigate recent computer/network security breaches that have occurred in healthcare and the resulting damage.
- 3.3. You define terminology related to computer security and networking.
- 3.4. You list basic computer industry standard precautions and their limitations for computer/network security.
- 3.5. You list typical methodologies and their characteristics for securing/backing-up/archiving medical data.
- 3.6. You secure a workstation using different operating system or hardware tools.
- 3.7. You backup data using different operating system or hardware tools.
- 3.8. You setup user accounts along with appropriate permissions, access, and login requirements.
- 3.9. You utilize operating system and hardware tools to secure a networked computer.

Learning Objectives

- 3.a. Explain the need for computer/network security within medical systems.
- 3.b. Explain basic computer/network security methods.
- 3.c. Explain computer/network security related to HIPPA requirements.
- 3.d. Explain medical data archiving scenarios.
- 3.e. Practice securing computer workstations.
- 3.f. Practice data archiving schemes.
- 3.g. Practice user setup.
- 3.h. Practice setting up network security methods.

4. Explain PACS.

Assessment Strategies

- 4.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.

- 4.2. Skill demonstration in simulated or actual situations.
- 4.3. Objective tests.

Criteria

You will know you are successful when

- 4.1. You describe the role of PACS in medical equipment imaging data maintenance and utilization.
- 4.2. You define PACS terminology using appropriate computer, medical equipment, and healthcare terminology.
- 4.3. You compare and contrast a PACS vs a generic computer network system

Learning Objectives

- 4.a. Explain the function of PACS in the medical environment.
- 4.b. Define common PACS terminology.
- 4.c. Relate PACS to networking in general.

5. Explain HL7.

Assessment Strategies

- 5.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.
- 5.2. Skill demonstration in simulated or actual situations.
- 5.3. Objective tests.

Criteria

You will know you are successful when

- 5.1. You research and report on the history, goals, and activities of the HL7 organization.
- 5.2. You explain the healthcare application of the HL7 standard.
- 5.3. You define terminology related to the HL7 standard.
- 5.4. You list different HL7 standards versions along with their general characteristics and applications.
- 5.5. You explain healthcare data and equipment interoperability applications, advantages, and associated risks including the role HL7 accomplishes.
- 5.6. You describe the different parts of an HL7 message.
- 5.7. You encode/decode practice HL7 messages.

Learning Objectives

- 5.a. Describe the HL7 organization.
- 5.b. Describe the HL7 standard.
- 5.c. Explain the HL7 application for health data interoperability.
- 5.d. Describe different HL7 standards versions.
- 5.e. Describe HL7 messaging.
- 5.f. Analyze HL7 messaging.

6. Explain DICOM.

Assessment Strategies

- 6.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.
- 6.2. Skill demonstration in simulated or actual situations.
- 6.3. Objective tests.

Criteria

You will know you are successful when

- 6.1. You describe how the DICOM standard meets medical imaging data storage requirements.
- 6.2. You explain the role DICOM plays in medical device/data interoperability.
- 6.3. You define DICOM terminology as used in the current DICOM standard.
- 6.4. You explain the goals and characteristics of each of the different parts of the DICOM standard.
- 6.5. You include the purpose of the DICOM header.
- 6.6. You define terminology used for the DICOM header.
- 6.7. You analyze a typical DICOM header.
- 6.8. You explain the application of the conformance statement in implementing the DICOM standard and device interoperability.

- 6.9. You define terminology used for conformance statements.
- 6.10. You describe the parts of a conformance statement and what each part's characteristics and purpose is.
- 6.11. You analyze a typical conformance statement.

Learning Objectives

- 6.a. Explain the function of the DICOM standard.
- 6.b. Define common DICOM terminology.
- 6.c. Describe the different parts of the DICOM standard.
- 6.d. Describe the DICOM header.
- 6.e. Explain aspects of conformance statements.

7. Explain wireless applications utilized with medical equipment.

Assessment Strategies

- 7.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.
- 7.2. Skill demonstration in simulated or actual situations.
- 7.3. Objective tests.

Criteria

You will know you are successful when

- 7.1. You describe different methods used for wireless communication including but not limited to: infrared, RF, Wi-Fi, Bluetooth.
- 7.2. You define general terminology related to wireless communication.
- 7.3. You describe RFID/RTLS systems used for medical equipment.
- 7.4. You describe telemetry systems used in the medical environment.
- 7.5. You describe systems to communicate with implanted medical devices.
- 7.6. You describe the different government and industry agencies responsible for regulating the radio frequency spectrum.
- 7.7. You describe the different regulations and standards used to control and allocate use of the radio frequency spectrum.
- 7.8. You list the different radio frequencies used for medical applications.
- 7.9. You describe the function of different types of physical devices used for wireless communication.
- 7.10. You analyze wireless medical communication system setup.

Learning Objectives

- 7.a. Explain wireless communication.
- 7.b. Explain applications for wireless communication with medical equipment.
- 7.c. Explain the regulation of radio frequencies used in the medical environment.
- 7.d. Describe the different physical devices used to implement wireless communication.

8. Perform basic networking troubleshooting skills as would be used with medical equipment.

Assessment Strategies

- 8.1. Performance in assigned activities including classroom discussions, observation of and responses to in or out of class training, research assignments, and practice questions.
- 8.2. Skill demonstration in simulated or actual situations.
- 8.3. Objective tests.

Criteria

You will know you are successful when

- 8.1. You use operating system applications to troubleshoot and repair a simulated medical network.
- 8.2. You use command prompt tools to troubleshoot and repair a simulated medical network.
- 8.3. You use electronic network troubleshooting devices to troubleshoot and repair a simulated medical network.

Learning Objectives

- 8.a. Setup a simulated medical network.
- 8.b. Practice troubleshooting a simulated medical network.