# Appendix M

**INFORMATION TECHNOLOGY (IT)**
**YOUTH APPRENTICESHIP**

**PROGRAMMING & SOFTWARE DEVELOPMENT AND**
**INFORMATION SUPPORT & SERVICES PATHWAY**
**SOFTWARE UNIT**
**UNIT 5**

# Unit 5:  Programming & Software Development and Support & Services Pathway
# Software

Competency
## 1.  Use basic office software applications

Performance Standard Condition
**Competence will be demonstrated**
- at the worksite

Performance Standard Criteria
**Performance will be successful when the learner:**
- Accesses software application
- Utilizes basic features of Spreadsheet, Word Processing, Internet and Email applications as required for job tasks
- Changes application settings
- Manages files within an application
- Performs common editing and formatting functions
- Performs common printing functions
- Queries, adds, deletes, edits, saves, and prints information as applicable using these software applications
SPREADSHEETS
- Modifies worksheet data and structure
- Formats data in a worksheet
- Sorts data, manipulates data using formulas and functions
- Adds and modifies charts in a worksheet
WORD PROCESSING
- Formats text and documents Including the use of automatic formatting tools
- Inserts, edits, and formats tables in a document
INTERNET
- Uses search engines and URLs to locate valid information
EMAIL
- Creates, edits, saves, sends, and prints email communications
PUBLISHING/PRESENTATION APPLICATIONS
- Creates, edits, saves, and prints a document or presentation using these kinds of applications

Learning Objectives
- Identify new data technologies relevant to information technology
- Identify data communication trends and major current issues
- Explain how computing/networking hardware and software architecture interact
- List types of widely used software applications (e.g., word processing, database management, spreadsheet development)
- Identify new and emerging classes of software
- Identify common on-screen elements of Windows software applications
- Identify how electronic mail works

- Identify different types of information sources on the Internet
- Describe how to evaluate internet web sites and information for validity and reliability
- Explain appropriate and inappropriate uses of email and internet while at work
- Describe how to develop effective presentations using appropriate technologies (e.g., tables, charts, and visual graphics)
- Explain the use of writing/publishing/presentation applications
- Describe how database and spreadsheet technology is used at your worksite to manage worksite operations

**Comments:**

# Unit 5: Programming & Software Development and Support & Services Pathway
# Software

Competency
## 2. Assist to maintain database security measures

Performance Standard Condition
**Competence will be demonstrated**
- at the worksite
- while assisting a worksite professional

Performance Standard Criteria
**Performance will be successful when the learner:**
- Follows all security protocols for access, addition and deletion of access to databases
- Maintains confidentiality
- Loads virus detection and protection software
- Identifies sources of virus infections
- Removes viruses
- Reports viruses in compliance with company standards
- Provides for user authentication and restricted access  (e.g., assign passwords, access level)
  - o Obtain technical request as required to security requests
  - o Verify security authorization
  - o Set up new user accounts
  - o Delete old user accounts
  - o Modify current user accounts
- Documents request and action taken as required

Learning Objectives
- Identify and evaluate industry trends in database systems
- Discuss security needs for a database
- Explain the purpose of security and access to files
- Describe the security levels and access for different types of accounts and files
- Specify users and user access levels for each segment of a database
- Analyze legal and ethical dilemmas (e.g., virus development, hacking, phishing)
- Describe the role of computer forensic investigators
- List common internet crimes
- List some prevention actions related to cyber crime
- Describe techniques to identify criminal activity

**Comments:**

# Unit 5: Programming & Software Development and Support & Services Pathway
# Software

Competency
## 3. Monitor and maintain date integrity

Performance Standard Condition
### Competence will be demonstrated
- at the worksite

Performance Standard Criteria
### Performance will be successful when the learner:
- Identifies maintenance requirements
- Performs monitoring and maintenance activities regularly as required
- Verifies that all possible security safeguards are in place
- Selects and enters codes to monitor database performance
- Performs database queries to analyze database functionality
- Measures changes in productivity using metrics
- ***Assists to troubleshoot application and database problems***
- Communicates and documents maintenance activities and results

Learning Objectives
- Identify the elements of the information processing cycle (i.e., input, process, output, and storage)
- Describe the information system life cycle
- Identify current information life cycle models
- Explain the key functions of database system software
- Explain measurement techniques for performance
- Explain primary reasons for the need for data conversion
- Explain the basic concepts and potential for loss of data in data conversions

**Comments:**

# Unit 5: Programming & Software Development and Support & Services Pathway
# Software

Competency
## 4. Assist to troubleshoot application and database problems

Performance Standard Condition
### Competence will be demonstrated
- at the worksite
- while assisting a worksite professional

Performance Standard Criteria
### Performance will be successful when the learner:
- Detects problem
- Identifies available diagnostic tools used for application and database system maintenance
- Performs appropriate analysis to identify problem cause
    - Identify function affected
    - Identify what changed
    - Identify how it's supposed to work
    - Identify what doesn't match up
- Rules out hardware equipment issues
- Isolates system faults in database and applications
- Identifies criticality of problem
- Develops resolution plan
- Identifies possible solutions
- Modifies existing databases and database management systems or reports to programmers and analysts to make changes
- ***Assists to test software programming changes or modification***
- Documents troubleshooting results and solutions

Learning Objectives
- List common issues or concerns with database applications
- Describe search strategies
- Explain how search queries are used to extract useful information
- Describe how application and database issues are documented and hard-coded for future reference

**Comments:**

# Unit 5: Programming & Software Development and Support & Services Pathway
## Software

Competency
## 5. Create a database

Performance Standard Condition
### Competence will be demonstrated
- at the worksite

Performance Standard Criteria
### Performance will be successful when the learner:
- Creates a database from model specifications using both program code and Graphic User Interface (GUI) processes when provided by the database software
- Verifies that all possible security safeguards are in place
- Plans and develops record specifications
- Modifies record structures
- Populates the database created with test data
- Performs database queries to analyze database functionality and diagnose problems
- Performs database troubleshooting and system-tuning functions

Learning Objectives
- Explain database development processes
- Define database model
- Compare types of database models
- Describe a brief history of database management systems
- Review a data model describing data elements and how they are used
- Compare advantages and disadvantages of data centralization and data decentralization and its impact on computing processes
- Describe application development tools used with a database system to create solutions for an organization
- Define database schema
- Explain the purpose and function of database normalization
- Discuss industry standards for platform interface development (e.g., XML, ASP, PHP)
- Explain the process of data mining

**Comments:**

## Unit 5: Programming & Software Development and Support & Services Pathway
## Software

Competency
## 6. Acquire and install new software

Performance Standard Condition
**Competence will be demonstrated**
- at the worksite

Performance Standard Criteria
**Performance will be successful when the learner:**
- Verifies the **application package has been evaluated**
- Researches the compatibility of the hardware and software
- Identifies hardware requirements (e.g., processor, memory, disk space, communications, printers, monitors) required
- Verifies that software to be installed is licensed prior to performing installation
- Installs given application/system software in accordance with manufacturer's procedures
- Selects appropriate installation options (e.g., default, customized)
- Configures software to appropriate operating system and user application settings
- **Converts data files** if required
- **Assists to test new software**
- Refers unexpected results to worksite professional
- Documents installation, settings and testing of new software

Learning Objectives
- Identify common system processing requirements
- Explain the concept of an End User License Agreement (EULA)
- Differentiate between open source, single-user, multiple and proprietary licenses
- Explain the concept of open source
- Identify common characteristics of open source licensing agreements, including the GNU General Public License (GPL)
- Differentiate between procedures for an upgrade and for a new installation
- Differentiate between stand-alone and network software installation procedures

**Comments:**

## Unit 5:  Programming & Software Development and Support & Services Pathway
## Software

Competency
## 7.  Assist to test software programming changes or modifications

Performance Standard Condition
### Competence will be demonstrated
- at the worksite
- while assisting a worksite professional

Performance Standard Criteria
### Performance will be successful when the learner:
- Follows defined test procedures
- Accesses and runs test cases using requirements and design specification
- Helps with unit testing, integration, and regression testing as required
- Helps with user-acceptance testing
- Documents testing results and any errors discovered

Learning Objectives
- Define the purpose and principle of unit testing
- Define the purpose and principles of integration testing
- Define the purpose and principles of regression testing
- Define the purpose and principles of user-acceptance testing
- Explain how to resolve program implementation issues (e.g., debugging, documentation, auditing)
- List common software development issues (e.g., audit ability, correctness, reliability, and productivity)
- Explain how programming control structures are used to verify correctness

**Comments:**

# Unit 5:  Programming & Software Development and Support & Services Pathway
# Software

Competency
## 8.  Evaluate application software packages

Performance Standard Condition
**Competence will be demonstrated**
- at the worksite or in the classroom in a simulated setting

Performance Standard Criteria
**Performance will be successful when the learner:**
- Performs work flow analysis to determine user needs
- Evaluates appropriateness of software for specific projects
- Prepares a cost-benefit analysis for a software package
- Documents results of the software evaluation
- Performs a software configuration audit
- Performs a physical configuration audit

Learning Objectives
- Identify common system processing requirements
- Describe how to conduct work flow analysis
- Describe how to conduct a cost-benefit analysis
- List elements to evaluate in a software configuration audit
- List elements to evaluate in a physical configuration audit

**Comments:**

# Unit 5: Programming & Software Development and Support & Services Pathway
# Software

Competency
## 9. Write code

Performance Standard Condition
**Competence will be demonstrated**
- at the worksite or in the classroom in a simulated setting

Performance Standard Criteria
**Performance will be successful when the learner:**
- Analyzes and prepares logic using a program flowchart
- Analyzes and prepares logic using at least one alternative to flowcharting such as pseudo-coding
- Reviews design (e.g., peer and/or user walkthrough)
- Uses appropriate programming language
- Compiles and debugs code
- Prepares code documentation
- Prepares unit testing plan
- Conducts unit testing and bug fixes

Learning Objectives
- Identify and define object-oriented programming terminology
- List current key programming languages and the environment they are used in
- Compare languages used in software development
- Identify the use of program design tools in a software development process
- Explain programming language concepts
- Describe the necessary ~~the~~ hardware-software connections for programming
- Explain the concepts of data and procedural representations
- Discuss the basic principles for analyzing a programming language
- Explain programming structures
- Compare source and object code
- List the basics of structured, object-oriented language
- Explain how a programming language can support multitasking and exception-handling
- Describe how data structure and program design is translated into code in an appropriate language
- Describe the function and operation of compilers and interpreters
- Summarize how data is organized in software development
- List common key constructs and commands specific to a language you will be using
- Define structured/modular programming

**Comments:**

# Unit 5: Programming & Software Development and Support & Services Pathway
# Software

Competency

## 10. Participate on a software development or customization project team

Performance Standard Condition
### Competence will be demonstrated
- at the worksite

Performance Standard Criteria
### Performance will be successful when the learner:
- Reviews the scope and phases of the software development project
- Reviews the needs analysis and decision evidence for the software development project
- Participates in the following software development team activities as able:
  - Perform workflow analysis to determine user needs
  - Analyze existing procedures
  - Define business problem to be solved by the application
  - Develop networking, hardware, and software requirements and specifications
  - Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, word flowcharts)
  - Divide design specifications into logical process blocks
  - Identify constraints
  - Identify key functions and subsystems of the software product
  - Identify software development process and issues
  - Design project plan
  - ***Write code*** using appropriate programming language
  - Use code development tools (e.g. debugger, integrated development environments)
  - ***Assist to test software programming***
- Periodically reviews system project activities and completed results

Learning Objectives
- Identify roles of team members/customers in the software development process
- Describe software development processes and methodology
- Discuss key elements of functional requirements for software development
- Discuss nonfunctional requirements for a software development plan (e.g., security, integrity response time, reliability, support, and documentation)
- Explain the use, structure, and contents of a requirements specification document
- Explain how to use modeling and analyze functional requirements (e.g., dataflow diagrams, process specifications, and a data dictionary)
- Explain how to use modeling and analyze data requirements (e.g., Jackson diagrams, entity relationship diagrams, and relations)
- Describe common system analysis issues related to design, testing, implementation, and maintenance
- Identify standards and issues related to I/O programming and design of I/O interfaces

- Recognize the relationship between dependability, functionality, ease of use, etc.
- Describe trade-offs involved in design choices

**Comments:**