Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

# OS BASED PROCESSING DEVICE’S SOFTWARE MAINTENANCE

ETESM401

## MAINTAIN SOFTWARE OF OS BASED PROCESSING DEVICE

## Competence

**RQF Level:** 4

**Learning Hours** 60

**Credits:** 6

**Sector:** Technical services

**Trade:** Electronics and telecommunication

**Module Type:** Specific

**Curriculum:** TSVETE4001-TVET Certificate IV in Electronics and Telecommunication

**Issue Date:** May 2023

1200

<table>
<tr><td><b>Purpose statement</b></td><td colspan="6">This module describes the knowledge, skills, and attitude required to Maintain software in OS based processing devices.<br>Upon completion of the module, the learners will be able to conduct servicing of OS based processing device's Software maintenance namely Perform pre-installation activities, perform installation activities, maintain software of OS based processing devices, and perform post-installation activities.</td></tr>
<tr><td><b>Learning assumed to be in place</b></td><td colspan="6">Apply digital electronics fundamentals, Maintain hardware of OS based processing devices, Apply Computer skills, apply networking fundamentals</td></tr>
<tr><td rowspan="6"><b>Delivery modality</b></td><td colspan="2"><b>Training delivery</b></td><td><b>100%</b></td><td colspan="2"><b>Assessment</b></td><td><b>Total 100%</b></td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>• Group work and presentation</td><td>30%</td></tr>
<tr><td>• Individual work</td><td>40%</td></tr>
<tr><td colspan="2"></td><td colspan="3">Summative Assessment</td><td>50%</td></tr>
</table>

## Elements of Competency and Performance Criteria

| Elements of competency | Performance criteria |
|---|---|
| 1. **Perform pre-installation software activities** | 1.1. The workplace is well prepared according to the ICT workshop standards |
| | 1.2. Tools, materials, and equipment are well selected according to activities to be done |
| | 1.3. The testimony of device's owner well-recorded based on the diagnostic form |
| 2. **Perform installation Software activities** | 2.1. The types of OS based processing devices are identified based on manufacturers and models |
| | 2.2. The software types are appropriately identified according to their usages |
| | 2.3. The software types are appropriately installed according to manufacturers and models |
| | 2.4. The installed OS based processing device is effectively tested |

| | |
|---|---|
| | according to functionality testing techniques |
| **3. Maintain software of OS based processing devices** | 3.1. The OS user manual is correctly interpreted according to the preventive maintenance techniques |
| | 3.2. The software faults are identified/ interpreted according to signs and notification |
| | 3.3. The corrective/debugging maintenance techniques are applied according to software faults |
| **4. Perform software post-installation activities** | 4.1 The installed device is post-maintained as per software post-installation activities |
| | 4.2 Recommendations to the user are clearly provided as per software routine preventive maintenance operations and maintenance form |
| | 4.3 The installed device is documented according to the usage and recording template |

| **Knowledge, Skills, Attitudes** | | |
|---|---|---|
| **Knowledge** | **Skills** | **Attitudes** |
| ✓ Safety precautions, and security<br>✓ Technical Symbols and diagrams<br>✓ Interpret circuit diagrams<br>✓ Industrial codes and standards<br>✓ Basic of electronic fundamentals<br>✓ Digital electronics<br>✓ Types of operating system | ✓ Computer skills<br>✓ Proper use of measurement tools<br>✓ Computer-aided design<br>✓ Creating a circuit diagram<br>✓ Analytical skills<br>✓ Diagnostic skills<br>✓ Communication skills<br>✓ Collaborative skills<br>✓ Task management skills<br>✓ Maintaining OS software skills | ✓ Honest<br>✓ Accountability<br>✓ Self-motivated<br>✓ Gender sensitive<br>✓ Customer care oriented<br>✓ Decisive<br>✓ Time management<br>✓ Humble<br>✓ Creative / Innovative<br>✓ Patient<br>✓ Responsible<br>✓ Flexible<br>✓ Integrity<br>✓ Goal oriented<br>✓ Self-confident<br>✓ Good common sense<br>✓ Task-oriented<br>✓ Customer focused<br>✓ Energetic<br>✓ Able to work independently<br>✓ Strong moral character |

| | | |
|---|---|---|
| | | ✓ Personal hygiene<br>✓ Open-minded<br>✓ Organized<br>✓ Maintain health<br>✓ Positive work ethics<br>✓ Problem solver<br>✓ Goals oriented<br>✓ Teamwork / Collaboration<br>✓ Professionalism<br>✓ Strong Work Ethic<br>✓ Adaptability<br>✓ Safety Consciousness |

## Course content

| **Learning outcomes** | **At the end of the module the learner will be able to:**<br>1. Perform pre-installation activities<br>2. Perform installation activities<br>3. Repair software of OS based processing devices<br>4. Perform post-installation activities |
|---|---|
| **Learning outcome 1: Perform pre-installation software activities** | **Learning hours: 10** |
| **Indicative content** | |
| • **Introduction to OS based processing software**<br>✓ Definition of key concept<br>✓ Application of OS based processing software<br>• **Preparation of workplace**<br>✓ ICT lab arrangement standards<br>✓ Cleaning techniques<br>• **Selecting tools, materials, and equipment**<br>• **Completion of diagnostic Software form**<br>✓ Template of diagnosed device<br>✓ Elements of diagnostic form | |

| Resources required for the learning outcome | |
|---|---|
| **Equipment** | Mobile phone, Personal Computer (laptop, desktop), Personal protective equipment (PPE) kit |
| **Materials** | CD/DVD, Flash disk, Hard Disk Drive (HDD), VGA cable, VGA adapter, HDMI adapter, USB adapter |
| **Tools** | Computer software, Mobile phone software |
| **Facilitation techniques** | ▪ Demonstration<br>▪ Trainer guided<br>▪ Brainstorming |
| **Formative assessment methods /(CAT)** | ▪ Written assessment<br>▪ Oral presentation<br>▪ Performance assessment |

| Learning outcome 2: Perform software installation activities | Learning hours: 20 |
|---|---|
| **Indicative content** | |

- **Description of OS based processing device**
    - ✓ OS Manufacturer and models
    - ✓ OS based single task devices
    - ✓ OS based multi-task devices
- **Identification of software types of OS based processing device**
    - ✓ System software
        - Types of operating systems: for PC and Mobile phone
        - Usages of Operating system
    - ✓ Application software
        - Types of application software
        - Usages of application software
    - ✓ Utility software
        - Types of utility software
        - Usages of utility software

- **Software Installation**
    - Software installation standard
    - Operating system installation
    - Application software installation
    - Utility software installation
- **Software functionality testing**
    - software testing techniques
    - Software testing procedures

| **Resources required for the learning outcome** | |
|---|---|
| **Equipment** | Computer or processing device |
| **Materials** | Installation Media (CDs, DVDs, USB drives) |
| **Tools** | Internet connection |
| **Facilitation techniques** | ▪ Group discussion<br>▪ Demonstration<br>▪ Practical exercise<br>▪ Trainer guided |
| **Formative assessment methods /(CAT)** | ▪ Written evidence<br>▪ Oral evidence<br>▪ Performance evidence |

| **Learning outcome 3: Maintain software of OS based processing devices** | **Learning hours: 20** |
|---|---|
| **Indicative content** | |

- **Applying software preventive maintenance**
  - ✓ Types of preventive maintenance
  - ✓ software preventive maintenance techniques
    - Preventive software maintenance procedures
    - Preventive maintenance user manual
- **Identification of software faults in OS based processing device**
  - ✓ Software faults signs/notification
  - ✓ Types of software faults
- **Applying software fault corrective/debugging maintenance techniques**
  - ✓ Types of corrective maintenance
  - ✓ Steps of software fault corrective maintenance

| **Resources required for the learning outcome** | |
|---|---|
| **Equipment** | Computer or processing device, miracle box |
| **Materials** | Installation Media (CDs, DVDs, USB drives, or downloadable files from the internet), Internet connection |
| **Tools** | Mobile phone software, Computer software |
| **Facilitation techniques** | ▪ Group discussion<br>▪ Demonstration<br>▪ Practical exercise<br>▪ Trainer guided |
| **Formative assessment methods /(CAT)** | ▪ Written evidence<br>▪ Oral evidence<br>▪ Performance evidence |

| **Learning outcome 4: Perform post-installation software activities** | **Learning hours: 10** |
|---|---|
| **Indicative content** | |

- **Applying software post-installation activities**
  - ✓ Post-installation activities
- **Identification of software routine preventive maintenance operations**
  - ✓ Software routine preventive maintenance operation
  - ✓ Elements of Maintenance form
  - ✓ Types of maintenance form
- **Reporting the Work-related activities**
  - ✓ Elements of the work-related report document
  - ✓ work-related report form(s)

## Resources required for the learning outcome

| | |
|---|---|
| **Equipment** | Personal Computer (laptop, desktop), Personal protective equipment (PPE), Cell phone, tablet |
| **Materials** | CD/DVD, Flash disk, Computer spare parts, Hard Disk Drive (HDD), Mobile software repair box /USB Key CD software Cables set, Spray, Alcohol, HDMI cable, VGA cable, VGA adapter, HDMI adapter, USB adapter |
| **Tools** | Mobile phone software, Computer software, brush, sponge, |
| **Facilitation techniques** | ▪ Group discussion<br>▪ Demonstration<br>▪ Practical exercise<br>▪ Trainer guided |
| **Formative assessment methods /(CAT)** | ▪ Written evidence<br>▪ Oral evidence<br>▪ Performance evidence |

## Integrated/Summative assessment

### Integrated situation

Rwanda electronic company (REC) Ltd is an electronic and IT Company located in Southern Province, Muhanga District. It has signed an agreement with Alpha College of Education located in Western Province. The head teacher of the college has HP Intel(R) Celeron(R) N4020 CPU @ 1.10GHz, which restarts itself without ending. Matron in the same college has smartphone Techno Pop 5 which froze from last week until now. As you are hired by the company, you are requested:

a. To install new operating system in the computer HP Intel(R) Celeron(R) N4020 CPU @ 1.10GHz

b. Perform corrective maintenance of the smartphone of Matron.

The company need to ensure smooth and efficient maintenance by considering software installation and maintenance standards. You are requested also to fill the maintenance form and prepare the work-related document report;

**all tasks must be accomplished within 5 hours.**

**Resources**

| | |
|---|---|
| **Tools** | CD/DVD, Flash disk, Computer spare parts, Hard Disk Drive (HDD), Mobile software repair box /USB Key CD software Cables set |
| **Equipment** | Personal Computer (laptop, desktop), Personal protective equipment (PPE), Cell phone, tablet |
| **Materials/ Consumables** | Mobile phone software, Computer software |

| Assessable outcomes | Assessment criteria (Based on performance criteria) | Indicator | Observation | | Marks allocation |
|---|---|---|---|---|---|
| | | | Yes | No | |
| **1. Perform pre-installation activities** | 1.1. The workplace is well prepared according to the ICT workshop standards | Workplace is prepared | | | 5 |
| | 1.2 Selection of tools, materials, and equipment used to install software in OS based device | Software Installation tools are selected | | | 3 |
| | | Software Installation materials are | | | 3 |

| | | | | | |
|---|---|---|---|---|---|
| | | selected | | | |
| | | Software Installation equipment are selected | | | 3 |
| | 1.3 Filling of the device diagnostic form (Software based form) | Software diagnostic form is filled | | | 6 |
| **2. Perform Software installation activities** | 2.1. The types of OS based processing devices are identified based on manufacturers and models | Manufacturer models of the computer are identified | | | 3 |
| | | Manufacturer models of the phone are identified | | | 3 |
| | 2.2. The software types are appropriately identified according to their usages | OS is identified | | | 4 |
| | | Utility software for the telephone is identified | | | 4 |
| | 2.3. The software types are appropriately installed according to manufacturers and models | OS is installed | | | 10 |
| | 2.4. The installed OS based processing device is effectively tested according to functionality testing techniques | Functionality of computer is tested after OS installation | | | 6 |
| 3. **Maintain software of OS based processing devices** | 3.1. The OS user manual is correctly interpreted according to the preventive maintenance techniques | user manual of the phone is interpreted | | | 10 |

| | | | | | |
|---|---|---|---|---|---|
| | 3.2. The software faults are identified/ interpreted according to signs and notification | The Phone software fault is identified | | | 10 |
| | 3.3. The corrective maintenance techniques are applied according to software faults | The phone software fault is fixed | | | 10 |
| **4. Perform post-software installation activities** | 4.1 The installed device is post-maintained as per software post-installation activities | of the software are Updated | | | 4 |
| | | settings are Configured | | | 3 |
| | | user account is l created | | | 3 |
| | 4.2 Recommendations to the user are clearly provided as per software routine preventive maintenance operations and maintenance form | Recommendation is provided | | | 5 |
| | 4.3 The installed device is documented according to the usage and recording template | Work-related report is prepared | | | 5 |
| **Total marks** | | | | | 100 |
| **Percentage Weightage** | | | | | 100% |
| **Minimum Passing line % (Aggregate):**<br>70% | | | | | |

## List of abbreviations

1. **BIOS:** Basic input and output system

2. **CAT**: Common Admission Test
3. **HDD**: Hard Disc Drive
4. **ISO: (**independent system operator) International Organization for Standardization
5. **MIS:** Management Information System
6. **MSI:** Medium Scale Integration
7. **OS:** Operating System
8. **PPEs**: Personal Protective Equipment
9. **RJ: Registered Jack**
10. **SSD:** Solid State Drive
11. **UEFI:** Unified extensible firmware interface
12. **UPS**: Uninterruptible Power Supply
13. **USB 2.0:** Universal serial bus version 2

## References

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## Glossary

**Activity:** Activities include releases, events, and deployment plans that you develop, start, and complete with the product.

**API:** An interface that allows an application program that is written in a high-level language to use specific data or functions of the operating system or another program.

**Application environment:** A user-defined collection of resources that hosts an application. These application environments refer to environments that are created to be in the product.

**Application process:** A process that is associated with an application. Unlike a component or generic process, an application process is created from application-level steps.

**Application:** One or more computer programs or software components that provide a function in direct support of a specific business process or processes. See also application server.

**Architecture:** The internal structure of a computer system or a chip that determines its operational functionality and performance.

**Artifact:** A deployable item such as a file, image, database, configuration material, or anything else that is associated with a software project. By default, artifacts are stored in Code Station repository.

**ASIC:** Application-Specific Integrated Circuit. A chip that is designed to fulfill a specific task in a computer system.

**Cache:** Small, fast memory close to the CPU that can hold a part of the data or instructions to be processed. The primary or level 1 caches are virtually always located on the same chip as the CPU and are divided a cache for instructions and one for data. A secondary or level 2 cache is mostly located off-chip and holds both data and instructions. Caches are put into the system to hide the large latency that occurs when data have to be fetched from memory. By loading data and or instructions into the caches that are likely to be needed, this latency can be significantly reduced.

**Capability computing:** A type of large-scale computing in which one wants to accommodate very large and time-consuming computing tasks. This requires that parallel machines or clusters are managed with the highest priority for this type of computing possibly with the consequence that the computing resources in the system are not always used with the greatest efficiency.

**Capacity computing:** A type of large-scale computing in which one wants to use the system (cluster) with the highest possible throughput capacity using the machine resources as efficient as possible. This may have adverse effects on the performance of individual computing tasks while optimizing the overall usage of the system.

**Clock cycle:** Fundamental time unit of a computer. Every operation executed by the computer takes at least one and possibly multiple cycles. Typically, the clock cycle is now in the order of one to a few nanoseconds.

**Clock frequency:** Reciproke of the clock cycle: the number of cycles per second expressed in Hertz (Hz). Typical clock frequencies nowadays are 400 MHz--1 GHz.

**Component process:** A process defined for the deployment of components.

**Component:** A representation of deployable items and the user-defined processes that operate on them, usually by deploying them.

**Control processor:** The processor in a processor array machine that issues the instructions to be executed by all the processors in the processor array. Alternatively, the control processor may perform tasks in which the processors in the array are not involved, e.g., I/O operations or serial operations.

**Deployment:** The activities used to deliver a software project to a deployment target. Typically, you run deployments for each stage of your release lifecycle, ending with the production stage when the software becomes generally available.

**Duration:** The time a task takes to run. Duration is measured from the time a task starts until it is resolved. When you create some task types, you can estimate their expected duration. Duration is reported in minutes.

**Environment:** A collection of resources that identify the components that can be deployed by the parent application and the agents that do the work.

**EPIC:** Explicitly Parallel Instruction Computing. This term is coined by Intel for its IA-64 chips and the Instruction Set that is defined for them. EPIC can be seen as Very Large Instruction Word computing with a few enhancements. The gist of it is that no dynamic instruction scheduling is performed as is done in RISC processors but rather that instruction scheduling and speculative execution of code is determined beforehand in the compilation stage of a program. This simplifies the chip design while potentially many instructions can be executed in parallel.

**Events:** Release-related activities that are applied to releases and tracked with a calendar. You can use events to organize your releases and other time-dependent activities, such as holidays and blackouts.

**Functional unit:** unit in a CPU that is responsible for the execution of a predefined function, e.g., the loading of data in the primary cache or executing a floating-point addition.

**Initiative:** An action to take for the change occurred.

**Insights:** A set of related features such as metric data dashboards, reports, and the application portfolio.

**Instruction Set Architecture:** The set of instructions that a CPU is designed to execute. The Instruction Set Architecture (ISA) represents the repertoire of instructions that the designers determined to be adequate for a certain CPU. Note that CPUs of different making may have the same ISA. For instance, the AMD processors (purposely) implement the Intel IA-32 ISA on a processor with a different structure.

**Integration:** Regular communication between IBM Urban Code Velocity and external products and services. Communication with integrated products can be bidirectional.

**Lifecycle:** The phases in a release. A lifecycle is a template for the stages of work in a release.

**Multithreading:** A capability of a processor core to switch to another processing thread, i.e., a set of logically connected instructions that make up a (part of) a process. This capability is used when a process thread stalls, for instance, because necessary data are not yet available. Switching to another thread that has instructions that can be executed will yield better processing utilization.

**PCI bus:** Bus on PC node, typically used for I/O, but also to connect nodes with a communication network. The bandwidth varies with the type from 110-480 MB/s. Newer upgraded versions of PCI-X and PCI Express are (becoming) available presently.

**Plugin:** A separately installable software module that adds function to an existing program, application, or interface.

**Register file:** The set of registers in a CPU that are independent targets for the code to be executed possibly complemented with registers that hold constants like 0/1, registers for renaming intermediary results, and in some cases a separate register stack to hold function arguments and routine return addresses.

**Resource:** A user-defined construct that is based on the architectural model of IBM Urban Code Velocity. A resource represents a deployment target.

**RISC:** Reduced Instruction Set Computer. A CPU with its instruction set that is simpler in comparison with the earlier Complex Instruction Set Computers (CISCs) cycle.

**Role:** A job function that identifies the tasks that a user can perform and the resources to which a user has access. A user can be assigned one or more roles.

**Segment:** A period of time in a deployment plan. Deployment plans can group tasks into segments to specify when tasks are run relative to each other.

**Shared Memory (SM):** Memory configuration of a computer in which all processors have direct access to all the memory in the system. Because of technological limitations on shared bandwidth generally, not more than about 16 processors share a common memory.

**Task:** Represents a business-meaningful activity that has starting and ending points and a measurable duration. Durations are used to estimate deployment times. You add tasks to deployment plans. When you run a deployment, you complete the tasks in the plan

**User:** A representation of an account on the server. Users can be members of teams and groups. User can be created in IBM Urban Code Velocity server or import users from an external authentication realm, including an LDAP, Active Directory, or SSO provider.

**Version:** A representation of an IBM Urban Code Deploy application snapshot.

**Virtual Shared Memory:** The emulation of a shared memory system on a distributed memory machine by a software layer.