**COMPUTERS AND COMPUTING SYSTEMS, NQF LEVEL 4, CREDITS 12**

**SUMMATIVE ASSESSMENT**

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| **Module #** | 251201-005-00-KM-01: |
| **NQF Level** | level 4 |
| **Notional hours** | 120 |
| **Credit(s)** | Cr 12 |
| **Occupational Code** | 251201005 |
| **Qualification Title** | Occupational Certificate: Software Developer |

**CONTACT INFORMATION:**

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**Note to the learner**

This Learner Guide provides a comprehensive overview of the module. It is designed to improve the skills and knowledge of learners, and thus enabling them to effectively and efficiently complete specific tasks.

**Purpose**

The main focus of the learning in this knowledge module is to build an understanding of what computers can do and the processes that make them function in terms of the four major parts: input, output, CPU (central processing unit) and memory. It gives an overview of networks and connectivity as well as security issues pertaining to IT ecosystems

**Topic elements to be covered include**

The learning will enable learners to demonstrate an understanding of:

* KM-01-KT01: Problem solving skills for IT Professionals 5%
* KM-01-KT02: Techniques for safety 5%
* KM-01-KT03: System components 5%
* KM-01-KT04: Motherboards 5%
* KM-01-KT05: Processors 5%
* KM-01-KT06: Memory 5%
* KM-01-KT07: BIOS and CMOS 5%
* KM-01-KT08: Hard drives and storage devices 5%
* KM-01-KT09: Power supplies and voltage 5%
* KM-01-KT10: Ports, cables, and connectors 2%
* KM-01-KT11: Networking and network operating systems 5%
* KM-01-KT12: Networking and wireless connections 3%
* KM-01-KT13: Input and output devices 3%
* KM-01-KT14: Installing and managing printers 2%
* KM-01-KT15: Mobile devices, multimedia, and laptop computers 2%
* KM-01-KT16: Preventative maintenance 2%
* KM-01-KT17: Troubleshooting procedures 2%
* KM-01-KT18: Operating systems 5%
* KM-01-KT19: Managing files 2%
* KM-01-KT20: Applications utility, troubleshooting, and optimization 2%
* KM-01-KT21: Configuring device drivers 5%
* KM-01-KT22: Recovery 5%
* KM-01-KT23: Cloud computing 5%
* KM-01-KT24: Security fundamentals 5%
* KM-01-KT25: Programming and development 5%

**Entry Requirements**

NQF 4

**Provider Accreditation Requirements for the Knowledge Module**

**Physical Requirements:**

* The provider must have lesson plans and structured learning material or provide learners with access to structured learning material that addresses all the topics in all the knowledge modules as well as the applied knowledge in the practical skills
* QCTO/ MICT SETA requirements

**Human Resource Requirements:**

* Lecturer/learner ratio of 1:20 (Maximum)
* Qualification of lecturer (SME):
* NQF 6 in industry recognised qualifications with 1 year’s experience in the IT industry
* AI vendor certification (where applicable)
* Assessors and moderators: accredited by the MICT SETA

**Legal Requirements:**

* Legal (product) licences to use the software for learning and training (where applicable)
* OHS compliance certificate
* Ethical clearance (where necessary)

**Exemptions**

* No exemptions, but the module can be achieved in full through a normal RPL process

**Venue, Date and Time:**

Consult your facilitator should there be any changes to the venue, date and/or time.

Refer to your timetable

**Assessments**

The only way to establish whether you are competent and have accomplished the learning outcomes is through continuous assessments. This assessment process involves interpreting evidence about your ability to perform certain tasks. You will be required to perform certain procedures and tasks during the training programmer and will be assessed on them to certify your competence.

This module includes assessments in the form of self-evaluations/activities and exercises. The exercises, activities and self-assessments will be done in pairs, groups or on your own. These exercises/activities or self-assessments (Learner workbook) must be handed to the facilitator. It will be added to your portfolio of evidence, which will be proof signed by your facilitator that you have successfully performed these tasks.

Listen carefully to the instructions of the facilitator and do the given activities in the time given to you.

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# SECTION 1: KM-01-KT01: Problem solving skills for IT Professionals 5%

**Learning Outcome**

**Describe the steps to protect your computer from Cyber Threats**

• Use Strong, Unique Passwords: Create complex passwords using upper and lowercase letters, numbers, and special characters.

• Enable Two-Factor Authentication: Add extra security by requiring a second form of verification.

• Keep Software and Operating System Updated: Regularly update operating system, antivirus software, browsers, and applications with the latest security patches.

• Being wary of Phishing Scams: Avoid suspicious emails and verify sensitive information before responding.

• Having Antivirus Software: Choose reputable antivirus software to detect and prevent malware, viruses, and other threats.

• Firewall: Enable both hardware and software firewalls to filter incoming and outgoing traffic.

# SECTION 2: KM-01-KT02 : Techniques for safety 5%

**Learning Outcome**

**Describe the hazards can caused by (tripping, electrical, fire, jewellery, etc.)**

Workplace health hazards include environmental, chemical, physical, biological, ergonomic, mechanical, and biological risks.

Environmental hazards include poor air quality, exposure to hazardous substances, and exposure to toxic substances. Poor air quality and lighting can cause respiratory issues. Toxic substances can cause physical damage like eye damage from debris and chemical exposure which could lead to poisoning. Exposure to hazardous substances can pose health risks.

Chemical hazards include exposure to fumes, vapors, and corrosive chemicals. Exposure to toxic substances can cause acute or chronic health effects. Inhalation of fumes and vapors can lead to respiratory diseases. Handling corrosive chemicals can cause burns or tissue damage. As mentioned above, these could cause poisoning which could lead to workers being unable to perform their work or day to day chores or even lifelong illnesses that could even lead to death.

Physical hazards include slips, trips, falls, noise, machinery, electrical hazards, fire hazards, temperature extremes, radiation exposure, and infectious agents. Slips, trips, and falls due to wet floors, uneven surfaces, poor lighting, and obstacles. Excessive noise levels can cause hearing loss or stress. Machinery and equipment can cause injuries.

Electrical hazards can lead to shocks, burns, or fires. Fire hazards increase the risk of fire. Temperature extremes can lead to heat stress, frostbite, or hypothermia.

Biological hazards include diseases, mold, mildew, and bloodborne pathogens. Infectious agents can cause diseases. Mold and mildew can cause respiratory issues. Animal and insect bites can transmit diseases or cause injuries. Bloodborne pathogens can expose workers to diseases.

Ergonomic hazards include repetitive motions, improper lifting, and poor workstation design.

Mechanical hazards include moving parts and pressurized systems. Repeated motions can lead to musculoskeletal disorders. Improper lifting can cause back injuries. Poor workstation design can lead to discomfort or long-term injuries.

# SECTION 3: KM-01-KT03 : System components 5%

**Learning Outcome**

**Describe the storage devices such as hard drives, magnetic tapes, flash drives functions**

Hard Disk Drives (HDDs): Use magnetic storage to read and write data on a spinning disk. Capacity ranges from hundreds of gigabytes to several terabytes.

SSDs: Use flash memory to store data, providing faster access times and data transfer speeds. Capacity ranges from hundreds of gigabytes to several terabytes.

Magnetic Tapes: Use a thin strip of plastic coated with magnetic material to store data. Capacity ranges from hundreds of GBs to several TBs.

Optical Discs (CDs, DVDs, Blu-ray): Store data using lasers that read and write data on the disc's surface. Capacity ranges from up to 700 MB.

USB Flash Drives: Portable storage devices that use flash memory and connect to computers via a USB port. Capacity ranges from a few GBs to several hundred GBs.

Memory Cards (SD Cards, microSD Cards): Use flash memory to store data and are commonly used in portable devices. Capacity ranges from a few GBs to several hundred GBs.

Network Attached Storage (NAS): Dedicated file storage units that connect to a network, allowing multiple users and devices to access shared data. Capacity can be scaled from a few TBs to several dozen TBs depending on the number of drives.

Cloud Storage: Allows users to store data on remote servers accessed via the internet, managed by third-party providers. Capacity is virtually unlimited, depending on the service plan.

External Hard Drives: Portable storage devices that connect to a computer via USB, Thunderbolt, or other interfaces. Capacity is like internal HDDs and SSDs, ranging from hundreds of GBs to several TBs.

Hybrid Drives (SSHDs): Combine the large capacity of HDDs with the speed of SSDs by using a small amount of flash memory.

# SECTION 4: KM-01-KT04 : Motherboards 5%

**Learning Outcome**

Topic elements to be covered include:

**Outline the** **components of a Computer System**• CPU: Executes instructions and processes data.  
• Memory: Temporary, volatile, and read-only.  
• Storage Devices: Hard disk drives, SSDs, optical drives, USB flash drives, external drives.  
• Motherboard: Houses CPU, memory, and other essential components.  
• Power Supply Unit: Converts AC power into DC.  
• Input Devices: Keyboards, mice, touchscreens, microphones.  
• Output Devices: Monitors, printers, speakers, GPUs.  
• Network Interface Cards: Enables wired or wireless network connectivity.  
• Cooling Systems: Removes heat from critical components.  
• Peripheral Devices: Connect to the computer via USB or other interfaces.  
• Software Components: Operating System, Device Drivers, Application Software, Utility Software, Firmware, Networking Components.

# SECTION 5: KM-01-KT05 : Processors 5%

**Learning Outcome**

**Describe the basic computer Terminologies**

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# SECTION 6: KM-01-KT06 : Memory 5%

**Learning Outcome**

**Explain the types of memory: ram and rom including dram, sram, cmos ram, and vram**

AM (Random Access Memory)

Volatile memory that temporarily stores data and instructions during active tasks. Types include DRAM (Dynamic RAM), SRAM (Static RAM), CMOS RAM (Complementary Metal-Oxide-Semiconductor RAM), VRAM (Video RAM), and ROM (Read-Only Memory).

DRAM (Dynamic RAM)

Stores each bit of data in a separate capacitor within an integrated circuit. Requires periodic refreshing of data to retain information. Commonly used as the main memory in computers, laptops, and servers.

SRAM (Static RAM)

Uses bistable latching circuitry (flip-flops) to store each bit of data. Faster, more reliable, but more expensive and less dense than DRAM.

CMOS RAM (Complementary Metal-Oxide-Semiconductor RAM)

A small amount of memory powered by a battery to store BIOS settings and system configuration data. Retains system settings such as date, time, and hardware configurations when the computer is powered off.

VRAM (Video RAM)

Designed for graphics and video applications. Stores frame buffer data, used in graphics cards and integrated GPUs. Optimized for fast read/write operations necessary for rendering images and videos.

ROM (Read-Only Memory)

Non-volatile memory that permanently stores data and instructions, typically used to store firmware or low-level system software. Types of ROM include Programmable ROM, EPROM, and EEPROM.

# SECTION 7: KM-01-KT07 : BIOS and CMOS 5%

**Learning Outcome**

**Describe how to update your computer's BIOS**

* Check your current BIOS version on Windows by pressing `Windows Key + R`, type `msinfo32`, and press Enter.
* Identify your motherboard model by checking your computer's manual or using tools like CPU-Z.
* Visit the manufacturer's website and compare the latest BIOS version with your current version.
* Download the BIOS update file and read the manufacturer's instructions.
* Prepare for the update by backing up important data, ensuring stable power, and creating a bootable USB drive if needed.
* Update the BIOS using the BIOS/UEFI utility or a Windows-based utility.
* Do not interrupt the update process, as it may restart several times.
* Verify the update by restarting the computer and re-entering the BIOS/UEFI to ensure the new version is installed.
* Restore default settings if needed.

# SECTION 8: KM-01-KT08 : Hard drives and storage devices 5%

**Learning Outcome**

**What Does Hard Disk Drive (HDD) Mean?**

A Hard Disk Drive (HDD) is a data storage device that uses magnetic storage to store and retrieve digital information. It consists of one or more rotating disks, or platters, coated with a magnetic material, and read/write heads that access the data on these platters.

# SECTION 9: KM-01-KT09 : Power supplies and voltage 5%

**Learning Outcome**

**Describe the affecting system hardware and components**

Computer hardware includes the physical parts of a computer, such as the central processing unit (CPU), random access memory (RAM), motherboard, computer data storage, graphics card, sound card, and computer case. It includes external devices such as a monitor, mouse, keyboard, and speakers.

# SECTION 10: KM-01-KT10 : Ports, cables, and connectors 2%

**Learning Outcome**

**Describe what are AC-DC Converters**

AC-DC converters are integral components in modern electrical and electronic systems, allowing for the transition from AC power, commonly available from power grids to the DC power required for a multitude of applications. Their design and efficiency are critical in ensuring reliable performance across various devices and systems.

# SECTION 11: KM-01-KT11 : Networking and network operating systems 5%

**Learning Outcome**

**An understanding of secure collaboration across the internet**

Secure collaboration over the internet is vital for organizations and individuals needing to share sensitive data and work together effectively while protecting their information from unauthorized access, breaches, and other cyber threats.

Secure collaboration over the internet requires a multi-faceted approach that encompasses technology, policies, and ongoing education. By adhering to best practices and utilizing appropriate tools, individuals and organizations can effectively work together while minimizing the risk of unauthorized access and data breaches, thereby enhancing trust and productivity in their collaborative efforts.

# SECTION 12: KM-01-KT12 : Networking and wireless connections 3%

**Learning Outcome**

**Describe the common functionality of server networks**

Server networks and wireless connections are fundamental components of modern networking, serving various functions that enable efficient communication, data storage, and resource sharing among devices. Both server networks and wireless connections play pivotal roles in contemporary networking. Server networks provide essential services and centralized management for resources and applications, while wireless connections support mobility and ease of access to networked resources. Together, they enhance collaboration, flexibility, and efficiency in how individuals and organizations connect and communicate.

# SECTION 13: KM-01-KT13 : Input and output devices 3%

**Learning Outcome**

**Describe the functions of keyboards, mouses, and touchscreens**

Keyboards: Input device that is primarily used for text entry, command input, navigation, data entry, and gaming, featuring function keys and customizable options for enhanced use.

Mouses: Input device that enables pointer navigation, file selection, scrolling, and contextual actions, making them ideal for precision tasks like graphic design, onscreen navigation and gaming.

Touchscreens: Also an input device that allows direct interactions through taps and gestures, support multi-touch capabilities, and are widely used in mobile devices and interactive displays, improving accessibility for all users.

# SECTION 14: KM-01-KT14 : Installing and managing printers 2%

**Learning Outcome**

**Describe the installing and managing printers**

* Unboxing and setup: Place printer in suitable location and remove protective materials.
* Connecting: USB for direct connection or Ethernet for network printers.
* Powering On: Plug in printer and initialize it correctly.
* Installing Drivers: Install necessary drivers using CD, manufacturer’s website, or operating system.
* Adding the Printer: Use appropriate method in Windows or Mac.
* Managing Printers: Set as default, manage print queues, update drivers, follow manufacturer recommendations, manage network printers, troubleshoot common issues, and remove printers.

# SECTION 15: KM-01-KT15 : Mobile devices, multimedia, and laptop computers 2%

**Learning Outcome**

**Explain what is a mobile device?**

Mobile devices are compact, portable computing devices used for communication, internet browsing, and multimedia. Key types include smartphones, tablets, laptops, ultrabooks, wearable devices, and e-readers. These devices are characterized by portability, battery-powered functionality, wireless connectivity, touch interfaces, and specialized operating systems. They revolutionize communication and information access in modern life.

# SECTION 16: KM-01-KT16 : Preventative maintenance 2%

**Learning Outcome**

**Preventative procedures are explained**

Preventative maintenance (PM) is a process that involves regular cleaning, software updates, data backup, disk maintenance, security measures, performance monitoring, hardware checks, and user education. These procedures aim to prevent hardware and software failures, enhance equipment longevity, and ensure optimal performance. By implementing these procedures, users can improve efficiency, reduce downtime, and lower maintenance costs while prolonging system life.

# SECTION 17: KM-01-KT17 : Troubleshooting procedures 2%

**Learning Outcome**

**Hardware and software tools and the respective functions are described**

Troubleshooting is a systematic process for diagnosing and resolving hardware and software issues in computer systems. It involves using various tools such as a multimeter, POST Card, memory tester, external hard drive enclosure, basic tools, and cable tester. Software tools include antivirus/antimalware, task manager/resource monitor, system event viewer, device manager, network troubleshooter, disk utility tools, performance monitoring tools, and backup and restore software. This approach enhances diagnostic efficiency, leads to quicker solutions, and reduces downtime.

# SECTION 18: KM-01-KT18 : Operating systems 5%

**Learning Outcome**

**An understanding of operating systems is demonstrated**

An operating system (OS) is a computer system that manages various functions such as process management, memory management, file system management, device management, user interface, and security and access control. OS can be classified into different types, such as batch operating systems, time-sharing operating systems, real-time operating systems (RTOS), distributed operating systems, network operating systems, and mobile operating systems. The OS components include the kernel, which manages resource allocation, the shell for user commands, the file system for file management, device drivers for hardware communication, and system utilities for system maintenance. These functions ensure efficient use of CPU time, efficient data storage, and secure communication between hardware and applications.

# SECTION 19: KM-01-KT19 : Managing files 2%

**Learning Outcome**

**Describe the copying, moving, deleting and archiving (ZIP) files and folders**

Effective file and folder management involves key operations such as copying, moving, deleting, and archiving (ZIP compression). Copying creates a duplicate of a file or folder without affecting the original, useful for backups and sharing files. Moving transfers a file or folder to a new location, removing it from the original place. Deleting removes a file or folder, making it inaccessible, freeing up space and eliminating outdated files. Archiving compresses multiple files or folders into a single ZIP file, saving space and simplifying management. The user selects items, initiates the archive command, and creates the ZIP file, benefiting sharing and data organization.

# SECTION 20: KM-01-KT20 : Applications utility, troubleshooting, and optimization 2%

**Learning Outcome**

**Procedures for installing and removing utilities are described**

Installing Utilities:

* Identify the required utility.
* Download the utility from a trusted website.
* Run the installer file.
* Accept the EULA, choose installation type, and select the installation folder.
* Complete the installation and adjust settings according to your preferences.

Removing Utilities:

* Access Program Management.
* Locate the desired utility.
* Follow the uninstallation process for Windows or macOS.
* Use cleanup software to remove leftover files.

Troubleshooting:

* Ensure system compatibility.
* Confirm necessary administrator privileges.
* Disable antivirus if it interferes.
* Clear temporary files to resolve issues.
* Check for conflicts.
* Use Safe Mode for stubborn uninstalls.
* Note and search for error messages.
* Check installation logs for troubleshooting insights.

# SECTION 21: KM-01-KT21 : Configuring device drivers 5%

**Learning Outcome**

**Describe the system restore points**

System Restore Points are snapshots of a computer's system files, settings, and installed applications at a specific time, allowing users to revert to previous states without affecting personal files. They serve two main purposes: recovery and safety net. To create a Restore Point, users can access System Protection settings, select a drive, enable system protection, and name the restore point. Device Drivers are essential software that enables the operating system to communicate with hardware. Proper configuration is crucial for functionality. Driver management includes automatic installation, manual installation, regular updates, uninstalling drivers, and configuration settings. Regularly creating restore points and effectively managing device drivers help maintain system stability and recover from issues efficiently. By implementing these strategies, users can maintain system stability and recover from issues efficiently.

# SECTION 22: KM-01-KT22 : Recovery 5%

**Learning Outcome**

**Recovery processes are identified and application is described**

Computer recovery is a process that involves various procedures and tools to restore a computer's functionality after issues like crashes, data loss, or malware infections. Key recovery processes include System Restore, Backup and Restore, Windows Recovery Environment (Windows RE), Safe Mode, Recovery Disc or USB Drive, Factory Reset, and Command Line Recovery. System Restore uses restore points to revert the system to a previous state without affecting personal files. Backup and Restore involves creating regular copies of files and system images for recovery. Windows RE offers diagnostic tools for troubleshooting and fixing common problems. Safe Mode provides a minimal operating environment for troubleshooting. Recovery Disc or USB Drive is used to restore the system to factory settings or reinstall the operating system if it fails to boot. Factory Reset restores the computer to its original state, erasing all personal files and applications. Command Line Recovery uses command-line tools for advanced repairs.

# SECTION 23: KM-01-KT23 : Cloud computing 5%

**Learning Outcome**

**What is the relationship between internet and network (Network vs. Internet)?**

A network is a set of interconnected devices that communicate with each other, such as computers and servers. It can be a Local Area Network (LAN) with small geographical coverage, or a Wide Area Network (WAN) with larger coverage, with the internet being the largest WAN. Networks can be private or public, focusing on local communication. The internet is a global network of networks that facilitates communication and resource sharing among devices worldwide through standardized protocols like TCP/IP. It provides various services like web browsing, email, and file sharing, enabling connectivity over long distances. The internet consists of millions of interconnected networks, which enhance communication by connecting them to a broader range of resources and users. While local devices can communicate within a LAN without internet access, the internet extends the ability to connect with remote systems globally. In summary, a network is a set of interconnected devices localized in scope, while the internet is the overarching system linking countless networks worldwide.

# SECTION 24: KM-01-KT24 : Security fundamentals 5%

**Learning Outcome**

**Describe what is a Computer Security Risk?**

Computer security risks are threats that can compromise the confidentiality, integrity, and availability of information systems. These risks can come from intentional attacks, unintentional actions, and natural disasters. Key types of security risks include malware, phishing attacks, unauthorized access, data breaches, denial of service (DoS), insider threats, social engineering, weak passwords, outdated software, and natural disasters. The impacts of these risks can include data and financial loss, reputational damage, and legal consequences. To mitigate these risks, organizations should implement strategies like regular software updates, strong authentication, employee training, access controls, security solutions, and an incident response plan. Understanding and addressing these risks is crucial for maintaining effective computer security.

# SECTION 25: KM-01-KT25 : Programming and development 5%

**Learning Outcome**

**Describe the game development**

* Conceptualization: Generating game idea and creating Game Design Document.
* Pre-Production: Planning game's scope, budget, timeline, resources, prototyping, and technical design.
* Production: Implementing programming, creating art and animation assets, composing audio, and designing levels.
* Testing: Performing quality assurance to identify bugs and gather feedback.
* Launch: Preparing for release, publishing, and marketing the game.
* Post-Launch: Releasing updates, engaging with the community, and analyzing feedback for future improvements.
* Development tools: Unity, Unreal Engine, Git, Adobe Photoshop, Blender.