FUTM-CPT 122: Introduction to Computer Hardware Systems and Maintenance

Module 3:   **Building and Maintaining a Computer System**

Unit 1:   **Computer Components and Requirements**

Unit 2:   **Assembling a Computer System**

Unit 3:   **Software Installation**

Module 3

Assembling and Setting Up a Computer

Unit 1

Computer Components and Requirements

Contents

1.0 Introduction

Assembling a computer system from individual components is a fundamental skill for anyone interested in computer hardware, maintenance, or custom-built systems. This unit will prepare you and guide you on what you need to know before assembling a computer system.

2.0 Learning Outcomes

In this unit, you will:

- Be guided through the preparation stage of putting together various parts to create a fully functional computer.
- Understand the safety precautions to avoid damages during the assembling of a computer

Let's continue our journey to demystify the world of computers.

3.0 Learning Contents

3.1 Preparation for Assembly

Proper preparation is key to a successful assembly. Before you begin, here are the things you need to do:

3.1.1 Tools and Equipment Needed

The tools and equipment required include:

1. **Screwdrivers:** A screwdriver is a tool used to turn (or "drive") screws into something. It has an axial shaft with a tip of a certain shape that fits into the head of a screw. On the other end of the screwdriver is a cylindrical handle to be held by a person's hand. This tool is very essential for securing components. It is advisable to use Phillips and flat-head screwdrivers for assembling your computer.
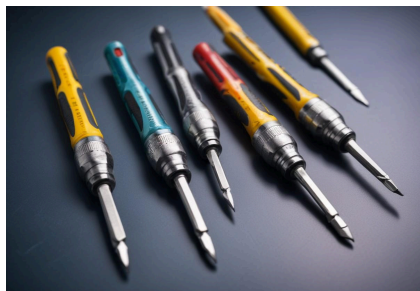

Figure 1: Screwdrivers

2. **Anti-Static Wrist Strap:** As previously mentioned in the course, it is used to prevent electrostatic discharge (ESD) that can damage your components. If you do not happen to have any anti-static spray, there are several alternatives to using an anti-static wrist strap when working with sensitive electronic components. Some alternatives include using an anti-static mat, wearing anti-static gloves, using an anti-static grounding strap attached to your work surface, or simply touching a grounded metal object before handling electronics.

Figure 2: Anti-Static Wrist Strap

3. **Thermal Paste:** This is a thermally conductive (but usually not electrically conductive) chemical compound, which is commonly used as an interface between heat sinks and heat sources such as high-power semiconductor devices. The main role of thermal paste is to eliminate air gaps or spaces (which act as thermal insulation) from the interface area to maximise heat transfer and dissipation.
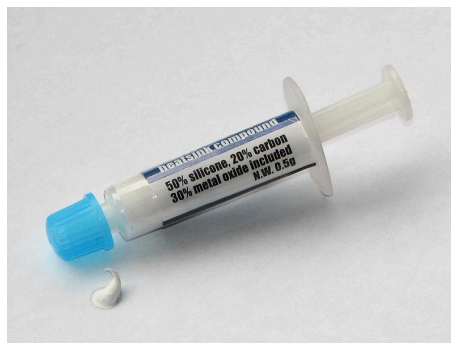
Figure 3: Thermal Paste

4. **Cable Ties:** This component will help manage cables and keep the interior of the case tidy. They have no mechanical strength (other than the surface tension of the paste and the resulting adhesive effect) and require an external mechanical fixation mechanism.

Figure 4: Cable Ties

5. **Small Size Cutting Machine:** Cable ties as mentioned are essential when tidying the wires of a computer, but when cutting the ends of these cable ties, a cutter like a plier, is essential. Other alternatives are nipper, scissors, etc.

Figure 5: Small Size Cutting Machine

3.1.2 Safety Precautions

Safety precautions are very important in the assembling of your computer as overlooking any may result in temporal or permanent damage to your computer system. Some safety precautions include;

1. **Electrostatic Discharge (ESD) Prevention:** Static electricity is the biggest danger to the expensive parts you are about to assemble. Even a tiny shock, which is much too small for you to feel, can damage or ruin the delicate electronic traces many times smaller than a human hair that makes up your CPU, RAM and other chips. It's important to use your anti-static wrist strap or its alternatives to prevent damage to these components. Once you have the power supply installed in the case, clip the end of the wrist strap to the outside of the power supply.

Never plug your computer in while you are connected to it by a wrist strap. This will ensure that you, the case and the power supply are all connected to

a common ground, in other words, there will be no inequality of charge that will allow a spark to jump from you to the case. It's also helpful to have an anti-static mat to set the case and other components on.

2. **Ensure Power Is Off Before Installation:** Turn off your computer and switch off your Power Supply at the wall before installing or removing any components. if power is flowing to components as they are installed or removed, they can be seriously damaged. To have a computer properly grounded, you need it plugged in at the wall but turned off at the power supply and the wall. The neutral line may be earthed.

3. **You Can Get Shocked:** Dismantling discrete electronic components such as your Power Supply or Monitor is dangerous. They contain high-voltage capacitors, which can cause a severe electric shock if you touch them. These hold a charge even when the unit is not plugged in and are capable of delivering a fatal shock.

4. **Safe Handling of Components:** Handle every component with care and calmness. Do not be in a hurry, take your time to avoid dropping or mishandling delicate parts.

5. **Clean and Organised Workspace:** Ensure you have a clean and organised workspace free of clutter.

6. **Proper Lighting and Ventilation:** Ensure proper lighting of the workspace to ensure clear visibility of small components and proper ventilation to prevent overheating during extended assembly sessions.
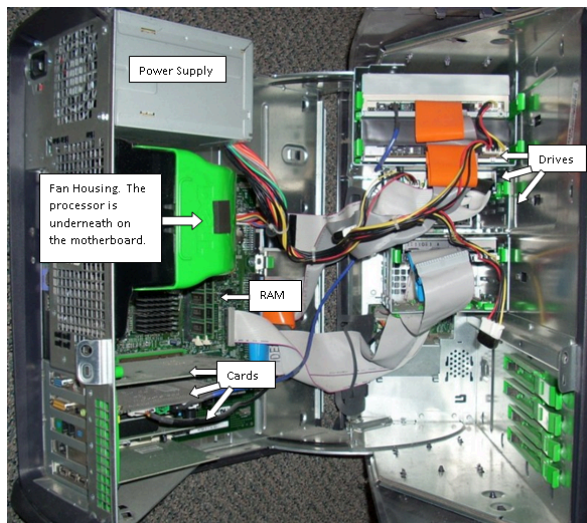
3.2   Understanding the Components

3.2.1 Case and Form Factor

The case size refers to the physical dimensions of the computer case, while the form factor refers to the motherboard's size and layout that the case can accommodate. When assembling a computer, understanding the case and form factor is important as it will determine the components you can install in your system. Check for compatibility, Cable Management, Airflow and Cooling, Drive Bays and Expansion Slots. Common form factors include;

1. ATX
2. Micro-ATX

3. Mini-ITX.

Figure 6: Desktop Case

3.2.2 Power Supply Unit (PSU)

When assembling a computer, understanding the power supply unit (PSU) is crucial as it provides the necessary electrical power to all your PC components. Here are some key points to consider about the PSU:

1. **Wattage:** The wattage of the PSU determines how much power it can supply to your components. Calculate the total power requirements of your components (CPU, GPU, drives, etc.) to determine the minimum wattage you need. It's recommended to leave some headroom for future upgrades or overclocking.

2. **Efficiency Rating:** PSUs come with efficiency ratings such as 80 Plus Bronze, Silver, Gold, Platinum, and Titanium. Higher efficiency ratings mean the PSU wastes less power and generates less heat. A more efficient PSU can also save you money on electricity bills in the long run.

3. **Modularity:** Modular PSUs allow you to detach unused cables, making cable management easier and improving airflow inside the case. Semi-modular PSUs have some fixed cables, while fully modular PSUs offer complete flexibility. Choose wisely.

4. **Connectors:** Check that the PSU has all the necessary connectors for your components, including the motherboard (ATX power connector), CPU (EPS

connector), GPU (PCIe connectors), storage drives (SATA power connectors), and peripherals.

5. **Size and Form Factor:** Make sure the PSU fits in your case. Standard ATX cases usually support ATX PSUs, but smaller form factor cases may require SFX or TFX PSUs. Check the dimensions and compatibility before purchasing.

3.2.3 Motherboard

Understanding the motherboard is essential as it serves as the foundation for connecting and powering all your PC components. Here are some key points to consider about the motherboard:

1. **Form Factor:** The motherboard's form factor determines its size and layout, which in turn affects the compatibility with your chosen case. Ensure that the motherboard form factor matches the case's form factor.

2. **Socket Type:** The CPU socket on the motherboard must match the socket type of your chosen processor. For example, if you have an Intel Core i7-9700K CPU, you will need a motherboard with an LGA1151 socket compatible with that specific CPU.

3. **Chipset:** The chipset on the motherboard determines its features and capabilities, such as the number of USB ports, SATA connections, PCIe lanes, and support for overclocking. Make sure the motherboard's chipset aligns with your requirements and supports the features you need.

4. **RAM Support:** Verify the type of RAM (DDR3, DDR4, etc.) and the maximum supported memory capacity and speed of the motherboard. Ensure it is compatible with your chosen RAM modules.

5. **Expansion Slots and Ports:** Consider the number and type of expansion slots (PCIe, M.2) and ports (USB, SATA, Ethernet, audio) available on the motherboard. This will determine the connectivity and expandability of your system.

3.2.4 Central Processing Unit (CPU)

When assembling a computer, fixing the Central Processing Unit (CPU) is a critical step that requires attention to detail and care. Here are some important points to consider when installing a CPU:

1. **Compatibility:** Ensure that the CPU is compatible with the motherboard socket. Check the motherboard's specifications to confirm compatibility with the specific CPU model you have.

2. **Handling:** Handle the CPU with care, holding it by the edges and avoiding touching the pins or contacts on the bottom. Static electricity can damage sensitive components, so it's advisable to ground yourself by touching a metal object or using an anti-static wrist strap before handling the CPU.

3. **Wiring and Cable Management:** Pay attention to the routing of cables and wires around the CPU area to avoid interference with the CPU cooler or fan. Proper cable management can improve airflow and help maintain optimal cooling performance.

3.2.5 Memory (RAM)

When assembling a computer, just like its components, fixing the Memory (RAM) is a crucial step that can significantly impact the performance of your system. Here are some important points to consider when installing RAM:

1. **Compatibility:** Ensure that the RAM modules you have chosen are compatible with your motherboard. Check the motherboard specifications for supported RAM types, speeds, and capacities. Ensure that you are using the correct RAM form factor (e.g., DDR4, DIMM, SO-DIMM).

2. **Matching Modules:** If you are installing multiple RAM modules for dual-channel or quad-channel configurations, it is recommended to use identical modules (same capacity, speed, and timings) for optimal performance.

3. **Static Precautions:** Handle the RAM modules with care and avoid touching the gold contacts on the bottom. To prevent damage from static electricity, ground yourself by touching a metal object or using an anti-static wrist strap before handling the RAM.

3.2.6 Storage Devices

When assembling a computer, it's important to understand the different types of storage devices available and how they can impact your system's performance and storage capacity. Here are some key points to consider about storage devices:

1. **Types of storage devices:** The two main types of storage devices are Hard Disk Drives (HDDs) and Solid-State Drives (SSDs). HDDs are traditional mechanical drives with spinning disks, while SSDs use flash memory for faster read and write speeds.
2. **Capacity:** Storage devices come in various capacities ranging from a few gigabytes to several terabytes. Consider your storage needs when selecting a drive, ensuring you have enough space for your operating system, applications, and files.
3. **Speed:** SSDs are significantly faster than HDDs due to their lack of moving parts. They provide quicker boot times, faster file transfers, improved overall system responsiveness and of course more expensive.
4. **Form factor:** Storage devices come in different forms, such as 2.5-inch drives for laptops, M.2 drives for compact builds, and 3.5-inch drives for desktop PCs. Ensure that your case and motherboard support the form factor of the storage device you choose.
5. **Interface:** Most storage devices use the Serial ATA (SATA) interface for connecting to the motherboard. However, newer SSDs may utilise the faster NVMe interface, which provides even higher speeds. Make sure your motherboard has compatible ports for the type of drive you plan to install.

4.0 Conclusion

In this unit, we have discussed the preparation processes of building a computer from individual components. This unit emphasised the significance of preparation, and understanding each component to ensure a functional and efficient computer system.

5.0 Summary

In this unit, we delved into the preparation stages of assembling a system from its components. Here are the key points covered:

1. Preparation for Assembly
   a. **Tools and Equipment:** Essential tools such as screwdrivers, anti-static wrist straps, and thermal paste.

b. **Safety Precautions:** Preventing electrostatic discharge (ESD) and ensuring safe handling of delicate components.

c. **Workspace Setup:** Importance of a clean, organised, and well-lit workspace.

2. Understanding the Components

a. **Case and Form Factor:** Types of computer cases and considerations for choosing the right one.

b. **Power Supply Unit (PSU):** Selecting the appropriate wattage and understanding modular vs. non-modular PSUs.

c. **Motherboard:** Compatibility and features, including connectors and slots.

d. **Central Processing Unit (CPU):** Installation process, applying thermal paste, and attaching the CPU cooler.

e. **Memory (RAM):** Installing RAM modules and configuring dual-channel or quad-channel setups.

f. **Storage Devices:** Differences between HDDs and SSDs, and their installation.

g. **Graphics Processing Unit (GPU):** Installing and securing a dedicated GPU.

h. **Additional Expansion Cards:** Installing and ensuring proper fit and connection of sound cards, network cards, etc.

Unit 2

Assembling a Computer System

Contents

1.0 Introduction

In the previous unit, we dwelled majorly on the preparation and components needed to assemble a computer system. This unit will guide you through the intricate process of putting together various components to create a fully functional computer. You will be learning the step-by-step procedures of assembly. This unit will equip you with the knowledge needed to confidently build a computer system. Whether you're assembling a computer for personal use, for a specific task, or as a professional technician.

2.0   Learning Outcomes

In this unit, you will:

- .Learn how to handle components safely, ensure compatibility, and troubleshoot common issues that might arise during assembly.
- Be able to assemble a computer system that meets specific requirements, ensuring optimal performance and reliability.

3.0 Learning Contents

3.1   Computer Assembly Process

Step 1: Installing the Motherboard

After case and motherboard selection, and paying attention to their compatibility, place the case on a flat surface, remove the side panel, and ground yourself to discharge any static electricity.

1. **Install The I/O Shield:** This metal plate goes in the back of the case and aligns with the ports on your motherboard. Make sure it snaps into place securely.
2. **Install The Standoffs:** Screw these small brass or metal pegs into the case where the motherboard will be installed. Make sure they align with the mounting holes on the motherboard.

3. **Place The Motherboard:** Carefully lower the motherboard into the case, aligning the ports with the I/O shield and the standoffs with the mounting holes. Be gentle and make sure everything fits correctly.

4. **Secure The Motherboard:** Use the screws provided with your case to secure the motherboard to the standoffs. Tighten the screws evenly but not too tight to avoid damaging the board.

5. **Connect Power Supply Cables:** Connect the main ATX power connector, CPU power connector, and any other necessary power cables from the power supply to the motherboard.

Step 2: Installing the CPU

After installing the motherboard, here are the steps for installing a CPU
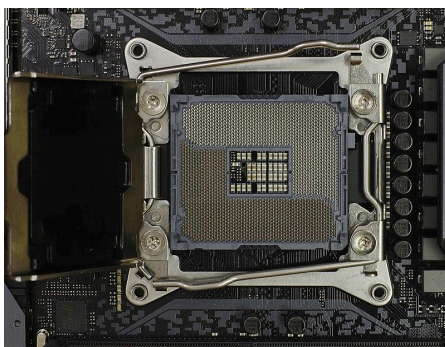

1. **Open The CPU Socket:** Locate the CPU socket on the motherboard. Lift the lever or latch to open the socket.

2. **Identify The Correct Orientation:** Look for the arrow or markings on the CPU and the socket to ensure you're inserting the CPU in the correct orientation. Be very careful not to bend the pins on the CPU.

3. **Install The CPU:** Holding the CPU by its edges (avoid touching the pins or contacts), gently place it into the socket. Ensure it is properly aligned and fits snugly. Do not apply force or wiggle the CPU once it's in place.

4. **Close The CPU Socket:** Lower the socket lever/latch to secure the CPU in place. The lever/latch should close easily; if you encounter resistance, check the CPU alignment.

5. **Apply Thermal Paste:** If you are installing an air or liquid CPU cooler, you may need to apply thermal paste to the CPU lid before attaching the cooler. Follow the instructions provided with the cooler for the correct application method.

6. **Install The CPU Cooler:** Place the cooler on top of the CPU and secure it according to the instructions provided with the cooler. This may involve attaching mounting brackets, screws, or a retention mechanism to hold the cooler in place.

7. **Connect The CPU Fan:** If your CPU cooler has a fan, connect it to the CPU fan header on the motherboard. Consult the motherboard manual for the location of the CPU fan header.

Step 3: Installing the RAM
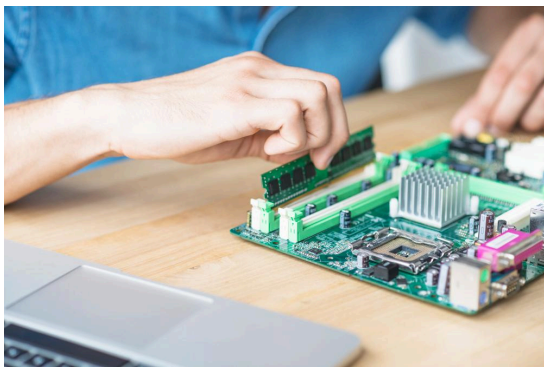
Installing RAM (Random Access Memory) is a relatively simple process. Here's a step-by-step guide on how to install RAM modules on your motherboard:

1. **Locate The RAM Slots:** Identify the RAM slots on your motherboard. They are typically located near the CPU socket and are longer than other expansion slots.

2. **Open The Clips:** Depending on your motherboard, you may need to open the clips on both ends of the RAM slot. Simply push them away from the slot until they snap into place.

3. **Align The Notches:** Check the notches on the RAM module and the slot to ensure proper alignment. Most RAM modules have a notch in the middle that corresponds to a key in the slot.

4. **Install The RAM:** Holding the RAM module by its edges (avoid touching the gold contacts), gently but firmly push the module straight down into the slot. Apply even pressure on both ends until you hear and feel the clips snap into place.

5. **Secure The Clips:** If your motherboard has clips on both ends of the slot, push them back into place to secure the RAM module. The clips should lock automatically when the RAM is properly installed.

Step 4: Installing Storage Devices

Installing a storage device, such as a solid-state drive (SSD) or hard disk drive (HDD), is a straightforward process. Here's a step-by-step guide on how to install a storage device on your computer:

1. **Open Your Computer Case:** Depending on your case, you may need to remove a side panel to access the internal components. Consult your case manual for specific instructions on how to open it.
2. **Locate The Drive Bays:** Identify the drive bays in your case where you can install the storage device. These bays are typically located in the front or side of the case and are designed to hold drives securely.
3. **Mount The Storage Device:** If you are installing a 2.5-inch SSD or HDD, you may need to use mounting brackets or screws to secure it in a drive bay. For 3.5-inch HDDs, they can slide into dedicated drive caddies or brackets directly.
4. **Connect The Sata Cable:** Locate an available SATA port on the motherboard and connect one end of the SATA data cable to the port. Connect the other end of the cable to the SATA port on the storage device.

5. **Connect The Power Cable:** Locate an available SATA power cable from your power supply unit (PSU) and connect it to the power port on the storage device. Most modern PSUs have SATA power connectors specifically for drives.

6. **Secure The Cables:** Ensure that the SATA data and power cables are connected securely to the storage device to provide stable connectivity.

Step 5: Installing the GPU (Graphics Processing Unit)

Installing a GPU is a crucial step in building a computer, especially if you intend to use your system for gaming, graphic design, or other intensive tasks that require strong graphics capabilities. Here's a step-by-step guide on how to install a GPU on your computer:

1. **Locate The PCIe Slot:** Identify the PCIe (Peripheral Component Interconnect Express) slot on your motherboard where you'll install the GPU. PCIe slots are typically longer and have a locking mechanism to secure the GPU in place.
2. **Remove The PCIe Slot Covers:** Some cases may have metal covers on the PCIe slots to protect them. Remove the appropriate covers to make room for the GPU.
3. **Prepare Your GPU:** Carefully remove the GPU from its packaging, handling it by the edges to avoid damaging the delicate components.
4. **Insert The GPU:** Align the GPU with the PCIe slot on the motherboard, ensuring that the connectors at the bottom of the GPU line up with the slot. Press down gently but firmly until the GPU is seated securely in the PCIe slot.
5. **Secure The GPU:** Depending on your case and GPU design, you may need to use screws or a locking mechanism to secure the GPU in place. Follow the instructions provided with your GPU and case to properly secure it.

6. **Connect Power Cables:** If your GPU requires additional power, connect the necessary PCIe power cables from the PSU to the connectors on the GPU. Make sure the connections are secure to provide adequate power to the GPU.

Step 6: Connecting the Power Supply Unit (PSU)

When installing a Power Supply Unit (PSU) in your computer, connecting it properly is crucial to ensure that your components receive adequate power and that your system operates safely. Here's a step-by-step guide on how to connect the PSU to your computer:

1. **Locate The PSU Mounting Area:** Identify the area in your computer case where the PSU will be installed. It is usually located at the top or bottom of the case, depending on the case design.
2. **Positioning The PSU:** Insert the PSU into the mounting area with the fan facing downward. Some cases have a PSU shroud that covers the PSU; make sure to align the PSU properly with the mounting screw holes.
3. **Secure The PSU:** Once the PSU is positioned correctly, use the screws provided with your case to secure the PSU in place. Tighten the screws evenly to ensure the PSU is firmly attached to the case.
4. **Connect the power cables:**
   a. **Motherboard:** Locate the main 24-pin power connector from the PSU. Connect it to the corresponding 24-pin power socket on the motherboard. The connector is usually located near the edge of the motherboard.
   b. **CPU Power:** Find the CPU power connector (usually 4-pin or 8-pin) from the PSU. Connect it to the CPU power socket on the motherboard near the CPU socket.
   c. **Graphics Card:** If your graphics card requires power directly from the PSU, use the appropriate PCIe power cables to connect to the GPU. Higher-end GPUs may require multiple PCIe power connectors.
   d. **Storage Drives And Other Components:** Use SATA power cables from the PSU to connect to your storage drives (HDDs and SSDs), optical drives, and any other components that require power.
5. **Cable Management:** After connecting the necessary power cables, organise and route the cables neatly to improve airflow inside the case and prevent

obstruction of components. Many cases have cable management features to help with this task.

Step 7: Connecting Peripherals

Connecting peripherals to your computer is a straightforward process that involves plugging in the necessary cables and ensuring they are properly configured. Here is a general guide on how to connect common peripherals to your computer:

1. **Identify Your Peripherals:** Gather all the peripherals you want to connect to your computer, such as a monitor, keyboard, mouse, speakers, printer, external storage devices, and any other devices you use regularly.
2. **Locate The Ports:** Identify the appropriate ports on your computer where you will connect each peripheral. Common ports include USB ports, audio jacks, HDMI or DisplayPort for monitors, Ethernet ports for networking, and more.
3. **Connect The Peripherals:**
   a. **Monitor:** Connect the monitor's cable (HDMI, DisplayPort, VGA, etc.) to the corresponding port on your computer's graphics card or motherboard.
   b. **Keyboard And Mouse:** Plug the USB or PS/2 connectors of your keyboard and mouse into the USB ports on your computer. Wireless keyboards and mice may require a USB receiver or Bluetooth connection.
   c. **Speakers or Headphones:** Connect the audio cable from your speakers or headphones to the audio output jack on your computer. Alternatively, use USB speakers for digital audio.
   d. **Printer or Scanner:** Connect your printer or scanner to a USB port on your computer. Install any necessary drivers or software provided by the manufacturer.
   e. **External storage devices:** Connect external hard drives, USB flash drives, or SD cards to the USB ports on your computer to transfer data.
   f. **Other peripherals:** Follow the manufacturer's instructions to connect other peripherals like webcams, microphones, game controllers, etc., using the appropriate ports.

Step 8: Finalising Internal Connections

Finalising internal connections when assembling a computer is a crucial step to ensure that all components are properly connected and ready for operation. Here are some tips to help you finalise internal connections during the computer assembly process:

1. **Connect Front Panel Connectors:** Connect the power button, reset button, HDD activity LED, and other front panel connectors to the appropriate pins on the motherboard.

2. **Double-Check All Connections:** Before closing up the case, go through each internal connection to ensure everything is properly connected. Make sure all cables are securely plugged in and that there are no loose connections.

3. **Organise Cables:** Proper cable management is important for airflow and ease of maintenance. Use cable ties, Velcro straps, or clips to organise and route cables neatly. Keep cables away from fans and components to prevent obstruction and improve airflow. Leave enough clearance for components to operate without interference.

3.2 First Boot and BIOS Setup

After assembling all the components and ensuring proper connections, the next crucial step is powering the system for the first time. First Boot and BIOS Setup involves ensuring that the newly built computer system can start up properly, configuring the basic settings in the BIOS to optimise performance and passing the initial Power-On Self-Test (POST). Here is a general guide on how to perform the First Boot and BIOS Setup:

1. **Power on the System:** Connect the power supply unit (PSU) power cable to a wall outlet or power strip. Ensure the power strip is turned on if you are using one. Locate the power switch on the back of the PSU and flip it to the "On" position (usually marked with an "I").

2. **Power-On Self-Test (POST):** As the system powers on, it will perform a series of self-diagnostic tests known as the POST. The purpose of POST is to check that all critical hardware components are functioning correctly.

3. **Beep Codes:** Listen for any beep codes. A single beep usually indicates a successful POST, while multiple beeps or a specific pattern of beeps can

indicate a hardware issue. Refer to your motherboard manual for a list of beep codes and their meanings.

4. **Visual Cues:** Check the monitor for any messages or indicators. You should see the manufacturer's logo or BIOS/UEFI splash screen.

5. **Access The BIOS:** During the boot-up process, you will see a message on the screen indicating which key to press to enter the BIOS setup. Common keys to access the BIOS setup are Del, F2, F10, or Esc. Press the corresponding key to enter the BIOS setup utility.

6. **Set Date And Time:** In the main BIOS screen, locate the option to set the system date and time. Adjust these settings to the correct values for your location.

7. **Check Boot Order:** Navigate to the Boot menu in the BIOS setup and ensure that the boot order is set correctly. The boot order determines which device the system will try to boot from first. Typically, you want to set the primary boot device as your primary storage drive (e.g., SSD or HDD).

8. **Save and Exit:** Once you have made any necessary changes in the BIOS setup, save the settings and exit. Usually, you can do this by pressing F10 and confirming the changes.

9. **Restart the System:** After saving the BIOS settings, the system will restart. Ensure that it boots up without any issues.

3.2.1 Troubleshooting

If the system has some issues when turned on, here are some steps you can take to troubleshoot the issue:

1. **No power or no Response:** If there are no signs of power (no lights, no fan movement), check the following:
   a. Ensure the PSU is switched on.
   b. Verify that the power cable is securely connected to both the PSU and the wall outlet.
   c. Confirm that the case power button is properly connected to the motherboard front panel header.

2. **No Display:** If the system powers on but there's no display, check:
   a. The monitor is powered on and set to the correct input source.

b. The monitor cable is securely connected to both the monitor and the GPU.

c. The GPU is properly seated in the PCIe slot and connected to the PSU if it requires additional power.

3. **Error Beeps:** If you hear a series of beeps, refer to the motherboard manual to diagnose the issue based on the beep code.

4.0 Conclusion

In this unit, we delved into the comprehensive and methodical process of building a computer from individual components. This unit emphasised the significance of meticulously following assembly steps to ensure a functional and efficient computer system along with configuring the assembled system.

5.0 Summary

In this unit, we focused on assembling a computer system and the essential tasks involved in configuring a new computer system after assembly and tailoring it to meet specific needs and preferences. This unit covered hardware setup, ensuring optimal performance and usability. Key Points Covered include:

1. **Assembly Process:**
   a. Detailed step-by-step guide to installing each component, from the motherboard and CPU to RAM, storage devices, GPU, and connecting the PSU and peripherals.
   b. Finalising internal connections and ensuring proper cable management for better airflow and organisation.
2. **First Boot and BIOS Setup:**
   a. **Powering On the System:** Initial boot-up process, checking for POST signals, and troubleshooting common issues.
   b. **Entering BIOS/UEFI:** Navigating the BIOS/UEFI menus, configuring initial settings, and setting up the boot order.
3. **Troubleshooting Common Issues:**

    a. Addressing no power or display issues, hardware compatibility problems, error beeps and codes, and system instability or overheating.

6.0 Tutor-Marked Assignment (TMA)

Question 1: Component Identification

1. List and briefly describe the function of the following components in a computer system:
   a. Central Processing Unit (CPU)
   b. Motherboard
   c. Power Supply Unit (PSU)
   d. Graphics Processing Unit (GPU)
   e. Random Access Memory (RAM)

Question 2: Assembly Steps

1. Outline the step-by-step process of installing the CPU and its cooler onto the motherboard. Include any precautions that should be taken during this process.

Question 3: Powering On the System

1. Explain the significance of the Power-On Self-Test (POST) and what you should do if the system fails to complete POST successfully.

Unit 3

Software Installation

Contents

1.0 Introduction

In Module 1, we delved into the heart of software: computer programs, in this unit we will dwell on the procedures for the installation of computer programs and software.

Understanding software components is crucial as they enable the hardware to perform tasks and provide a platform for users to interact with the computer.

2.0 Learning Outcomes

In this unit, you will cover the step-by-step installation of

- System Software
- Application Software
- Development Tools
- Security Software.

By the end of this unit, you will have a solid understanding of the steps required in the installation of software in a computer system. This unit will cover the step-by-step installation of system software, application software, development tools, and security software.

3.0 Learning Contents

3.1 Installation of System Software

As previously discussed, system software manages and controls computer hardware for applications to run smoothly, stating the key types which include operating systems, device drivers, and utility programs.

3.1.1 Operating System (OS) Installation

OS manages hardware resources, provides a user interface, and acts as a platform for applications. Here are the steps for installing an operating system on a newly assembled computer.

3.1.1.1   Prepare Installation Media

1. Obtain a bootable installation media such as a USB flash drive or a DVD containing the operating system you want to install.
2. Make sure the installation media is formatted correctly and has the necessary files to install the operating system.

3.1.1.2   Configure BIOS Settings

1. Power on the computer and enter the BIOS setup (usually by pressing Del, F2, F10, or Esc during boot).
2. Ensure the boot order is set to boot from the installation media (USB or DVD drive) first.
3. Save the BIOS settings and exit to restart the computer.

3.1.1.3   Start the Installation Process

1. Insert the installation media into the appropriate drive (USB port or optical drive).
2. Restart the computer to boot from the installation media.

3.1.1.4   Install the Operating System

1. Follow the on-screen prompts to start the installation process.
2. Select the language, time zone, and keyboard layout as prompted.
3. Choose the option to install the operating system (e.g., "Install Now" for Windows).

3.1.1.5   Enter Product Key (if required)

If prompted, enter the product key for the operating system. This is usually provided with the software or can be purchased separately.

3.1.1.6   Select Installation Type

Choose the type of installation you want (e.g, Custom installation for a fresh installation).

3.1.1.7   Wait for Installation to Complete

The installation process will copy files, install features, and configure settings. This may take some time, so be patient.

3.1.1.8   Set Up User Account and Preferences

Follow the prompts to set up a user account, password, and other preferences.

Customise settings such as computer name, colour scheme, and privacy options.

3.1.2 Drivers Installation

Device drivers allow the OS to communicate with hardware components such as printers, graphics cards, and network adapters. Here are the steps for installing drivers on a newly installed OS.

3.1.2.1   Identify the Hardware

Make a list of the hardware components that need drivers. Common devices that require drivers include graphics cards, network adapters, sound cards, and peripherals like printers and scanners.

3.1.2.2   Check the Manufacturer's Website

Visit the website of the hardware manufacturer to download the latest drivers for your specific hardware model. Make sure to download the correct drivers for your operating system. Download the driver files to your computer.

3.1.2.3   Installing the Drivers

Here's how you can install the drivers:

1. **Automatic Installation:** Some drivers come with an installer that guides you through the installation process. Simply run the installer and follow the on-screen instructions.
2. **Manual Installation:** If the drivers don't come with an installer, you can manually install them by following these steps:
    a. Press Win + X on Windows or Cmd + Space on macOS to open the search bar.
    b. Search for "Device Manager" and open it.

c. Locate the hardware device that needs a driver update. It will typically have a yellow exclamation mark next to it if the driver is missing or outdated.

d. Right-click on the device and select "Update driver."

e. Choose "Browse my computer for drivers" and navigate to the location where you saved the downloaded driver files.

f. Follow the on-screen instructions to complete the installation.

3.1.2.4 Restart Your Computer

After installing the drivers, it's a good practice to restart your computer to ensure that the changes take effect.

3.1.3 Utility Software Installation

These software perform maintenance tasks such as disk cleanup, antivirus scanning, and data backup. When installing utility software on your computer, it is important to keep in mind several key considerations to ensure a smooth and efficient installation process. They include;

3.1.3.1 Download From Reputable Sources

Always download utility software from official and reputable sources. This helps to ensure that you are getting a legitimate and safe program without any harmful malware or viruses.

3.1.3.2 Check System Requirements

Before installing the utility software, make sure that your computer meets the minimum system requirements specified by the software vendor. This includes checking compatibility with your operating system version.

3.1.3.3 Remove Conflicting Software

If you are installing a utility software that performs similar functions to an existing program on your computer, it is recommended to uninstall or disable the conflicting software to prevent any compatibility issues.

3.1.3.4 Close Other Programs

Before starting the installation process, close any unnecessary programs or applications running in the background. This helps to free up system resources and minimise the chance of conflicts during the installation.

3.1.3.5 Follow Installation Instructions

Carefully read and follow the installation instructions provided by the software vendor. This may include agreeing to terms and conditions, selecting installation options, and choosing the installation directory.

3.1.3.6 Customise Installation Options

Some utility software may offer customization options during the installation process, such as choosing specific components or features to install. Take the time to review these options and select the ones that best suit your needs.

3.1.3.7 Create A System Restore Point

Before installing utility software, consider creating a system restore point on your computer. This allows you to revert to a previous state in case any issues arise during or after the installation process.

3.1.3.8 Test The Software

Once the installation is complete, test the utility software to ensure that it is functioning as expected. This includes checking for any errors, verifying that the features work properly, and confirming compatibility with other programs on your computer.

3.2 Installation of Application Software

Application software allows users to perform specific tasks and functions on their computers, from creating documents and editing photos to browsing the internet and communicating with others. Installing application software correctly is crucial for maximising productivity and ensuring that these applications run smoothly. Proper installation ensures that these applications integrate seamlessly with the system software and hardware, providing a user-friendly experience.

3.2.1   Steps For Application Software Installation

Installing application software on your computer is a common and straightforward process. Here are the general steps to install application software:

3.2.1.1   Download The Software

Obtain the installation file for the application software you wish to install. You can download it directly from the software developer's website, a trusted software repository, or from a physical installation disc.

3.2.1.2   Check System Requirements

Before installing the application software, ensure that your computer meets the minimum system requirements specified by the software vendor. This includes checking compatibility with your operating system version, processor, RAM, and storage space.

3.2.1.3   Run The Installation File

Double-click on the downloaded installation file to begin the installation process. Follow the on-screen instructions provided by the installer. During the installation process, you may be prompted to choose installation settings such as the installation directory, shortcut creation on the desktop, and additional components to install. Customise these options based on your preferences. Also, read and accept the software licence agreement or terms and conditions if prompted. This is usually a mandatory step to proceed with the installation after which you wait for the installation to complete. The installation process may take a few moments to complete, depending on the size of the application software and your computer's performance. Be patient and do not interrupt the installation process.

3.2.1.4   Register or Activate The Software

Some application software may require you to register or activate the product using a licence key or account credentials. Follow the instructions provided to complete this step.

3.2.1.5   Run The Application

Once the installation is complete, launch the application software from the desktop shortcut or Start menu. Test the software to ensure that it runs correctly and that all features are functioning as expected.

3.3 Troubleshooting Software

When encountering software installation issues on your computer, it can be frustrating, but there are several troubleshooting steps you can take to resolve the problem.

3.3.1 Common Troubleshooting Methods For Software Installation

3.3.1.1 Check System Requirements

Make sure that your computer meets the minimum system requirements for the software you are trying to install. Ensure compatibility with your operating system version, processor, RAM, and storage space.

3.3.1.2 Run As Administrator

Right-click on the software installation file and select "**Run as administrator**" to ensure that you have the necessary permissions to install the software.

3.3.1.3 Disable Antivirus Software

Sometimes, antivirus programs can interfere with the installation process. Temporarily disable your antivirus software before attempting to install the application and remember to enable it back once the installation is complete.

3.3.1.4 Check For Conflicting Software

Ensure that there are no conflicting programs installed on your computer that may be causing installation issues. Uninstall any conflicting software or disable it temporarily.

3.3.1.5 Use A Different Installation Method

If you are experiencing issues with the standard installation process, try using a different installation method such as a manual installation or installation in compatibility mode.

3.3.1.6   Check Error Messages

Pay attention to any error messages or prompts that occur during the installation process. Use this information to troubleshoot and diagnose the specific issue.

3.3.1.7   Contact Software Support

If you have tried all the above steps and are still unable to resolve the installation issue, consider reaching out to the software developer's customer support for assistance.

4.0 Conclusion

Installing system software is the first and most critical step in setting up a computer system. The operating system (OS) acts as a bridge between the hardware and the user, providing an interface to interact with the computer and managing resources. Device drivers ensure the OS can communicate effectively with the hardware components, while utility software helps maintain and optimise the system. Application softwares, also known programs, are softwares designed to perform specific tasks or functions for end-users.

5.0 Summary

In this unit, we explored procedures for the installation of software components of a computer system. We detailed step-by-step installation guides on the different types of software and provided troubleshooting tips to ensure a smooth setup process. Understanding these software components and their installation is crucial for managing and utilising computer systems effectively.

6.0 Tutor-Marked Assignment (TMA)

Question 1: Define and Differentiate Between System Software and Application Software

- **Question:** Explain the primary functions of system software and application software. How do they differ in terms of their roles and examples? Provide at least three examples of each.

- **Guidelines:** In your answer, describe what system software and application software are, their functions, and how they interact with the hardware and the user. Provide examples like operating systems and utility software for system software, and word processors, web browsers, and games for application software.

Question 2: Explain the Importance of Driver Software in a Computer System

- **Question:** Discuss the role of driver software in a computer system. Why is it essential to keep drivers up to date? What can happen if a driver is outdated or missing?
- **Guidelines:** Explain what driver software is, its role in facilitating communication between the operating system and hardware components, and the importance of keeping drivers updated for optimal performance and security. Mention potential issues such as hardware malfunction or reduced performance that can arise from outdated or missing drivers.

Question 3: Describe the Steps Involved in Installing an Operating System

- **Question:** Outline the steps required to install a new operating system on a computer. What preparations should be made before starting the installation process? What are some common post-installation tasks?
- **Guidelines:** Provide a step-by-step guide to installing an operating system, including preparations like backing up data and ensuring compatibility, the installation process itself (booting from installation media, partitioning the hard drive, etc.), and post-installation tasks such as installing drivers, applying updates, and setting up user accounts.

Question 4: Discuss Common Issues and Solutions Related to Software Installation

- **Question:** Identify common problems that might occur during the installation of software applications and provide solutions for each. Include issues such as compatibility errors, installation failures, and conflicts with other software.
- **Guidelines:** List and explain common issues like compatibility errors with the operating system, insufficient disk space, missing dependencies, and conflicts with existing software. For each issue, provide a solution, such as checking system requirements, freeing up disk space, installing required libraries, or running the installation in compatibility mode.