Course Number  
NET 103

Course Title  
I T Essentials

Credits  
3

Lecture/Laboratory Hours  
2/3

Catalog description:
A continuation of NET102. Students learn advanced concepts regarding the installation, configuration, diagnosis, and troubleshooting of microcomputer hardware components and operating systems. Includes coverage of terminology and concepts that will assist students preparing for the A+ Certification exams.

Recommended Prerequisites:
NET102

Required texts/other materials:
Reference Division Booklist

Last revised:
Spring 2019

Course coordinator:
Jeff Weichert

Library resources:
In addition to the required textbook, students will be required to make use of a variety of technical Web sites throughout the semester.

Learning Center resources:
Some tutoring is available through the Learning Center.
**Introduction to the course**

This course is a continuation of NET 102. Students will learn advanced concepts about how microcomputer hardware and software function. Advanced installation, configuration, and upgrading of all types of internal and external computer hardware components and popular operating systems and software will be covered. Advanced troubleshooting and preventive maintenance for both computer components and software is also covered.

This course helps prepare students for the A+ Certification Core Exams (hardware and software), developed by CompTIA. Students are reminded that simply completing NET 103 will not ensure passing the A+ exams. In most cases, additional intensive self-study is required.

**Course goals**

*The student will be able to:*

- Identify, at an advanced level, the names, purposes, and characteristics, of system modules, and recognize the modules by sight or definition.

- Identify, at an advanced level, the major desktop components and interfaces, and their functions, and differentiate the characteristics of the various desktop operating systems.

- Identify, at an advanced level, the procedures for adding and removing field-replaceable modules for desktop systems and portable systems and, given a replacement scenario, choose the appropriate sequences.

- Identify, at an advanced level, the names, locations, purposes, and contents of major system files.

- Identify, at an advanced level, typical IRQs, DMAs, and I/O addresses, and procedures for altering those settings, when installing and configuring devices, and choose the appropriate installation or configuration steps in a given scenario.

- Demonstrate, at an advanced level, the ability to use command line functions and utilities to manage the operating system, including proper syntax and switches.

- Identify, at an advanced level, the names, and performance characteristics, of standardized/common peripheral ports, associated cabling, and their connectors, and recognize ports, cabling, and connectors by sight.
• Identify, at an advanced level, the concepts and procedures for creating, viewing, and managing disks, directories, and files, including procedures for changing file attributes and the ramifications of those changes (including security issues).

• Identify, at an advanced level, the proper procedures for installing and configuring common IDE and SCSI devices and peripheral devices, and choose the appropriate installation or configuration sequences in given scenarios, as well as recognize the associated cables.

• Identify, at an advanced level, the major operating system utilities, their purpose, location, and available switches.

• Identify, at an advanced level, the procedures to optimize PC operations in specific situations, and predict the effects of specific procedures under given scenarios.

• Identify, at an advanced level, the procedures involved installing the various desktop operating systems, and bringing the operating system to an advanced operational level.

• Determine, at an advanced level, the issues that must be considered when upgrading a PC, and in a given scenario, determine when and how to upgrade system components.

• Identify, at an advanced level, the steps to perform an operating system upgrade and, given an upgrade scenario, choose the appropriate next steps.

• Recognize, at an advanced level, common problems associated with each module and their symptoms, identify steps to isolate and troubleshoot the problems, and given a problem situation, interpret the symptoms and infer the most likely cause.

• Identify, at an advanced level, the advanced system boot sequences and boot methods, including the steps to create an emergency boot disk with utilities.

• Identify, at an advanced level, various troubleshooting procedures and tools, and how to elicit problem symptoms from customers.

• Identify, at an advanced level, the procedures for installing/adding a device, including loading, adding, and configuring device drivers, and required software.
• Identify, at an advanced level, the various types of preventive maintenance, safety, and environmental protection measures and procedures, and when and how to use them.

• Identify, at an advanced level, the procedures necessary to optimize the operating system and major operating system subsystems.

• Distinguish, at an advanced level, between the popular CPU chips in terms of their advanced characteristics.

• Recognize and interpret, at an advanced level, the meaning of common error codes and startup messages from the boot sequence, and identify steps to correct the problems.

• Identify, at an advanced level, the types of RAM, form factors, and operational characteristics, and determine banking and speed requirements under given scenarios.

• Recognize, at an advanced level, common operational and usability problems and determine how to resolve them.

• Identify, at an advanced level, the purpose of CMOS memory, what it contains, and how and when to change its parameters and, given a scenario involving CMOS, choose the appropriate course of action.

• Identify, at an advanced level, the networking capabilities of Windows and, given various configuration parameters, configure the operating system to connect to a network.

• Identify, at an advanced level, printer technologies, interfaces, and options/upgrades, and recognize common printer problems and techniques used to resolve them.

• Identify, at an advanced level, the Internet protocols and terminologies, and procedures for establishing Internet connectivity and, given a scenario, configure the operating system to connect to and use Internet resources.
Course-specific General Education goals and objectives

This is not a general education course.

Units of study in detail

Unit I  PC Hardware

Learning Objectives
The student will be able to…
• Locate the power supply unit, system board, system speaker, disk drive unit, and expansion slots.
• Discuss the differences between different PC case styles, and explain the strong and weak points associated with each.
• Describe the function of typical PC power supplies.
• Locate the system’s RAM banks and use documentation to determine the amount of RAM installed.
• Identify different types of RAM modules (DIP, SIP, SIMM, DIMM).
• Identify common microprocessor IC package types.
• Identify a Video Graphics Array (VGA) adapter card.
• Recognize different disk drive types associated with PCs.
• Describe typical external connections.
• Define the functions of the computer’s input/output systems.
• Explain the function of the system ROM BIOS.
• Describe the function and purpose of a disk operating system.
• Describe the value of a graphical user interface.
• Describe popular software application programs.
• Explain three classes of software used with computer systems.

Unit II  Advanced System Boards

Learning Objectives
The student will be able to…
• Name popular Pentium class microprocessors and describe their basic characteristics, such as speeds, voltages, form-factors, and cache capabilities.
• Differentiate between the characteristics of various types of RAM used in a PC system, including the different types of dynamic and static RAM.
• Discuss typical memory organization schemes used with different system board types and, given a specific memory arrangement, identify the types of devices employed.
• Identify the most popular types of motherboards, their components, and their architecture, including ATX as well as full and baby AT designs.
• Identify typical system board components, including COMM ports, memory modules, and processor sockets.
• Describe the characteristics of different expansion bus architectures, including ISA, PCI, AGP, USB, VESA, and PC Card specifications.
• Discuss basic compatibility guidelines for different types of disk drive interfaces used with Pentium system boards, including the various types of IDE and SCSI devices.
• State the purpose of CMOS RAM, what it typically contains, and how to change its basic parameters.

Unit III  Standard I/O Systems

Learning Objectives
The student will be able to...
• Define the overall function of the computer’s input/output system.
• Describe differences between parallel and serial ports.
• Identify the various port connectors used in PC-compatible systems.
• Describe the differences between synchronous and asynchronous transmissions, stating advantages and disadvantages of both.
• Describe the need for parallel/serial conversions.
• Explain the operation of an RS-232C serial communications port and define its signal lines.
• Describe the operation of the Universal Serial Bus (USB).
• List the events that occur when a key is depressed on the keyboard.
• Describe the operation of the PC’s keyboard.
• Explain the operation of a mouse.
• Describe the operation of a game port used with joysticks and game paddles.
• Describe the operation of a flat-bed scanner.
• Describe the physical aspects of a cathode-ray tube.
• Explain how a single dot can be positioned anywhere on the face of the CRT, using raster scanning.
• Describe how color displays are created on the screen.
• Define the terms pixel and PEL.
• Describe the function of a shadow mask in a CRT monitor.
• State the characteristics of the VGA video standard, including the type of physical connector specified for this video standard.
• Identify standard PC-compatible resource allocations.
• Differentiate between the operating characteristics of IEEE-1394 and USB ports.

Unit IV  Mass Storage Systems

Learning Objectives
The student will be able to...
• Differentiate between different types of hard- and floppy-disk drives.
• State reasons for the popularity of magnetic disks as computer data storage systems.
• Describe the format or organization of a typical hard or floppy disk.
• Identify the major physical blocks of the disk drive unit.
• Explain why the DOS software is so important to the operation of a disk drive.
• Differentiate between common connecting cables (SCSI, IDE, FDD).
• Discuss the different RAID advisory levels and apply them to given applications.
• Install IDE and EIDE devices, including setting Master/Slave/Single designations.
• Install and configure single and complex SCSI device chains
• Establish proper addressing and termination for SCSI devices to avoid conflicts and problems.
• Describe the operation of a Writable CD drive.
• Differentiate between different types of CDs.
• Install and configure a CD-ROM drive for operation.

**Unit V  Data Communications**

*Learning Objectives*

*The student will be able to…*

• Define the term modem.
• Define the term baud.
• Compare hardware- and software-oriented (code control) protocols.
• Describe the operation and hardware of an Ethernet LAN system.
• Differentiate among typical LAN topologies.
• Differentiate among different types of network media (10Base-2, Base-5, etc).
• Define the term wide area network (WAN).
• Describe the function of routers, hubs, and bridges in network systems.
• Discuss basic concepts relating to Internet access (dial-up, ISP, etc.).
• Discuss ISDN, DSL, and cable modem connections.
• Describe FTP operations.
• Discuss common Internet concepts and terminology (e-mail, etc.).
• Discuss the purpose and use of an Internet browser.

**Unit VI  Printers**

*Learning Objectives*

*The student will be able to…*

• Describe the various methods currently used to place computer print on paper.
• Discuss characteristics of dot-matrix characters.
• Discuss the types of paper handling common to different printer technologies.
• Install and configure a printer.
• List special considerations that must be observed when installing or repairing serial printers.
• Identify a given type of cable connection between the printer and the computer.
• Discuss data flow-control methods as they apply to serial printers.
• Identify the major components of a dot-matrix printer.
• Describe troubleshooting techniques associated with dot-matrix printers.
• Relate symptoms to associated components in a dot-matrix printer.
• Describe general alignment procedures for printhead mechanisms.
• Describe the operation of a typical ink-jet printer.
• Identify the major components of an ink-jet printer.
• Describe troubleshooting techniques associated with ink-jet printers.
• Relate symptoms to associated components in an ink-jet printer.
• Describe the process for applying print to a page in a laser printer.
• Identify the major components of a laser printer.
• Describe troubleshooting techniques associated with laser printers.
• Relate symptoms to associated components in a laser printer.

Unit VII  Portable Computer Systems

Learning Objectives
The student will be able to…
• Identify the unique components of portable systems and their unique problems.
• Describe basic procedures for adding and removing FRU modules associated with portable systems.
• Identify proper procedures for installing peripheral devices commonly used with portable systems.
• Describe the applications that the three types of PCMCIA cards can be used to perform.
• Discuss and recognize the different PCMCIA devices currently available.
• Describe the purpose of a docking station.

Unit VIII  Operating Systems

Learning Objectives
The student will be able to…
• Describe the basic functions of an operating system.
• Differentiate between single-process and multiple-process systems.
• Differentiate between multiuser, multitasking, and multiprocessor operations.
• Identify FAT-based operating system functions, structures, and major system files.
• Describe procedures for locating, accessing, and retrieving information in a command-line environment.
• Identify basic concepts and procedures for creating and managing files and directories in a FAT-based system.
• List the events that occur during the bootup process.
• Explain the basic organization of a FAT and NTFS-based disk.
• Describe the operation of the Microsoft command line.
• Identify and use disk-level commands.
• Create, delete, and navigate through various directories.
• Discuss naming conventions as they apply to various types of files.
• Find, copy, rename, delete, and move files.
• Manipulate file attributes from the Microsoft command line.
• Describe the methods used to bypass and correct inoperable MS-DOS startup sequences.
• Describe the sequence of events associated with the MS-DOS configuration during bootup.
• Describe the different types of DOS memory.
• Use the AUTOEXEC.BAT and CONFIG.SYS files to optimize system performance.
• Load driver software for any devices added to the system.

Unit IX  Basic Desktop Operating Systems

**Learning Objectives**

*The student will be able to…*

• Install and upgrade the latest desktop operating systems.
• Describe the bootup sequence.
• Navigate through the operating systems, including the Internet Explorer or equivalent.
• Explain the structure of operating systems.
• List the core files in the various operating systems structures.
• Identify the components of the Registry structure.
• Install and access printers
• Install and access software applications.
• Install and configure hardware devices and drivers.
• Install and configure local area networking functions.
• Install and configure wide area networking and Internet.

Unit IX  Advanced Desktop Operating Systems

**Learning Objectives**

*The student will be able to…*

• Identify the procedures for installing OS and bringing the software to a basic operational level.
• Identify the basic OS boot/startup sequences and alternative ways to boot the system software.
• Identify the steps to create a Startup Disk with helpful utilities installed.
• Identify the procedures for loading/adding device drivers and the necessary software for certain devices in an operating system.
• Identify procedures for changing options, configuring, and using the printing subsystem.
• Identify the procedures for installing and launching typical applications in system.
• Identify operating system functions, structure, and major system files.
• Describe the major system files, indicating where they are located and how they are used.
• Identify ways of navigating through the operating system and how to get to needed technical information.
• Describe procedures for locating, accessing, and retrieving information.
• Identify basic concepts and procedures for creating and managing files and folders.
• Identify the local area networking capabilities.
• Describe procedures for connecting to the network.
• Describe procedures for sharing disk drives, and print and file services.
• Identify concepts and capabilities relating to the Internet.
• Describe basic procedures for setting up Internet access.

Unit XI  Hardware Troubleshooting

Learning Objectives
The student will be able to...
• Describe the characteristics of a good workspace.
• Outline steps for using a digital multimeter to perform voltage, resistance, and current checks on a system, as well as identify common DMM tests associated with personal computers.
• List preliminary steps for diagnosing computer problems.
• Perform visual inspections of a system.
• Describe the three general categories of problems into which symptoms can be grouped, and differentiate between them.
• Differentiate between software- and hardware-based troubleshooting.
• Use disk-based diagnostic tools to isolate system problems.
• Describe the function of a POST card.
• Describe quick checks that can be used to determine the nature of system hardware problems.
• Describe FRU-level troubleshooting.
• Describe the steps for isolating power supply problems.
• Outline checks to isolate problems that produce a dead system.
• Discuss the methods of dealing with symptoms that are not defined well enough to point to a particular component.

Unit XII  OS Troubleshooting

Learning Objectives
The student will be able to...
• Identify and solve Setup problems.
• Locate and solve startup problems.
• Locate and solve operational problems.
• Describe system tools, disk management tools, and TCP/IP tools.
• Use the Policy Editor to change policy settings.
• Use the various Safe Mode startup scenarios.
• Use the Automated System Recovery and System Restore functions.
• Use log files to determine the location of operating system problems.
• Employ Microsoft On-line Help utilities.

Unit XIII  Preventative Maintenance

Learning Objectives
The student will be able to...
• Demonstrate proper cleaning procedures for various system components.
• Describe electrostatic discharge hazards and methods of preventing ESD.
NET 103 Course Outline

- List the steps for proper IC handling.
- Define the term ground.
- Describe the two types of uninterruptible power supplies (UPS) and state their qualities.
- State typical precautions that should be observed when working on computer equipment.
- Perform generic preventative maintenance routines as required (remove excess toner, defragment hard drives, create backup copies).
- Detail routine preventative maintenance procedures as they apply to hard and floppy disks.
- Perform basic disk management functions on a hard drive, including using ScanDisk, CHKDSK, and Defrag utilities.
- Use backup software to create backups of important data.
- Use software utilities to identify and remove viruses from computer systems.
- List precautionary steps that should be taken when handling floppy disks.
- List steps to clean dot-matrix, ink-jet, or laser printer.
- Establish and maintain preventative maintenance schedules for users.
- Differentiate between various UPS specifications and state how they apply to a given situation.
- State potential hazards that are present when working with laser printers, monitors, and other equipment.

**Evaluation of student learning**

Weekly class attendance and participation 10%
Average of weekly homework 10%
Average of weekly laboratory assignments 20%
Average of Quizzes 20%
Four Multiple-Unit Tests: Units I-IV 10%
Units V-VII 10%
Units VIII-X 10%
Units XI-XIII 10%

**Grade Policy**

Letter Grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
<th>Nominal %</th>
<th>QPA quality point value</th>
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<tr>
<td>A</td>
<td>Superior Achievement</td>
<td>93-100</td>
<td>4</td>
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<tr>
<td>A-</td>
<td></td>
<td>90-92</td>
<td>3.7</td>
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<tr>
<td>B+</td>
<td></td>
<td>87-89</td>
<td>3.4</td>
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<tr>
<td>B</td>
<td>Above Average Achievement</td>
<td>83-86</td>
<td>3</td>
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<tr>
<td>B-</td>
<td></td>
<td>80-82</td>
<td>2.7</td>
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<tr>
<td>C+</td>
<td></td>
<td>77-79</td>
<td>2.4</td>
</tr>
<tr>
<td>C</td>
<td>Average Achievement</td>
<td>70-76</td>
<td>2</td>
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<td>Minimally Passing</td>
<td>60-69</td>
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<td>F</td>
<td>Academic Failure</td>
<td>0-59</td>
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<td>X</td>
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<td>W</td>
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<tr>
<td>WA</td>
<td>Withdrawal (Administration-initiated)</td>
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</tr>
</tbody>
</table>
Audit:

If you audit the course, you will receive an “X” grade—this cannot be changed to a letter grade at a later date.

Withdrawal Course Requirements:

To receive a W grade for any course, a student must consult with the course instructor or an appropriate division representative and then withdraw officially before two-thirds of the course has been completed by submitting a withdrawal form to the Office of Student Records. Withdrawal after this point results in a grade other than W (usually F). At any time before two-thirds of the course has been completed, the instructor may also withdraw with a W grade any student who has been absent excessively. A student thus withdrawn will not be entitled to any refund of tuition or fees. The student may appeal this action.
Attendance Policy

Mercer County Community College does not have a “cut system.” Students are expected to attend all classes of every course on their schedules. Only illness or serious personal matters may be considered adequate reasons for absence.

It is the prerogative of the instructor to excuse absences for valid reasons, provided the student will be able to fulfill all course requirements.

Student performance in classes is formally verified at each class meeting. If a student’s attendance has been infrequent or performance unsatisfactory, he or she may receive notification in the mail. At any time, the instructor may withdraw the student from class for insufficient attendance.

Classroom Conduct Statement

It is the student’s responsibility to attend all classes. If a student misses a class meeting for any reason, he/she is responsible for all content that is covered, for announcements made, and for acquiring any materials that may have been distributed in class. It is expected that students be on time for all classes. Students who walk into class after it has begun are expected to choose seats close to where they entered the room so that they do not disrupt the class meeting.

Students are expected to follow ordinary rules of courtesy during the class sessions. Engaging in private, side conversations during class time is distracting to other students and to the instructor. Leaving class early without having informed the instructor prior to class is not appropriate. Unless there is an emergency, leaving class and returning while the class is in session is not acceptable behavior. Disruptive behavior of any type, including sharpening pencils during class while someone is speaking, is not appropriate.

The college welcomes all students into an environment that creates a sense of community of pride and respect; we are here to work cooperatively and to learn together.

Academic Integrity Statement

A student who knowingly represents work of others as his/her own, uses or obtains unauthorized assistance in the execution of any academic work, or gives fraudulent assistance to another student is guilty of cheating. The penalty for violating the honor code is severe. (See Student Handbook.) Any student violating the honor code is subject to receive a failing grade for the course and will be reported to the Office of Student Affairs. If a student is unclear about whether a particular situation may constitute an honor code violation, the student should meet with the instructor to discuss the situation.

It is permissible to assist classmates in general discussions of computing techniques; general advice and interaction are encouraged. Each person, however, must develop his or her own solutions to the assigned homework and laboratory exercises. Students may not "work together" on graded assignments. Such collaboration constitutes cheating, unless it is a group assignment. A student may not use or copy (by any means) another's work (or portions of it) and represent it as his/her own.