

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

**COURSE CURRICULUM
COURSE TITLE: COMPUTER MAINTENANCE AND TROUBLE SHOOTING
(COURSE CODE: 3350701)**

Diploma Programmes in which this course is offered	Semester in which offered
Computer Engineering	5 th Semester

1. RATIONALE

For the smooth functioning of computer system it is frequently required to upkeep, maintain, repair, troubleshoot and take up preventive maintenance of the system and its peripheral devices. Therefore it is essential for the students to acquire skills in the area of computer maintenance and troubleshooting and its preventive maintenance.

This course is focused on developing skills in installation and configuration of Operating systems, loading and configuring various device drivers, diagnosing the faults and troubleshoots the computer at software level as well as component level. This course will be helpful for students to get employment in the computer maintenance industry as well as self employment.

2. LIST OF COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in students so that they are able to acquire following competency:

- **Identify faults, troubleshoot, repair and do preventive maintenance of computer system and its peripherals.**

3. COURSE OUTCOMES:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- Install, configure Operating Systems and device drivers.
- Install, configure and maintain various components in computer system and peripheral devices.
- Diagnose faults, repair and maintain computer system and its peripherals.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit ESE - End Semester Examination; PA - Progressive Assessment.

5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Inside the PC: Core Components	1a. List and Identify the components of computer system 1b. State devices required for using laptops 1c. List ports and connecting devices 1d. Draw and explain the functional block diagram of motherboard	1.1 Identify different type and generation of computer, Identify devices required for using laptops, Identify components which makes the system and specify its importance. Identify various types of ports and its connecting devices. Motherboard: definition, Components/connections in motherboard, functional block diagram
	1e. Explain functionality and features of CPU 1f. Differentiate types of motherboards preprocessors	1.2 Central Processing Unit (CPU): CPU Speeds, Word Size, Data Path, Internal Cache memory, Slots and sockets, CISC vs RISC processor, CPU chips preprocessors motherboard Types/Form Factors (AT, Baby AT, ATX, LPX, NLX, BTX)
	1g. Describe bus slots and cards 1h. Define System Controller	1.3 Expansion Buses (Definition, Bus Architecture (PC/PC-XT, PC-AT/ISA, EISA, MCA, VESA Local (VL) Bus, PCI, Combination of Bus Systems, AGP – Accelerated Graphics Port, Universal Serial Bus (USB), IEEE 1394 Fire Wire- A Bus Standard 1.4 System Controller : Definition
	1i. Explain BIOS features	1.5 Basic Input Output System :Services, Bios Interaction, CMOS-RAM
	1j. List advantages of Chipsets	1.6 Chipsets : Definition, Advantage, North and South Bridge
	1k. List features of different types memory modules	1.7 System Memory : definition, memory sizes, speeds and shapes (DIP, ZIP, SIPP, SIMM, DIMM, RIMM), Memory modules (Dynamic RAM, SDRAM, DDR SDRAM, SLDRAM, DRDRAM, Fast Page Mode (FPM) DRAM, Extended Data Out(EDO) DRAM)
	Unit– II Hard Disk Drive and Controller, DVD Drives	2a. Define: Heads, Tracks, Sectors, Cylinders, Cluster, Landing zone, MBR, Zone bit recording . 2b. Describe functioning of hard disk.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	2c. Describe the parameters of performance characteristics of hard disk	2.4 Disk performance Characteristics: Seeks and Latency, Data Transfer Rate
	2d. Explain the working of hard disk controller	2.5 Hard Disk Controller: Functional Blocks, HDC Functions
	2e. Explain types of DVD, recording and constructions	2.6 DVD Drives : Types, Recording, Construction, Interfacing,
	2f. Describe the DVD drive performance criteria	2.7 DVD Drive Performance Criteria : Data Transfer Rate, Access time, Cache/buffer
	2g. list blu-ray disk specification	2.8 Blu-ray disk specification
Unit– III Input Devices and Printers	3a. Explain operation of keyboard 3b. Explain operation of mouse 3c. Explain working of scanner	3.1 Keyboard : Keyboard operation, Keyboard Types , Types of Key switches (Membrane, mechanical, rubber dome, capacitive) 3.2 Keyboard interfaces 3.3 Mouse : Types, Operation, Interfaces 3.4 Scanner : Scanner Types, Image quality measurement, Working
	3c. Classify printer 3d. Describe the working of LaserJet and Ink-jet Printer .	3.5 Types of Printers 3.6 Printer Interfaces 3.7 Ink-jet Printer : Parts, working principle 3.8 LaserJet Printer : Parts, working principle
Unit– IV Monitor and Display Adapters	4a. Define video basics (CRT parameters) and VGA monitors	4.1 Video Basics (CRT parameters) 4.2 VGA monitors
	4b. Differentiate digital display technologies 4c. State the appropriate applications of digital display	4.3 Digital Display Technology- Thin Displays, Liquid Crystal Displays, Plasma Displays, Light Emitting Displays
	4d. Differentiate graphic cards 4e. Explain their applications	4.4 Graphics Cards : Components of a card, Accelerated Video cards, CGA, EGA, VGA
Unit– V Trouble Shooting and Preventive Maintenance	5a. Explain POST sequence	5.1 POST : Functions, IPL Hardware, Test Sequence, Error messages
	5b. Explain troubleshooting procedures of listed peripherals and motherboard	5.2 Troubleshooting : possible problems and diagnosis <ul style="list-style-type: none"> ● Motherboard ● Keyboard ● Hard Disk Drive ● Printer

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	5c. Discuss preventive maintenance techniques 5d. List the Preventive maintenance tools	5.3 Preventive maintenance tools

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Inside the PC: Core Components	11	04	06	08	18
II	Hard Disk Drive and Controller, DVD Drives	07	04	04	04	12
III	Input Devices and Printers	07	04	06	04	14
IV	Monitor and Display Adapters	07	03	07	00	10
V	Trouble Shooting and Preventive Maintenance	10	00	10	06	16
	Total	42	15	33	22	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's Revised Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills (**Outcomes in cognitive, psychomotor and affective domain**) so that students are able to acquire the required competencies.

Following is the list of practical exercises for guidance:

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of Programme Outcomes/Course Outcomes in affective domain as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Hrs. required
1	I	Identify basic components of a personal computer. Prepare a list of various computer peripherals. (e.g. CPU, Monitor, Keyboard, Mouse, Speaker, Web cam, Printer, Scanner, microphone, speakers, modem, projector etc).	01
2	I	Identify common ports, associated cables, and their	01

		connectors. Observe various connectors, ports back and front side of the computer. Write their purpose and specifications. (e.g. Power, PS/2 keyboard and mouse, Serial and parallel, USB, VGA, LAN, Audio & microphone, Firewire, HDMI, games, SATA etc.)	
3	I	Identify major components including motherboards, memory, drives, peripheral cards and devices, BIOS, and Windows operating system. Observe the various components on the motherboard, identify it. Also observe their interconnection and arrangement inside the case. Detach and attach the cables and component in the PC case and motherboard. Carryout detailed study on all the components and devices on the given motherboard. <ul style="list-style-type: none"> • Processor socket ,Chipsets, • Memory module slots, BIOS, CMOS • FDD, HDD connectors • Different types of expansion slots (ISA, EISA, PCI, PCI express, AGP, Express Card & PC Card (or PCMCIA) etc.) • Add-on-cards (audio, graphics, I/O, TV tuner, network etc.) • Cables in a computer system (IDE Ribbon cable, SATA cable etc) • Connections for button, indicator lights etc. • Observe various types of memory modules (SIMM, DIMM, SO-DIMM, RIMM, SO-RIMM). Also observe impact of removal of memory modules from the system, start it and re insert memory module and restart system. • Disassemble the PC carefully. Assemble the same PC you have disassembled and boot the system. Observe the procedure of assembling a computer system. 	02
4	I	Observe the different types of motherboards, form factors and write the difference between the desktop motherboard and laptop motherboard, all in one desktop motherboard, server motherboard. (e.g Full size AT, baby AT, ATX, LPX, NLX etc)	02
5	I	Identify the on-board features of the motherboard. Add additional facilities like the network capabilities, and gaming capabilities by adding an Accelerator card. Install the given driver and test the computer for proper functioning. Remove the drivers for some devices like sound, display, network etc. and again install them and check the proper functioning of computer. Upgrade the given PC by adding RAM and additional Hard Disk.	02
6	II	Observe, search and write the specifications of CD/DVD	Homewo

		drive, HDD, motherboard, RAM chips, Power supply, Microprocessor chip, Add on cards. Prepare complete specifications of the latest system configuration available in the market.	rk
7	II	Observe the power supply (SMPS) and measure their voltage levels of a given SMPS. Measure various voltage levels, such as motherboard, storage devices and fan etc. using multi-meter. Do a detailed study on all the components and devices on the given power supply. Observe different types of switch mode Power Supply – AT, ATX, NLX . Record the different types of power connectors on the motherboard.	02
8	II	Observe various secondary storage systems- Hard Disk, Flash drives, CD/ DVD drive. Open drives and draw the internal structure of them. (If available Also open the various FDD/HDD disks to observe the magnetic disk inside.)	02
9	II	Observe the various techniques for low level and high level formatting of Hard Disk. Format the given Hard Disk using any one technique and create three partitions, two for operation systems and one for data.	01
10	II	Observe the procedure for installing Operating System like win7/win8 with partition formatted in previous practical in one partition, (fat, fat16, fat32, ntfs, gpt). Try booting PC. Learn the content of boot.ini after the installation process. Now install unix Operating System like Linux /Ubuntu/ centos/ fedora/ red hat in another partition. Create dual booting system try booting PC. Learn the content of boot.ini after the installation process.	02
11	III	Open at least 2 to 3 different types of keyboard and mouse and observe the internal circuits. Observe and write steps to troubleshoot, maintain and clean the diskette drives, keyboard, mouse, etc.	02
12	III	Observe different types of printers (dot matrix, inkjet & laser, multifunction). Install driver and interface the printers with PC/Laptop on any operating system (connect the printer to one PC directly using USB/Serial/Parallel ports as per the availability; test the functioning of the printer.) Write detailed comparative analysis of different types of printer available in the market and suggest a printer with good features and best price as per need. Justify your printer selection.	02
13	III	Observe the interfacing, installation and working of various devices such as scanner, projector, web cam etc. Connect all these devices with the given PC, install & test them.	02
14	V	Identify BIOS settings. (strictly under the observation of Instructor) <ul style="list-style-type: none"> • Define BIOS. • Demonstrate starting BIOS. • Identify how to disable unused devices to decrease 	02

		<p>security risks.</p> <ul style="list-style-type: none"> • Change booting of computer with different secondary storage CD, HDD, USB etc. 	
15	V	Identify the problem in the given PC, using the given troubleshooting sequence, fix the issue, record the given problem, and produce proper documentation of your work	02
16	V	<p>Recognize common symptoms associated with diagnosing and troubleshooting PCs and utilize Windows built-in diagnostic tools.</p> <ul style="list-style-type: none"> • Identify general troubleshooting techniques and strategies • Utilize scandisk, control panel, boot-up menu, and startup disk as diagnostic tools. • Access Microsoft Knowledge Base on the Internet to solve common problems. • Identify the common problems associated with shutdown, configuration, and cabling. • Identify problems associated with heating and cooling of the internal components. • Identify problems with installing internal devices such as hard drive, tape drives, or CD-ROM drive. • Recognize and interpret the meaning of common error codes and startup messages. • Recognize windows-specific printing problems and corrections. 	02
17	V	<p>Log boot ups and events.</p> <ul style="list-style-type: none"> • Describe the purpose of logging system events. • Correlate an event with a job and session. • Describe how the SLOG command enables and disables the selected system logging events. <p>Define registry file operation and maintenance.</p> <ul style="list-style-type: none"> • Describe registry file operations. • Demonstrate proper registry file maintenance practices. • Demonstrate how to remove unwanted software applications. 	02
18	V	Search for various data recovery software apply on pen drive/HDD.	02
19	V	<p>Perform computer maintenance and preventative maintenance functions.</p> <ul style="list-style-type: none"> • Perform physical cleaning (internal and external) of personal computer. • Demonstrate how to adjust basic performance settings. • Perform hard drive file system maintenance. • Identify anti-virus software and applications. • Identify diagnostic software such as Norton Utilities. <p>(Discuss the system maintenance & troubleshooting. Create policies, quality check forms and create a standard</p>	02

		procedure to reduce the maintenance job. Conduct the Preventive maintenance and troubleshooting of repaired PCs in the laboratories, create detailed plan to conduct the work in the stipulated time. Create a detailed report of your work.)	
20	V	Utilize Internet to download device drivers. Installation of drivers of various devices from the internet.	02
21	V	Demonstrate to remove unwanted software applications.	01
22	V	Operate and maintain registry file . <ul style="list-style-type: none"> • Describe registry file operations. & demonstrate proper registry file maintenance practices. 	02
23	V	Log boot ups and events. <ul style="list-style-type: none"> • Describe the purpose of logging system events. • Correlate an event with a job and session. • Describe how the SLOG command enables and disables the selected system logging events. 	02
Total (practical for 28 hours from above representing each unit may be selected)			42

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- i. Survey of computer system, laptops, servers and peripherals available in the market to get awareness of the technology being used and their specifications.
- ii. Prepare comparative charts as outcome of survey done.
- iii. Seminar presentation on various peripherals and it's working.
- iv. Industry visit to a company or workshop where maintenance are carried out.
- v. Prepare charts for various types of CPU and input/output devices available in market.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

The course activities should include Lectures and Practical Exercises with sufficient hands on as per teaching scheme. Following instructional strategies should be followed to cover the content:

- i. Concepts should be introduced in input sessions using multimedia projector.
- ii. More focus should be given on Practical work through laboratory sessions.
- iii. Discussion sessions.
- iv. Demonstrations.
- v. Power point presentation to explain construction and functioning of various devices and components.
- vi. Debate/Group Discussions for comparison of various peripherals and computer systems

10. SUGGESTED LEARNING RESOURCES

A) List of Books

S. No.	Title of Book	Author	Publication
1.	Computer Installation and Servicing	D Balasubramanian	Tata McGraw Hill Education Private Limited
2.	The complete PC Upgrade & Maintenance Guide	Mark Minasi	BPB Publications
3.	IBM PC and clones	Govind Rajalu	Tata McGraw Hill Education Private Limited

B) List of Major Equipment/ Instrument with Broad Specifications

- i. Desk top computer system, laptops, servers with latest configuration.
- ii. All peripheral maintenance kits (motherboard, keyboard, DVD, mouse, HDD etc)
- iii. Preventive maintenance kit
- iv. Disk cleaning kit
- v. diagnostic software/tools, preferably open source based
- vi. Internet Access
- vii. Library resources

C) List of Software/Learning Websites

- i. Software: Microsoft windows operating system from XP/vista/7/8 to latest version available in market, Windows server, linux/ubuntu/centos, server operating system
- ii. <http://www.gcflernfree.org/computerbasics/15/print>
- iii. <http://www.more.net/sites/default/files/training/BTTmain.pdf>
- iv. <http://www.computerhope.com/issues/ch000248.htm>
- v. <http://www.youtube.com/watch?v=Wk0m6TIO8X4>
- vi. <http://computer.howstuffworks.com/computer-hardware-channel.htm>

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. R. M. Shaikh**, H.O.D Computer Department, K. D. Polytechnic, Patan
- **Prof. K. N. Raval**, H.O.D Computer Department, R. C. Technical Institute, Ahmdeabad
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- **Dr. M. A. Rizvi**, Associate Professor, Dept. of Computer Engineering and Applications,
- **Dr. R. K. Kapoor**, Associate Professor, Dept. of Computer Engineering and Applications,