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
Diploma in Computer Engineering	5th Semester

1.   RATIONALE

Maintenance and troubleshooting of computer system and its peripherals is the necessity of the today's digital world. The students of this course will be able to troubleshoot and maintain the computer, peripherals and add on cards. Student will be given broad overview of computer system problems and solutions. Hence student will be easily self employed or absorbed in the computer maintenance industry.

2.   COMPETENCY

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- To identify faults, troubleshoot it and preventive maintenance of computer system and it's peripherals

3.   Course Outcomes:
- Identify different parts of Computer.
- Classify storage devices.
- Describe the working principals and faults of SMPS.
- Assembling and Disassembling Computer system.
- Troubleshooting and repairing of various computer parts and it's peripherals.

4. Teaching and Examination Scheme

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
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 DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Inside the PC: Core Components	1a. Draw a functional block diagram of the components of Motherboard	1.1 Motherboard: definition, Components/connections in motherboard, functional block diagram
	1b.Explain functionality and features of CPU 1c. Differentiate types of motherboards and chips 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(INTEL, CYRIX, AMD), Motherboard Types/Form Factors (AT, Baby AT, ATX, LPX, NLX, BTX)
	1d. Identify various bus slots and cards	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
	1e. List different BIOS features	1.5 Basic Input Output System :Services, Bios Interaction, CMOS-RAM
	1f. List advantages of Chipsets	1.6 Chipsets : Definition, Advantage, North and South Bridge
	1g. 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. Differentiate types of hard disk 2b. Define various terms of hard disk and Explain functioning of hard disk	2.1 Disk Basics 2.2 Hard Disk Interfaces: EIDE, Serial ATA, SCSI, USB and IEEE 1394 (Firewire), RAID, Solid State Drive (laptop) 2.3 Disk Geometry : Heads, Tracks, Sectors, Cylinders, Cluster, Landing zone, MBR, Zone bit recording
	2c. Discuss various disk performance characteristics	2.4 Disk performance Characteristics: Seeks and Latency, Data Transfer Rate
	2d. Draw functional block of hard disk controller and Explain functionality if hard disk controller	2.5 Hard Disk Controller: Functional Blocks, HDC Functions
	2e. Discuss and explain DVD types, recording and constructions	2.6 DVD Drives : Types, Recording, Construction, Interfacing, CAV versus CLV
	2f. Discuss DVD drive performance criteria	2.7 DVD Drive Performance Criteria : Data Transfer Rate, Access time, Cache/buffer
	2g. Write blu-ray disk specification	2.8 Blu-ray disk specification

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit– III **Input Devices and Printers**	3a. List assorted (enlisted) control's and it's properties, events and methods 3b. Develop small applications using appropriate controls	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 with Scanner in windows (TWAIN, Window Image Acquition(WIA))
	3c. Develop applications using menu and popup menu	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 and VGA monitors	4.1 Video Basics 4.2 VGA monitors
	4b. Discuss working of display controllers	4.3 Display controllers: Creating Image on the Screen, Character Graphics Display, Memory mapped Display
	4c. Discuss various digital display technology and explain them.	4.4 Digital Display Technology- Thin Displays, Liquid Crystal Displays, Plasma Displays, Light Emitting Displays
	4d. Differentiate various graphic cards and explain them	4.5 Graphics Cards : Components of a card, Accelerated Video cards, CGA, EGA, VGA
Unit– V **Trouble Shooting and Preventive Maintenance**	5a. Write and explain POST sequence	5.1 POST : Functions, IPL Hardware, Test Sequence, Error messages
	5b. Write and explain troubleshooting procedures of enlisted peripherals and motherboard	5.2 Troubleshooting : possible problems and diagnosis • Motherboard • Keyboard • Hard Disk Drive • Printer
	5c. Discuss various preventive maintenance techniques	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 = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's 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 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 terms, components and function of a personal computer. Visit the computer laboratories available in your department. Observe and make 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 peripheral ports, associated cables, and their connectors. Observe various connectors, ports back and front side of the computer, laptops. Draw them and write their purpose and specifications. (e.g. Power, Ps/2 keyboard and mouse, Serial and parallel, USB, VGA , LAN , Audio & microphone , Firewire, HDMI , games, eSATA etc.)	01
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. Do a detailed study on all the components and devices on the given motherboard. • Processor socket ,Chipsets, • Memory module slots, BIOS, CMOS • FDD , HDD connectors • Different types of expansion slots (ISA, EISA, PCI, PCI express, AGP, AMR, Express Card & PC Card (or PCMCIA) etc.) • Add-on-cards (audio, graphics, i/o, tv tuner, network	02

		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.	
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 drive, HDD, motherboard, RAM chips, Power supply, Microprocessor chip, Add on cards. Prepare complete specifications of the latest system configuration available in the market.	Homework
7	II	Observe the power supply (SMPS) and measure their voltage levels of a given PC. 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. Also observe the different types of power connectors on the motherboard.	02
8	II	Find and 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 winXp/win7/win8 with partition formatted in previous	02

		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 /Ubantu/ centos/ fedora/ red hat in another partition. Thus create dual booting system Try booting PC. Learn the content of boot.ini after the installation process.	
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, search 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. 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) • Define BIOS. • Demonstrate starting BIOS. • Identify how to disable unused devices to decrease security risks. • Change booting of computer with different secondary storage CD, HDD, USB etc.	02
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	Recognize common symptoms associated with diagnosing and troubleshooting PCs and utilize Windows built-in diagnostic tools. • 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	02

		codes and startup messages. • Recognize windows-specific printing problems and corrections.	

17	V	Log boot ups and events.
		• 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.
		Define registry file operation and maintenance.
		    • 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	Discuss the system maintenance & troubleshooting. Create policies, quality check forms and create a standard 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.
		Perform computer maintenance and preventative maintenance functions.
		    • 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.
			02

20	V	Prepare UPS requirement for the given machines and peripherals	02
21	V	Utilize Internet to download device drivers. Installation of drivers of various devices from the internet.	02
22	V	Demonstrate how to remove unwanted software applications.	01
23	V	Define registry file operation and maintenance. • Describe registry file operations. & Demonstrate proper registry file maintenance practices.	02

24	V	Log boot ups and events.
		    • 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			**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
  ii. Seminar on various peripherals and it's working
 iii. Industry visit to a company or workshop where maintenance are carried out
  iv. Make charts for input and output devices
   v. Make charts for various types of CPU available in market
  vi. Compare various specification of each computer and its related item

9.   **SPECIAL INSTRUCTIONAL STRATEGIES (if any)**
      The course activities include Lectures and Practical Exercises as per teaching scheme. The programmes in would be executed during practical's sessions. Following needs attention:

   i. Concepts will be introduced in lectures using multimedia projector.
  ii. Discussion
 iii. Demonstrations
  iv. Power point presentation for each of the devices
   v. Practical work will be through laboratory sessions.
  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.	The complete PC Upgrade & Maintenance Guide	Mark Minasi	BPB Publications
2.	Computer Installation and Servicing	D Balasubramanian	Tata McGraw Hill Education Private Limited
3.	IBM PC and clones	Govind Rajalu	Tata McGraw Hill Education Private Limited

B) **List of Major Equipment/ Instrument with Broad Specifications**
   i.   Computer System with latest configuration and memory, laptops, servers
   ii.   All peripheral maintenance kits (motherboard, keyboard, DVD, mouse, hdd etc)
   iii.   Preventive maintenance kit
   iv.   Disk cleaning kit
   v.   Open source Free diagnostic software/tools
   vi.   Internet Access
   vii.   Access to 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, linux/ubuntu/centos, server operating system
   ii.   http://www.gcflearnfree.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=Wk0m6TlO8X4
   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**
- **Prof. Manisha P Mehta, Sr. Lecturer in Computer Technology, K. D. Polytechnic, Patan**
- **Prof. R. M. Shah, Sr. Lecturer in Computer Technology, Government Polytechnic, Ahmedabad**

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. M. A. Rizvi,** Associate Professor, Dept. of Computer Engineering and Applications.

- **Dr. R. K. Kapoor**, Associate Professor, Dept. of Computer Engineering and Applications, NITTTR