GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester-VI

Course Title: Computer Maintenance & Troubleshooting
(Course Code:4360701)

Diploma programmer in which this course is offered	Semester in which offered
Computer Science & Engineering	6th Semester

1. RATIONALE

Personal computer systems have changed dramatically since the release of the original IBM PC in 1981. The role of the PC technician had to evolve to addresses improvements in hardware like motherboard technologies, micro processing power, RAM memory, flash memory, audio, video, printing, and networking. This course focuses on providing a solid foundation in current PC hardware, while the course labs provide a hands-on look inside the PC. In addition, the course reviews legacy computer system hardware, as well as looking at emerging technologies. This course will be helpful for students to get employment in the computer maintenance and related hardware industry as well as self-employment.

2. COMPETENCY

The aim of this course is to develop required skills in students so they are acquiring following competency:

- **Do Preventive Maintenance and troubleshooting of computer system and its peripherals.**

3. COURSE OUTCOMES (COs)

The theory and practical experiences and relevant soft skills associated with this course are to be taught and implemented so that the students demonstrate the following course outcomes:

I. **Evaluate the evolution of computer system on hardware technology advancement basis.**
II. **Classify various types of motherboards and its components.**
III. **Examine working of processor and BIOS.**
IV. **Classify hard disk and various types of peripheral devices.**
V. **Test and troubleshoot various faults related to computer hardware and its peripherals.**

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
3	0	2	4	30	70	25	25	150

(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the Cos

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

5. SUGGESTED PRACTICAL EXERCISES:

The following practical outcomes (Pros) are the subcomponents of the COs These Pros need to be attained to achieve the Cos

Sr. No.	Practical Outcomes (Pros)	Unit No. (CO)	Approx Hrs. required
1	Identify basic parts/components of a Personal computer and laptop Prepare a Chart of your observation.	1	2
2	Observe various types of ports and its connecting devices of front & back side of the PC.	1	2
3	Explore major components of motherboard including north bridge, south bridge, co-processor, chipset etc.	2	2
4	Test power supply (SMPS) and identify different connectors with various voltage levels.	2	2
5	Study the architecture of Multi Core processors.	3	2
6	Elaborate BIOS settings in detailed.	3	2
7	Demonstrate physical structure of Hard disk.	4	2
8	Demonstrate Logical structure of Hard disk.	4	2
9	Illustrate formatting and partitioning of Hard disk.	4	2
10	Classify various types of secondary storage devices.	4	2
11	Test and troubleshoot working of Laser printer.	4	2
12	Experiment various troubleshooting strategies.	5	2
13	Perform Power on Self-Test (POST).	5	2
14	Dissembling of PC for troubleshooting purpose.	5	2

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Various Preventive and Maintenance toolkit.	ALL
2	Computer, laptop system and various peripherals.	ALL
3	Trainer kit of motherboard, keyboard, mouse, HDD, Display unit etc.	2,3,4,5,8,11
4	Bootable OS.	12

7. AFFECTIVE DOMAIN OUTCOMES

This course will be helpful for students to get employment in the computer maintenance industry as well as self-employment

8. UNDERPINNING THEORY:

Only the major Underpinning Theory is formulated as higher-level UOs of Revised Bloom's taxonomy in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher-level UOs could be included by the course teacher to focus on the attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit-1 Introduction to PC Hardware	1.1 Describe features of personal computer. 1.2 List & identify the components of computer system 1.3 Introducing the front & Back Panel of the PC.	1.1.1 Introduction of PC and its basic terminology – Hardware(H/W), Software(S/W), Firmware(F/W), PC Block diagram, Types of computer system (Micro Computer, Mainframe, Mini Computer, Work station, Super Computer). 1.2.1 List and Identify components of PC / laptop and specify its importance. 1.2.2 Prepare latest specification of PC/laptop. 1.3.1 List and Identify various types of ports and connectors found in PC/laptop with their purpose.
Unit-2 Motherboard & SMPS	2.1 Introduction of motherboard 2.2 Different types of motherboards 2.3 Chipsets 2.4 Bus slots 2.5 Describe Power Supply Unit - SMPS	2.1.1 Motherboard: Introduction, Functional Block Diagram, Components, Layout Connection 2.2.1 Motherboard: Types (AT, ATX, LPX, NLX, BTX) Form factor and features 2.3.1 Chipset: Definition, North bridge, South bridge 2.4.1 Expansion buses: Definition, Bus Architecture (ISA, PCI, PCI-E, PCI-X, AGP, USB, PCMCIA, VESA, VESA Local bus, IEEE 1394) 2.5.1 SMPS: Block Diagram, Components and pin assignments
Unit-3 Processor & BIOS	3.1 Study the architecture of various types of Multi Core processors. 3.2 Describe Co-Processor 3.3 Explain the level and purpose of Cache Memory 3.4 BIOS	3.1.1 Processor: Introduction of basic processor fundamentals like Common Features, Types, Basic Structure of CPU, Different level of cache, system bus, clock speed, packaging 3.1.2 Multiple Core Processor: Concepts, Dual core, Quad core, Multi core processor, diagram & working advantage of multi core processor 3.2.1 Co-Processor: Concepts, diagram & working, types, applications processor v/s coprocessor 3.3.1 Cache Memory: Memory types, Level of Cache memory, significance of Cache Memory

		3.4.1 BIOS Components-BIOS ROM, BIOS CMOS Memory 3.4.2 Bios Functions Function and features (CMOS setup)
Unit-4 Hard disk& I/O Devices	4.1 Describe Hard disk and it's interfacing 4.2 Describe structure of Hard disk 4.3 Explain disk performance parameters. 4.4 Input Devices 4.5 Output Devices 4.6 Other Secondary storage devices	4.1.1 Hard Disk introduction and characteristics. 4.1.2 Hard Disk Interfaces: IDE, Serial ATA(SATA), SCSI, USB, RAID, SSD 4.2.1 Physical structure of Hard disk 4.2.2 Logical Structure of Hard disk: Heads, Tracks, Sectors, Cylinders, Cluster, Landing Zone, MBR, Zone bit recording. 4.2.3 Disk Partitioning 4.3.1 Disk Performance parameters: Seeks & Latency, Data Transfer Rate, File system 4.4.1 Keyboard: Block diagram, types, working principle, types of switches. 4.4.2 Mouse: Operation & working principle and its types. 4.4.3 Scanner: Types, Working principle 4.5.1Printer: Types of Printers Laser Printers-working principles, construction and process of printing Inkjet Printers- working principles, construction and process of printing 4.5.2 Monitor: Types of Monitors, LED Monitors- working principle and construction LCD Monitors- working principle and construction 4.6.1 Introduction to CD, DVD, USB

Unit-5 Troubleshooting & Preventive Maintenance	5.1 Explain POST Sequence 5.2 Explain Troubleshooting 5.3 Discuss Preventive Maintenance 5.4 Layman Check 5.5 PC Dissembling	5.1.1 POST: Functions, IPL Hardware, Test Sequence, Error messages with codes. 5.2.1 Troubleshooting: Basics, Troubleshooting by visual inspection, Systematic Troubleshooting procedure 5.2.2 Various peripheral devices troubleshooting: • Motherboard • Keyboard • Mouse • Printer • Hard Disk Drive • Monitor 5.3.1 PC Preventive Maintenance Requirements 5.3.2 Preventive Maintenance tools: Hardware Tool-Multi-meter, Software Tools-Diagnostic software, Disk utility software etc. 5.4.1 List of Layman checks 5.5.1 Dissembling PC component

9. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN:

Unit No	**Unit Title**	**Teaching Hours**	**Distribution of Theory Marks**			
			R Level	**U Level**	**A Level**	**Total Marks**
I	Introduction to PC Hardware	**6**	**2**	**2**	**4**	**8**
II	Motherboard & SMPS	**10**	**8**	**6**	**4**	**18**
III	Processor & BIOS	**8**	**6**	**6**	**2**	**14**
IV	Hard disk& I/O Devices	**12**	**8**	**6**	**4**	**18**
V	Troubleshooting & Preventive Maintenance	**6**	**2**	**2**	**8**	**12**
		42	**26**	**22**	**22**	**70**

Legends: R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)

Note: This specification table provides general guidelines to assist students for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from the above table.

10. SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

i) Survey of computer system, laptops, servers, processor, coprocessor 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 its working.
iv) Industry visit to a company or workshop where Computer hardware maintenance are carried out.
v) Prepare charts for various types of CPU and input/output devices available in market.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

The course activities should include Lectures and Practical Exercises with sufficient Handson 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 and/or Demonstrations.
iv. Power point presentation to explain construction and functioning of various devices and components.
v. Debate/Group Discussions for comparison of various peripherals and computer systems.

12. SUGGESTED MICRO/MINI PROJECT LIST

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project is group-based. However, in the fifth and sixth semesters, it should be preferably be individually undertaken to build up the skill and confidence in every student to become problem solver so that she/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should not exceed three. The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of Pros, UOs and ADOs. Each student will have to maintain a dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than 16 (sixteen) student engagement hours during the course. The student ought to submit a micro-project by the end of the semester to develop the industry-oriented Cos

A suggestive list of micro-projects is given here. This has to match the competency and the Cos Similar micro-projects could be added by the concerned course teacher:

Project Idea 1: Dissembling PC and troubleshoot.
Project Idea 2: SMPS: List down the components and measure different output voltages from SMPS.
Project Idea 3: Computer Motherboard: Prepare brief report on motherboard component and form factors.
Project Idea 4: Processor: Prepare small report of different microprocessor on industry-based survey.
Project Idea 5: Computer Specification: Prepare small report on major specification of different types of computers which is available in your LAB.
Project Idea 6: Troubleshooting of PC and its peripherals

13. SUGGESTED LEARNING RESOURCES:

Sr No	Title of Book	Author	Publication
1	IBM PC & Clones: Hardware Trouble Shooting and Maintenance	Govinda Rajalu	Tata McGraw Hill Education Private Limited
2	The complete PC Upgrade & Maintenance Guide	Mark Minasi	BPB Publications
3	PC Systems, Installation and Maintenance, Second Edition	R. P. Beales	Routledge
4	Computer Installation and Servicing	D Balasubramanian	Tata McGraw Hill Education Private Limited

14. SOFTWARE/LEARNING WEBSITES

Software: Microsoft windows operating system from XP/vista/7/8 to latest version available in market, Windows server, Linux/ubuntu/centos, server operating system

http://www.gcflearnfree.org/computerbasics/15/print
http://www.more.net/sites/default/files/training/BTTmain.pdf
http://www.computerhope.com/issues/ch000248.htm
http://computer.howstuffworks.com/computer-hardware-channel.htm

15. PO-COMPETENCY-CO MAPPING:

Semester VI (DCE)	**Computer Maintenance & Troubleshooting (Course Code:4360701)**						
	POs						
Competency & Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
Competency	**Do Preventive Maintenance and troubleshooting of computer system and its peripherals.**						
CO1 **Evaluate the evolution of computer system on hardware technology advancement basis.**	2	1	-	-	-	-	1
CO2 **Classify various types of motherboards and its components.**	2	2	1	1	-	-	1
CO3 **Examine working of processor and BIOS.**	2	1	1	1	-	-	-

CO4 **Classify hard disk and various types of peripheral devices.**	2	1	1	1	-	-	1
CO5 **Test and troubleshoot various faults related to computer hardware and its peripherals.**	2	2	2	2	1	1	2
	2	**1.4**	**1.25**	**1.25**	**1**	**1**	**1.25**

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation ofeach CO with PO.*

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

GTU Resource Persons

Sr. No.	Name and Designation	Institute	Contact No.	Email
1.	Mr. S. B. Prasad	Government Polytechnic Gandhinagar	9879237924	sbprasad011@gmail.com
2.	Jiger P. Acharya	Government Polytechnic Ahmedabad	9429462026	jigeracharya@gmail.com
3.	Ms. Charulata B Leuva	Government Polytechnic Ahmedabad	9662045575	cbleuva@gpahmedabad.ac.in