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Draft
Information Booklet cum Syllabus

of

NIELIT CERTIFIED HARDWARE AND IT SUPPORT EXECUTIVE

Revision-III

MONTH/YYYY

National Institute of Electronics and Information Technology

An Autonomous Scientific Society under
Ministry of Electronics and Information Technology, Government of India
NIELIT Bhawan,
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1. About the Revised Syllabus

The 2nd revised version of CHM 'O' Level (Hardware) course in Computer Hardware Maintenance syllabus came into effect in January 2010 examinations. Since then, much advancement has been observed in the area of Information Technology and Computer Hardware. The need of industry has also changed with the availability of new and advanced technologies. With the advancement in technologies, the hardware selected jobs have also changed. This also has led to change in job profile. Different job roles require different skills. Moreover, the digital initiatives taken by Government have also changed the way the business is taking place these days. These factors have led to bringing the revision in syllabus of CHM-O Level course.

This document presents the third revised version of CHM 'O' Level course in Computer Hardware Maintenance syllabus now known as **NIELIT Certified Hardware and IT Support Executive**, which becomes effective for teaching with effect from its notification. The syllabus of NIELIT Certified Hardware and IT Support Executive course is designed to enhance the skills of students so as to get job or enable them to be entrepreneur. The self learning approach is built into the syllabus enabling the learners to update themselves on the changing hardware scenario in their area of work. The syllabus has been designed to meet the skills required for various IT job roles.

2. NIELIT

National Institute of Electronics and Information Technology, NIELIT, (Erstwhile DOEACC Society) is an autonomous scientific society of the Ministry of Electronics & Information Technology, Government of India. The Society is registered under the Societies Registration Act, 1860. NIELIT was set up to carry out Human Resource Development and related activities in the area of Information, Electronics & Communications Technology (IECT). NIELIT is engaged both in Formal & Non-Formal Education in the area of IECT besides development of industry-oriented quality education and training programmes in the state-of-the-art areas. NIELIT has endeavoured to establish standards to be the country's premier institution for Examination and Certification in the field of IECT. It is also one of the National Examination Body, which accredits institutes/organizations for conducting courses in IT and Electronics in the non-formal sector.

Over the last three decades, NIELIT has acquired very good expertise in IT training through its wide repertoire of courses. These courses are as under.
- 'O' Level (Foundation) –NSQF aligned course at Level 5
- 'A' Level (Advance Diploma) - NSQF aligned course at Level 6
- 'B' Level (MCA equivalent) - NSQF aligned course at Level 7
- 'C' Level (M-Tech level) - NSQF aligned course at Level 8
- Digital Literacy Courses
  - ACC (Awareness in Computer Concepts)
  - BCC (Basic Computer Course)

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- o CCC (Course on Computer Concepts) –NSQF aligned at Level 3
- o CCC+ (Course on Computer Concepts Plus)
- o Expert Computer Course

At present, NIELIT is operating from offices located at Agartala, Aizawl, Ajmer, Aurangabad, Bhubaneswar, Calicut, Chandigarh, Chennai, Chuchuyimlang, Churachandpur, Delhi, Dibrugarh, Gangtok, Gorakhpur, Guwahati, Haridwar, Imphal, Itanagar, Jammu, Jorhat, Kohima, Kolkata, Kokrajhar, Kurukshetra, Leh, Lucknow, Lunglei, Mandi, Pasighat, Patna, Pali, Ranchi, Ropar, Senapati, Shillong, Shimla, Silchar, Srinagar, Tezpur, Tura, Tezu with its Headquarters at New Delhi. It is also well networked throughout India with the presence of about 700+ institutes. The Headquarters is situated at NIELIT Bhawan, Plot No. 3, PSP Pocket, Sector 8, Dwarka, New Delhi – 110 077

3. Objective of NIELIT Certified Hardware and IT Support Executive Course

The objective of the Scheme is to generate skilled manpower in the area of Computer Hardware, Networking and Electronics at the national level by utilizing the facilities and infrastructure available with the institutions/organizations in the non-formal sector. NIELIT is managed and administered by a Governing Council which consists of eminent academicians and professionals from IT and Electronics industries. Minister for Electronics & Information Technology, Government of India, is the Chairman of the Governing Council. The Director General is the Chief Executive Officer of the Society and manages day to day affairs of the Society. Manifold functions of this Scheme are:

i. Accreditation
ii. Registration
iii. Examination
iv. Certification

4. NIELIT Certified Hardware and IT Support Executive Level Course

4.1 Objective of NIELIT Certified Hardware and IT Support Executive Course

The objective of this course is to equip a student with necessary skills as per following job role based on specialisation attained.

i. Computer Hardware Technicians
ii. Computer Networking Technicians
iii. Office Automation Maintenance and Technical Support Service
iv. Customer Care Support Service for Computer Hardware & Networking
v. Personality Development and Communication Skills

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4.2 Structure of NIELIT Certified Hardware and IT Support Executive Level Course

The revised syllabus (Revision III) of NIELIT Certified Hardware and IT Support Executive Level course consists of four compulsory theory modules, one practical and one project. The structure of the NIELIT Certified Hardware and IT Support Executive syllabus is indicated below:-

Module Code	Module	Learning Hours (Theory)	Learning Hours (Practical/ Tutorials/ Project)	Total Learning Hours
CHM1-R3	Basics of Computer Hardware	48	72	120
CHM2-R3	Peripherals and Data Storage Devices	48	72	120
CHM3-R3	Computer Networking and Hardware	48	72	120
CHM4-R3	Working and Maintenance of Computer System	48	72	120
CHM PR1-R3	Practical(Based on CHM1-R3, CHM2-R3,CHM3-R3,CHM4-R3)	--	--	--
CHM PJ1-R3	Project	--	40	40
	Total	**192**	**328**	**520**

4.3 Duration of the Course

The duration of NIELIT Certified Hardware and IT Support Executive course is 520 learning hours and the minimum period to cover contents is one year for candidates undergoing NIELIT Certified Hardware and IT Support Executive after 10+2 and six month for candidates undergoing NIELIT Certified Hardware and IT Support Executive after Graduation.

5   Practical

The students have to devote 60% of the total time allotted to each module of the course for the practical sessions. Practical assignments have been worked out for each theory module. The Practical examination will be based on the syllabi CHM1-R3, CHM2-R3, CHM3-R3, CHM4-R3 modules of NIELIT Certified Hardware and IT Support Executive course.

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6   Improvement

The candidates are allowed to improve his/her grade in one subject immediately after clearing all the theory papers (immediate to last examination where the candidate has cleared his/her last paper).

7   Project

NIELIT Certified Hardware and IT Support Executive courses has a project as an important component. The project is carried out by the student under guidance and support of faculty and management of Institute /Organization where the student is undergoing training. It is felt that such a project provides an opportunity to the student to apply his / her knowledge and skills to know hardware components, problem and troubleshooting. The project should be given utmost importance and priority both by the students as well as institution faculty / management in respect of its identification, planning and implementation.

7.1   Objective of the Project

The objective of the project is to give the students additional hands-on experience in solving a real life problem by applying knowledge and skills gained on completion of theory papers in a course at a given Level. Project also helps the students to realize the importance of resource and time management, ownership of task towards deliverables, innovation and efficiency in task management apart from presentation skills. It also provides a good opportunity for students to build, enhance and sustain high levels of professional conduct and performance and evolves a problem solver frame of mind in the students. It is also felt that taking up the project by a student prepares him/her for a job in industry and elsewhere.

7.2   Project Submission

The student undergoing course NIELIT Certified Hardware and IT Support Executive Course has to submit a project in order to be NIELIT Certified Hardware and IT Support Executive certified. The project should be original and relevant to industry. The project should not be copy of existing material from any other source.

The Learners (Students) are expected to carry out a project successfully and submit the project certificate in the prescribed format from the head of the institute running the accredited course or the organization of which the learner is an employee. Performa of the Project Completion Certificate is given on next page

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Performa of the Project Completion Certificate

This is to certify that the Project work done by Mr./Ms._____ (NIELIT Registration No._____) in

partial fulfilment of NIELIT Certified Hardware and IT Support Executive Course

Examination at _____ has been found satisfactory.

This report has not been submitted for any other examination and does not form part of any other course undergone by the candidate.

Signature
Name:
(By Head of the Institution) with PROV
No. /FULL No.)
Or
Signature
(Name of Head of the Organization /
Division)
Division:
Organization Name:
Address:

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8   Credit Scheme for NIELIT Certified Hardware and IT Support Executive Course

8.1   Course Introduction

A credit system based on the AICTE norms has been introduced for indicating the efforts required to pass a specific level of course. Award of credit to a student will facilitate measurement/comparison of study hours including Theory Lectures, Tutorials and Practical Assignments put in a given module/paper/subject under the Scheme with similar course in Electronics, Computer Hardware and Networking in India and abroad. This will also facilitate other Universities/ Apex Accrediting bodies to consider academic and professional equivalence of NIELIT courses. This will also help students/organizations to transfer credits from NIELIT to other academic bodies and vice-versa for ensuring continuity in education. Following table gives the number of hours of theory lectures, tutorials and practical's per week to be attended and the credits earned by the student:-

8.2   Calculation of Credits

Sr. No.	Module Code	Module Name	No. of Lecture Theory Hours	No. of Tutorial/ Practical /Project Hours	Theory Credits	Practical Credits	Total Credits
			(A)	(B)	(C=(A)/ 15)	(D=((B) /2* 15)	(E=(C) + (D))
1.	CHM1-R3	Basics of Computer Hardware	48	72	3	2	5
2.	CHM2-R3	Peripherals and Data Storage Devices	48	72	3	2	5
3.	CHM3-R3	Computer Networking and Hardware	48	72	3	2	5
4.	CHM4-R3	Working and Maintenance of Computer System	48	72	3	2	5
5.	CHM PJ1-R3	Project		40		1	1
6.		**Total Credits**					**21**

Notes

1. One credit is defined as one hour of theory lecture and 2 hours of tutorials/ practical/project every week for one semester consisting of 15 weeks.

2. Total number of credits earned in a module is calculated using AICTE formula (as applicable to Under Graduate Courses in IT namely C=L + (T+P)/2 where L(Lecture), T(Tutorials) and P(Practicals) indicate number of hours per week for Lectures, Tutorials and Practical. Hours spent during Project development is considered under Tutorials and Practical.

3. The credit scheme has been implemented since July, 2003 examinations.

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4.   Fractions in Credits have been rounded to nearest integer.

9   Examination Pattern

The theory examination for each module under the third revised syllabus would be for duration of three hours and the total marks for each theory paper would be 100. One Practical examination of three hours duration and 100 marks would be conducted. The first examination with the revised syllabus will be held as per notification issued by NIELIT in this regard.

Dates for the various activities related with examinations will be announced on NIELIT website, well in advance of the examinations.

Laboratory/ Practical work will be conducted at Institutions / organizations, which are running the course. NIELIT will be responsible for holding the examination for the theory and practical both for the students from Accredited Centres and direct candidates.

9.1   Pass Percentage

To qualify a module, a candidate must have obtained at least 50% in each theory and practical examination. A successful project complete certificate is mandatory for student to qualify 'O' Level course. Following table shows the marks distribution.

Module Code	Module	Maximum Marks
CHM1-R3	Basics of Computer Hardware	100
CHM2-R3	Peripherals and Data Storage Devices	100
CHM3-R3	Computer Networking and Hardware	100
CHM4-R3	Working and Maintenance of Computer System	100
CHM PR1-R3	Practical Based on CHM1-R3,CHM2-R3,CHM3-R3 and CHM4-R3	100
CHM PJ1-R3	Project	-
	Total	500

The marks will be translated into grades, while communicating results to the candidates. The gradation structure is as below: -

Pass Percentage	Grade
Failed (<50)	F
>=50%-54.99%	D
>=55%-64.99%	C
>=65%-74.99%	B
>=75%-84.99%	A
>=85% and over	S

9.2   Award of Certificates

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The students would be eligible for the award of NIELIT Certified Hardware and IT Support Executive certificate on successfully qualifying the Theory Examinations of all modules, Practical Examination and the Project. The course is currently aligned at NSQF (National Skill Qualifications Framework) level 4.

9.3 Registration

Registration is a pre-requisite for appearing in NIELIT Certified Hardware and IT Support Executive examinations. A candidate can register at only **one level** at a time to appear for the examination. Registration is only for candidates and not for institutes. Candidate has to register with NIELIT through online portal.

9.4 Eligibility Criteria

The eligibility criteria for registration at NIELIT Certified Hardware and IT Support Executive are as follows:

9.4.1 Students from Institutes conducting accredited courses:

10+2 or ITI Certificate (One Year) after class 10 followed, in each case, by a NIELIT accredited NIELIT Certified Hardware and IT Support Executive course.
Or
Successful completion of the second year of a Government recognized polytechnic engineering diploma course after class 10, followed by an accredited NIELIT Certified Hardware and IT Support Executive course concurrently during the third year of the said polytechnic engineering diploma course. The certificate of NIELIT Certified Hardware and IT Support Executive will be awarded only after successful completion of the polytechnic engineering diploma

9.4.2 Direct Applicants

10+2 or ITI Certificate (One Year) after class 10, followed in each case, by one-year relevant experience. Relevant experience connotes job experience in Computer Hardware, IT, and Networking including teaching in a recognized institution as a faculty member, excludes coaching. Or A pass in the NCVT-DP&CS (data Preparation & Computer Software) Examination, conducted by DGE&T (Govt. of India)

For getting registered, a candidate fulfilling the eligibility criteria should apply online through NIELIT portal. Registration fee is also to be paid online. Registration fee once paid is not reimbursable or adjustable against any other payment.

Registration Application can be submitted online throughout the year, however cut off dates are specified for submitting Registration Application for each examinations for the convenience of processing and allotting Registration Numbers. Examination months are February and August. Portal is open for Registration for 15 Days in the month of January and July. To appear in any exam the Registration should be confirmed at least 06 months prior. No Direct candidates are allowed.

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Cut off Dates for Registration	
February Examination	**August Examination**
Preceding 28st or 29th February	Preceding 31st August

Accredited Institutes are allowed to submit the Registration Application Form of their candidates online one month beyond the cut off dates.

9.5   Auto-Upgradation

The candidates successfully completing all papers (Theory, Practical and Project) of a particular Level in a particular Examination and wish to appear in the next Examination for immediate higher Level are exempted from the above cut off dates. Such candidates can fill up examinations Form and Registration Forms for higher Levels subject to following conditions: -

a)   Combined Registration fee and Examination fee is paid online.

b)   The facility is available to the candidates appearing through Accredited Institutes and not for direct applicants. However, the facility is available to a candidate who might have completed lower level as a direct candidate and wishing to appear for immediate higher level through Accredited Institutes.

c)   The facility is also not available to those candidates who might be appearing through Accredited institute but have cleared lower level prior to the preceding exam (e.g. if a candidate has passed NIELIT Certified Hardware and IT Support Executive Exam in Jan, 2019, he would be eligible for this facility in case he wishes to appear for CHM 'A' Level Examinations in July, 2019 through Accredited Institute. If, however, he had passed NIELIT Certified Hardware and IT Support Executive Level prior to Jan., 2019 Exams, this facility would not be available to him).

d)   This facility would also not be available to the candidate opting for Level jumping (e.g. from NIELIT Certified Hardware and IT Support Executive to CHM 'A' Levels).

Once registered at a particular level, the registration is valid for ten consecutive examinations for NIELIT Certified Hardware and IT Support Executive, reckoned from the specific examination as indicated in the Registration allocation letter issued to the candidates.

Registration, by itself, does not entitle a candidate to appear for an examination at the Level concerned, unless all conditions, stipulated in the examination application form, and in any other notification, relevant to the examination are fulfilled by the candidate.

9.6   Re-registration

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Candidates who are not able to clear the level within the validity period of initial registration, are allowed to re-register for once, at the same level for another full term i.e. 5 years to clear the left over papers by submitting filled in Registration application and full Registration fee within one year of the expiry of the validity period of existing Registration.

10 Practical Examination Scheme

The Practical Examination will be conducted by the NIELIT Aurangabad in reputed Institutions for all candidates. The institutes are obliged to facilitate the conduct of Practical Examinations and arrange infrastructure, support of its faculty and staff for the conduct of Practical Examination at their Centre. The practical examination scheme is as follows.

Number of Practical Examination	One
Duration of Practical Examination	Three-hour duration including viva-voce
Max. Marks	100 = 80(Practical) + 20(Viva Voce)
Grading	Marks obtained by the students will be translated into the Grades as per the structure given Section 10.1.
Date(s)	Date(s) for practical examination will be announced on NIELIT Aurangabad website.

Only practical fees as decided from time to time by NIELIT are payable and institutes are not allowed to charge any fee from the candidates for facilitating the practical examination separately.

11 Hardware Requirement
Shown in Table 1

Table1: Hardware Requirement	
S.NO.	**List of Computer Hardware Component and Trainer Kit**
1	Desk Top Trainer Kit
2	Laptop Trainer Kit
3	Keyboard, Wireless Keyboard, Optical Mouse Trainer Kit
4	Dot Matrix Printer Trainer Kit
5	Ink-Jet Printer trainer Kit
6	Laser Printer Trainer Kit
7	ALL-In-One MFD (Multi Function Device) Trainer Kit
8	Hub, Bridge, Switch, Router, Gateway Trainer Kit
9	Computer Network Cables Display Board
10	Function Generator

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11	Bread Board and Power Supply
12	Variable Power Supply (0-15Volt, 2Amp)
13	Transformer Input-230V, 50Hzs, Output 9-0-9Volt
14	IC 741, IC7805, IC7404, IC7408, IC7432, IC7486, IC7400, IC74LS02, IC74266, IC74153, IC74139, IC74LS669, IC74LS194
15	Digital Multi-Meter
16	Soldering Station
17	Electronic Tool Kit Set
18	Digital Oscilloscope

12   Software Requirement

Shown in Table2

Table2: Software Requirement	
S. No.	**List of Software Requirement**
01	Linux OS – Ubuntu (Desk Top and Server)
02	PC Diagnostic Software – PC Doctor
03	Microsoft Windows Server – Latest Edition Windows 2000 Onwards
04	Microsoft OS – Latest Edition Windows 10 Onwards

13.   Syllabus of Basics of Computer Hardware (CHM1-R3)

13.1   Introduction

The module is designed to equip a student in gaining knowledge of Basics of Hardware used in Computers for professional as well as day to day use. It provides theoretical and practical in depth knowledge of various Computer Hardware and its components viz. Power Supply, Motherboard, Memories and I/O ports.

13.2   Objectives

After completing the module, the incumbent will be able to:

➢ Acquire confidence in identification of various hardware components viz. Power Supply, Motherboard, Memories and I/O ports.

➢ Well versed in Installation and Troubleshooting of Power Supply.

➢ Acquire knowledge of Motherboard, Form Factor, and in Depth analysis of Mother Board & its Reliability.

➢ Acquire knowledge in basic Principle and Operation of Primary and Secondary Memory.

➢ Acquire knowledge of Physical Identification and Working of Intel and AMD Chipset.

➢ Acquire knowledge of Bus Definition and Physical Identification and Applications of Ports and Buses on Motherboard.

13.3 Duration

120 Hours - (Theory: 48 hrs + Practical: 72 hrs)

13.4 Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives
1. Power Supplies	13	19	After completion of this unit of module, the Learner will be able to ● Know Basic Principles of Power Supplies. ● Get familiar with Connectors of power supply. ● Well Versed in Assembling, Installation, Fault Analysis and Troubleshooting of Power Supply.
2. Mother Board	13	20	After completion of this unit of module, the Learner will be able to ● Get familiar with various types of motherboard used in computers. ● Acquire knowledge of Motherboard basics. ● Well versed in practical identification of Mother Board-CPU Socket, Integrated Peripherals, Card Slots, CPU Fan Connector, and other components attached to Mother Board.
3. Chipset	6	9	After completion of this unit of module, the Learner will be able to ● Know working of Chipset. ● Physically Identify and various chipset available and technology

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			● Knowledge of chipset slot and socket
4. Primary and Secondary Memories	4	6	After completion of this unit of module, the Learner will be able to ● Get familiar with Memories and their types. ● Physical Identification of Primary and Secondary Memories
5. RAM & ROM	6	9	After completion of this unit of module, the Learner will be able to ● Learn about Virtual Memories, USB Flash Drive, DVD,CD etc.
6. Buses & I/O Ports	6	9	After completion of this unit of module, the Learner will be able to ● Identify various connecting ports used in desktop/laptop ● Physically identify types of Ports and Buses on the Motherboard.

13.5 Marks Distribution

Module Unit	Written Marks (Max.)
1. Power Supplies	20
2. Mother Board	25
3. Chipset	20
4. Primary and Secondary Memories	10
5. RAM & ROM	10
6. Buses & I/O Ports	15
Total	100

13.6 Detailed Syllabus

(i) Power Supplies

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Study and Application of Capacitor, Resistance, Diode, Zener Diode, Transistor, MOSFET, Introduction to Operation Amplifier IC 741 and its application as Comparators, Basic Principles and Operation of Power Supplies - Unregulated, Regulated, Linearly Regulated, Switched, Split Power Supply, Switching Supply and its Comparison w.r.t. Size, Weight, Input Voltage and Current Range and Output Voltage and Current Range, Efficiency, Circuit Complexity, Applications and Cost, Power Supply Assembling and Installation, Flow Chart Preparation for Fault and Troubleshooting of Power Supply, Introduction to Power Supply Filter and Heat Sink

(ii)   Motherboard

Motherboard Definition, Study of Motherboard Form Factor – ATX, Micro-ATX, Flex ATX, ITX and Mini-ITX, Processor Socket Definition, Processor Slots Definition, its Type – Ball-Grid Array and Pin Grid Array, Study of Motherboard Components – I/O Chip, ROM BIOS, Single In Line Memory Module, Dual In Line Memory Module, Rambus In Line Memory Module (SIMM/DIMM/RIMM) Sockets, Instruction Set Architecture (ISA)/Peripheral Component Interconnect (PCI)/Accelerated Graphics Port (AGP) Bus Slots, CMOS Battery, Study of Motherboard Integrated Connectors – Audio, Video, Network Interface Card (NIC), Small Computer System Interface (SCSI),Audio Modem Raiser (AMR), Communication and Networking Raiser (CNR)

(iii)   Chipset

Chipset Definition, Study of Northbridge and Southbridge Chipset Architecture, Study of Intel Chipset for Processor Socket LGA2066 and LGA1200, Study of AMD Chipset for Processor Socket SP3r2 and SP3r3.

(iv)   Primary and Secondary Memories

Basic Principle and Operation of Memory, How Data Organization and Representation is done in Memories, Comparison between Volatile and Non-Volatile Memories and its Examples, Definition of Primary Memory and Secondary Memory

(v)   RAM & ROM

Primary Memory – Working of RAM, ROM, Processor Register, Processor Cache, Virtual Memory, DDR2,DDR3,EPROM,EEPROM and Video Memory

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Secondary Memory – Working of HDD, SSD, Optical Storage, USB Flash Drive, Blue Ray, DVD, CD

(vi)   Buses & I/O Ports

Bus Definition, System and I/O Bus, its Types, Operation and Applications, Port Definition, Operations, Applications and its types - External and Internal Ports, Operation and Application of Parallel (LPT) and Serial Port (COM), Operation and Applications of Address, Data and Control Bus,

13.7   Reference Books/Study Material

1. Book Title   :   Upgrading and Repairing PCs
    Author   :   Scott Mueller
    Edition   :   22nd Edition
    Publisher   :   Que

2. Book Title   :   Modern Computer Hardware Course
    Author   :   Lotia Manahar
    Publisher   :   B P B Publications

3. Book Title   :   Computer Hardware
    Author   :   Hing Lown
    Publisher   :   Independently Published (Copy Right Material of Author)

4. Book Title   :   Computer Hardware and Troubleshooting Lab Guide: (Understand, Repair, Upgrade and do troubleshooting your computer (PC's) yourselves)
    Author   :   G. Ganesh Shashidhar
    Publisher   :   Independently Published (Copy Right Material of Author)

14   Syllabus of Peripherals and Data Storage Devices (CHM2-R3)
14.2 Introduction to Module

This module is designed to equip incumbent with the knowledge, working and operations of various peripherals like Mouse, Keyboard, Printers and Display devices,

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its types. This module also provides understanding of peripherals connections with computer motherboard etc. This module also focusing on enhancing the soft skill, innovative thinking stress and problem management.

14.3 Objective

After completing the module, the incumbent will be able to:
- ➤ Understand difference between input and output devices.
- ➤ Understand operation, assembly and de-assembly of Impact and Non Impact Printers etc along with general trouble shooting.
- ➤ Understand operation of various Electronic Display, System like Electronic Paper, LED Display, LCD Display, Flexible Display, Plasma Display etc.
- ➤ Understand diagnostic tools for problem shooting like Sys-Internals Suite, System Information for Windows (SIW) etc.
- ➤ Develop soft skills for understanding oneself, problem, stress and emotion management and development of leadership quality.

14.4 Duration

120 Hours - (Theory: 48 hrs + Practical: 72 hrs)

14.5 Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives
1. **Mouse, Key Board, Printers**	10	15	After completing this unit, Learner will be able to ● Know the types of Peripheral Devices. ● Know the Working of Peripherals Devices and application. ● Well versed in troubleshooting and identification of Components-Printers, Mouse, Keyboards.
2. **Display Devices**	10	15	After completing this unit, learner will be able to ● Learn Various Display types and its operation. ● Understand working of LED , LCD, TFT. Plasma, Quantum Dot Flexible and

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				Rollable Display.
3.	**System Diagnostic Tools**	08	12	After Completion of this unit learner will be able to learn ● How to trouble shoot Computer hardware problems through software diagnostic tools ● Identification of faulty components and finally its rectification.
4.	**Soft Skill**	20	30	After completing this unit, Learner will be able to ● Develop its own interpersonal and communication skill ● Think in innovative way. ● Manage problems, stress and emotions..

14.6 Marks Distribution

Module Unit	Written Marks (Max.)
1 Mouse, Key Board, Printers	20
2 Display Devices	30
3 Diagnostic Tools	25
4 Soft Skill	25
Total	100

14.7 Detailed Syllabus

(i) Mouse, Key Board, Printers

Study of Basic Principle, Construction and Operation of wired and wireless Optical Mouse, wired and wireless Keyboard, Study of Printers types, principle, Construction, Operation and Application of Impact Printers – Dot Matrix and Line Printers, Non Impact Printers - Inkjet, Laser and Multi-Function Printers

(ii) Display Devices

Display types and Operations of Electroluminescent Display, Electronic Paper Display, LED Display, LCD Display, TFT LCD Display, Plasma Display, Quantum Dot Display, Flexible Display and Rollable Display.

(iii) System Diagnostic Tools

Diagnostic Tools Definition, Application of Windows OS Diagnostic Tools for Task Scheduler, Event Viewer, Shared Folder, Disk Management Services, Memory Diagnostic Windows OS Diagnostic Command for Resource, Performance and Memory – perfmon, perfmon /report and mdsched, Linux OS Diagnostic Command – htop, vmstat, iotop ,lscpu, hwinfo, lspci, lsscsi, lsusb, lsblk, fdisk and free.

(iv) Soft Skill

Definition of Soft Skills, Importance, Understanding Oneself, Creative Innovative Thinking, Letter Writing and Composition, Problem Management, Stress and Emotion Management, Leadership, Teaming Up, Communication Skill Development.

14.8 Reference Books/Study Material

1. Book Title : Upgrading and Repairing PCs
   Author : Scott Mueller
   Edition : 22nd Edition
   Publisher : Que

2. Book Title : Modern Computer Hardware Course
   Author : Lotia Manahar
   Publisher : B P B Publications

3. Book Title : Computer Hardware
   Author : Hing Lown
   Publisher : Independently Published (Copy Right Material of Author)

4. Book Title : Computer Hardware and Troubleshooting Lab Guide: (Understand, Repair, Upgrade and do troubleshooting your computer (PC's) yourselves)
   Author : G. Ganesh Shashidhar
   Publisher : Independently Published (Copy Right Material of Author)

5. Book Title : Personality Development and Soft Skill
   Author : Barun K. Mitra
   Publisher : Oxford University Press, 2nd Edition

15. Syllabus of Computer Networking and Hardware (CHM3-R3)

15.1 Introduction to Module

This module acquaint learner firstly with the Networking Hardware Devices like switch, Hub, Router, Bridges, RJ45 Connectors and their operations. Then learner studies Internet Architecture, OSI and TCP/IP Layer, WWW, Network Topology, Channel Access Protocol, Network Traffic and networking devices needed when designing and implementing a LAN.

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This module also introduces the wireless architecture like Bluetooth and gives hand on practice as how to establish a Wired and Wireless LAN in a professional manner. At the end Network diagnostic tools and command are introduced to handle and trouble shoot the Computer Networking problems.

15.2 Objectives

The objectives of this module are to make the learners understand basics of networking and hardware concepts like wires, cables, router, switches, Internet Architecture, OSI and TCP/IP, Bluetooth, Network Diagnostic Commands etc.

After completion of the module, the learner is expected to analyze the real life problem of establishing and troubleshooting Computer Networking either wired or wireless. The main emphasis of this module is to have sound knowledge of the Computer Hardware Networking Devices so that the learner will be able to establish Computer Networking in professional manner and also to trouble shoot.

> ➢ Know the various Network Hardware Devices
>
> ➢ Understand Internet & its uses
>
> ➢ Know about the Bluetooth Architecture, Protocols, Operation and Applications.
>
> ➢ Know how to Establishment of Computer Network
> ➢ Diagnose network problem using various Network Software and commands.

15.3 Duration

120 Hours - (Theory: 48 hrs + Practical: 72 hrs)

15.4 Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives

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1. Network Hardware Devices	19	30	After completion of this unit of module, Learner will be able to • Understand the Computer Networking Hardware Devices • Practically use Networking Devices
2. Internet	19	20	After completion of this unit of module, Learner will be able to • Understand the Internet Architecture • Understand OSI, TCP/IP • Understand Network Topology • Understand WWW and it's working.
3.Bluetooth Networking	5	12	After completion of this unit of module, Learner will be able to • Understand Bluetooth Architecture – PICONET and SCATTEMET • Bluetooth Layers • Establish Bluetooth Personal Area Network its operation and applications
4.Networking Diagnostic Tools	5	10	After completion of this unit of module, candidate will be able to • Run Network Diagnostic Command • Run Network Diagnostic Software • Able to troubleshoot Network problems

15.5   Marks Distribution

Module Unit	Written Marks (Max.)
Network Hardware Devices	30
Internet	25
Bluetooth Networking	30
Networking Diagnostic Tools	15
Total	100

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15.6   Detailed Syllabus

(i) Network Hardware Devices

Introduction to Data Communication and Simplex, Half Duplex and Full Duplex Communication, Operation and Applications Copper Wire, Aluminium Wire, Core Cable Wire (DC or Single Phase AC) and 4 Core Wire le (3 Phase AC), Wires Gauge and Labelling, Operation and Application of Cables - Twisted Pair (Shielded and Non Shielded), Coaxial Cable (Thicknet and Thinnet), Optic Fiber Cables (Single and Multi Mode), Cable Gauge and Labelling, Operation and Application of Network Hardware Devices - NIC Card, Hub, Switches, Routers, Access Point, Modem and Gateway, Trouble shooting Fault Tree for Network Hardware Devices.

(ii)   Internet

Definition Architecture and Working of Internet, World Wide Web (www), Internet Service Provider (ISP), Introduction of OSI and TCP/IP Model, TCP/IP, Detail Study of Network Application Layer – Architecture (Client-Server and Peer to Peer), Functions (Identifying Communication Partners, Determining Resource Availability, Synchronizing Communication), Services of Application Layer (NVT, FTAM, Addressing, Mail Services, Directory Services)Protocols in Application Layers (Telnet, FTP, TFTP, NFS, SMTP, LPD, X Windows, SNMP, DNS and DHCP with Command Practice), Detail Study of, IPv4, IPv6, IP Addressing and Subnetting in IPv4 and IPv6, Network Topology, Trouble shooting Fault Tree for Internet Connectivity.

(iii) Bluetooth Networking.

Introduction, Bluetooth Topology (PICONET, SCATTEMET), Bluetooth Architecture - Radio, Baseband, Link Management Protocol (LMP), Host Controller Protocol (HCI), Logical Link Control and Adaptation Protocol(L2CAP), Radio Frequency Communication (RFCOMM), Service Discovery Protocol (SDP), Bluetooth Layers - Radio, Baseband, Link Manager, Protocol Host Controller Interface, L2CAP, RFCOMM, SDP, Telephony Control Protocol Specification (TCS), Application Program Interface(API) Libraries, Blue Tooth Protocols – Point to Point Protocol(PPP), Internet

Prtocol(IP), User Datagram Protocol(UDP), Transmission Control Protocol (TCP), Wireless Adaptation Protocol(WAP)

Blue Tooth Low Energy (BLE) Definition – BLE Devices, BLE Architecture, BLE Protocol Stack and BLE Applications.

Introduction to Bluetooth Security Issues and its remedies.

(iv) Networking Diagnostic Tools

Diagnostic Command - ping, tracert/traceroute, ipconfig/ifconfig, nslookup, netstat, Diagnostic Command for Linux - Windows Network Diagnostic Software Tool - PuTTY/Tera Term, Subnet Calculator, IP Calculator, Speed test.net Scope and Modules.

15.7   Reference Books/Study

1.   Book Title   :   Computer Network and Data Communications: Guide
                        Question and Answer
      Author   :   Prof. Satish Jain
      Publisher   :   B P B Publication
2.   Book Title   :   Computer Network
      Author   :   Suresh Fatehpuria, Dimple Jayaswal
      Publisher   :   Genius

3.   Book Title   :   Internetworking Technology: An Engineering Perspective
      Author   :   Rahul Banerjee
      Publisher   :   Prentice Hall

4.   Book Title   :   Fundamental of Wireless Communication
      Author   :   David Tse and Pramod Viswanath
      Publisher   :   Cambridge University Press)

16. Syllabus of Working and Maintenance of Systems (CHM4-R3)

16.1 Introduction

The module will demonstrate understanding of computer hardware covering complete eco system from desktop to laptop, microprocessor used and its technical specification, Digital Electronics, Number System, De-Morgan's Theorem, Simple combinational and sequential circuits working of BIOS, POST and booting process are covered. This module also covers working of OS and application software, its installation.

16.2 Objective

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After completing the module, the incumbent will be able to:

➢ Knowledge of Digital Electronics, Number System, De-Morgan's Theorem

➢ Basic knowledge of Combinational and Sequential ciercuits

➢ Understand the hierarchy of Computer and Laptop Hardware, operation and Application of Computer.

➢ Knowledge of processors architecture and its operation.

➢ Understand the BIOS operation and Setup - CPU Configuration.

➢ Understand the booting process of Desktop and Laptop

➢ Understand the POST Test

➢ Knowledge of Windows and Linux OS Architecture, operation and Installation.

➢ Knowledge of Installation of Application Software

16.3 Duration

120Hours - (Theory: 48 hrs + Practical: 72 hrs)

16.4 Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives
1. Computer Hierarchy	14	19	After completion of this unit of module, Learner will be able to ● Understand Digital Electronics, Number System, Sequential and Combinational Circuits ● Understand different types of computers ● Understand types of OS, Application Software and its Installation.
2. Processor	10	14	After completing this unit, Learner will be able to ● Identify Processors for Workstation, Midrange, Mainframe and Supercomputer.

			● Know Indian made super computer – Pratyush and Mihir ● Understand in -depth working of processor and comparison of processor based on Clock Speed, Cache etc.
3. Laptop	16	20	After completing this unit, Learner will be able to ● Understand internal operation of Laptop and its Architecture, ● Understand Hard and Soft Starting Process, ● Understand detail ACPI Specification ● Battery Charging Circuits,
4. BIOS, Booting and POST Test	4	9	After completing this unit, Learner will be able to understand ● BIOS definition, Starting BIOS, BIOS Setup - CPU Configuration. ● Working of BIOS Setup, SATA Configuration and Hardware. Health Configuration. ● BIOS and Booting Process, Security, POST Test Process
5. OS and Application Software	4	10	After completing this unit, Learner will be able to understand ● Definition and Architecture -Operating system(OS) ● Well Versed in installation of Ubuntu and Windows OS.

16.5 Marks Distribution

Module Unit	Written Marks (Max.)
1. Computer Hierarchy	30
2. Processor	20
3. Laptop	30
4. BIOS, Booting and POST Test	10
5. OS and Application Software	10
Total	100

16.6 Detailed Syllabus

(i) Computer Hierarchy

Comparison between Analog and Digital Electronics, Number Systems - Binary, BCD, Hexadecimal, Grey and its conversion, Study of Logic Gates and truth-table, De-Morgan's Equation, Study of simple Combinational Circuits – Half Adder and Subtractor, 4-Bit Full Adder and Subtractor, 1 Bit Multiplier, 4:1 MUX and 1:4 DEMUX and Decoder, Study of Simple Sequential Circuits – SR, JK, T and D Flip Flop, 4-Bit Universal Shift Register and 4-Bit Up/Down Counter Study of Types, Operation and Application of WorkStation, Midrange Computer, Mainframe Computer and Super Computer, operating system and application software.

(ii) Processor

Study of Specification, Electrical Properties and Application of Intel i7 Processor for Workstation, Intel i9 10980XE for Midrange Computer, Introduction to Indian Processor and its Applications – Shakti and Vega, Main and System Assistance Processor (SAP) for Mainframe Computer, Cray XC400 Parallel Multiprocessor Supercomputer, Introduction to Indian Super Computer and its Applications – Pratyush and Mihir.

(iii) Laptop

Introduction to Laptop and its Architecture, Hard and Soft Starting Process, ACPI Specification and G(Global), D(Device), S(Sleeping) and C State of ACPI, Power and Control Signal of ACPI, Clock and Reset Circuits, Battery Charging Circuits, Fault Tree for Common Errors and Failure

(iv) BIOS Booting and POST Test

Introduction to Firmware with Examples, BIOS definition, Starting BIOS, BIOS Setup - CPU Configuration, SATA Configuration, USM Configuration, On Board Device Configuration, Power Management Configuration, Hardware Health Configuration, BIOS and Booting Process, Security, POST Test Process, AMI Beep Codes, Phoenix Beep Codes, Fault Tree for Common Error and Messages

(v) OS Application

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Definition and Architecture -Operating system (OS), Single , Multi-Tasking OS, Distributed OS, Embedded OS and Real Time OS, Installation of Ubuntu and Windows OS, Definition and Architecture of Application Software, Installation of Free ware Application Software from Ubuntu OS and Proprietary Application Software Installation from Windows OS, Introduction to Cloud Computing.

16.7   Recommended Books/Study Material

1.   Book Title   :   Upgrading and Repairing PCs
       Author   :   Scott Mueller
       Edition   :   22nd Edition
       Publisher   :   Que
       ISBN-13   :   978-0789756107
       ISBN-10   :   9780789756107

2.   Book Title   :   Modern Computer Hardware Course
       Author   :   Lotia Manahar
       Publisher   :   B P B Publications
       ISBN No.   :   9788183331678, 818333167X

3.   Book Title   :   Computer Hardware
       Author   :   Hing Lown
       Publisher   :   Independently Published (Copy Right Material of Author)
       ISBN No.   :   9781718124493

4.   Book Title   :   Computer Hardware and Troubleshooting Lab Guide:
                               (Understand, Repair, Upgrade and do troubleshooting your
                               Computer (PC's) yourselves)
       Author   :   G. Ganesh Shashidhar
       Publisher   :   Independently Published (Copy Right Material of Author)
       ISBN No.   :   1983336319, 9781983336317

17.   Sample Practical Assignments

17.1 CHM1-R3 Basics of Computer Hardware

1.   How to use Digital Multi-Meter and its operation.
2.   Measurement of Resistance, Capacitance and Inductance values using Multi-Meter.
3.   How to use C.R.O. and its Operation.
4.   Measurement of Resistance, Capacitance and Inductance values using C.R.O.
5.   Measurement of Amplitude and Time of an input frequency.
6.   Verification of Ohm's Law.
7.   Measurement of Series and Parallel connected Resistance values.
8.   Measurement of Series and Parallel connected Capacitance values.

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9. Measurement of Series and Parallel connected Inductance values.
10. Measurement of Charging and discharging voltage of capacitor with respect to time.
11. Physical Identification of Diode, BJT Transistor and MOSFET.
12. Identification of terminals of Diode, BJT Transistor and MOSFET using Mutli-Meter.
13. Identification of faulty Diode, BJT Transistor and MOSFET using Mutli-Meter.
14. Identification of faulty Diode, BJT Transistor and MOSFET using C.R.O.
15. Full Wave Rectifier and observe output waveform on C.R.O.
16. Perform operation of Transistor as a switch.
17. To find out one example of each SSI, MSI and LSI VLSI ICs chips with operation of pin details from the datasheet.
18. Download Datasheet and find out IC No's for all Logic Gates.
19. Design of regulated power supply with filter using IC 7805 with following specifications as
    - Input Voltage 250V, 50Hzs and Output Voltage 5V DC
    - Compare calculated and Measured Power delivered by Power supply.
20. Design a SMPS power supply with filter using IC LM2576 with following specifications as
    - Input Voltage 250V, 50Hzs and Output Voltage 5V DC
    - Compare calculated and Measured Power delivered by Power supply.
21. Design a Compactor for 5V using IC 741
22. Identification of following on PC Mother Board
    - CPU Socket
    - CPU Fan
    - Heat Sink
    - SPU Fan Connector
    - Power Connector
    - SATA Connector
    - DIMM Memory Slots
    - Super IO Chip
    - BIOS Flash Chip
    - North Bridge
    - South Bridge
    - CMOS Backup Battery
    - Integrated Graphics Processor
    - Integrated Audio Codec Chip
    - Integrated Ethernet Chip
    - PCI Slots
    - Connectors for Integrated Peripherals like HDMI, USB, WIFI, Audio, Com Port.
23. De-assembly and Assembly of PC SMPS Power Supply
24. De-Assembly, Assembly, Windows OS Installation in Desktop PC.
25. Installation of Ubuntu Linux OS Installation in Desktop PC.
26. Installation of Dual OS with Dual Boot Facility(windows and Linux in Desktop PC.
27. Interfacing of AMD Chip set for processor socket SP3r3.

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17.2 CHM2-R3 Peripherals and Data Storage Devices

1. De-Assembly, Component Identification and Assembly of 3-Button (with wheel facility) wired optical mouse.
2. De-Assembly, Component Identification and Assembly of 3-Button (with wheel facility) wireless optical mouse.
3. De-Assembly, Component Identification and Assembly of Dot-Matrix Printer.
4. De-Assembly, Component Identification and Assembly of Ink-Jet Printer.
5. De-Assembly, Component Identification and Assembly of Laser-Jet Printer.
6. De-Assembly, Component Identification and Assembly of Multi-Function Printer.
7. Soldering Practice by connecting LEDs for displaying "NIELIT".
8. Pin Detail and connection of e-Paper and LED Dot-Matrix Display.
9. Pin Detail and connection of LCD and TFT Display.
10. Pin Detail and connection of Quantum Dot and Flexible Display.
11. With the help of Google Search list 05 no's of Free and Paid PC Diagnostic Tools in following Table

FREE PC DIAGNOSTIC TOOLS		
S.NO.	NAME	APPLICATION
01.		
02.		
PAID PC DIAGNOSTIC TOOLS		
S.NO.	NAME	APPLICATION
01.		
02.		

12. Pin Details and Working of following Ports
    - HDMI
    - USB
    - WIFI
    - COM
    - LPT
13. Result Analysis of Diagnostic Tools and its Command for Windows OS studied in Theory Class.
14. Result Analysis of Diagnostic Tools and its Command for Ubuntu Linux OS studied in Theory Class.
15. Practical session for developing Communication skills for collaboration which are essential for Technician.
16. Practical Session for developing Successful Negotiation Skills essential for Technician.
17. Practical Session to develop confidence and skills to overcome the barriers for working Efficiently and Effectively.
18. Practical Session for developing the skill of working in Team.

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19. Practical Session for developing the skill of Problem Management and Customer Handling.
20. Practical Session for developing the skill of Technical content writing.
21. Practical Session for developing the skill of content writing by viewing videos.
22. Practical Session for developing the skill of Leadership Quality.
23. Practical Session for developing the skill of working in Team.
24. Practical Session for developing the skill for facing Interview
25. Practical Session for developing the skill of Creative and Innovative Thinking. .

17.3 CHM3-R3 Computer Networking and Hardware

1. Physical setup and component identification of Co-axial, UTP and Fiber Optics cables.
2. De-Assembly, Component Identification and Assembly of Hub.
3. De-Assembly, Component Identification and Assembly of Switch.
4. De-Assembly, Component Identification and Assembly of Router.
5. De-Assembly, Component Identification and Assembly of wired Access Point.
6. De-Assembly, Component Identification and Assembly of Wi-Fi Access Point.
7. Practically identifying the Hardware and Software Components required for establishment of Gateways.
8. NIC Card Driver Installation for Windows OS.
9. NIC Card Driver Installation for Ubuntu OS.
10. Preparation of Cross-Over Network Cable using RJ45 Connector.
11. Preparation of Straight-Through Network Cable using RJ45 Connector
12. Setup 5(PCs) + 1(Server) wired networking using Windows Server 2000 and above and Windows OS on Client using IP and Subneting.
13. Setup 5(PCs) + 1(Server) wired networking using Ubuntu Linux Server and Ubuntu Linux OS on Client using using IP and Subneting.
14. Setup Login Credentials for accessing and sharing Internet on Windows Network Environment.
15. Setup Login Credentials for accessing and sharing Internet on Ubuntu Linux Network Environment.
16. Setup 5(PCs) + 1(Server) wifi networking using Windows Server 2000 and above and Windows OS on Client using IP and Subnetting.
17. Setup 5(PCs) + 1(Server) wifi networking using Ubuntu Linux Server and Ubuntu Linux OS on Client using IP and Subnetting.
18. Setup 5(PCs) + 1(Server) wired and wireless networking using Windows Server 2000 and above and Windows OS on Client using IP and Subnetting.
19. Setup 5(PCs) + 1(Server) wired and wireless networking using Ubuntu Linux Server and Ubuntu Linux OS on Client using IP and Subnetting.
20. Setup 5(PCs) + 1(Server) mixed of wired, wireless networking for Windows and Linux Environment in a single network using IP and Subnetting.
21. Setup Bluetooth Networking between PCs and Android Mobile Phone with resource sharing (Hardware and Software both).

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22. Hands on Practice and Result Analysis of the Network Command for Windows OS studied in Class.
23. Hands on Practice and Result Analysis of the Network Command for Linux OS studied in Class.
24. With the help of Google Search list 05 no's of Free and Paid Network Diagnostic Tools in following Table

FREE NETWORK DIAGNOSTIC TOOLS		
S.NO.	NAME	APPLICATION
01.		
02.		
PAID NETWORK DIAGNOSTIC TOOLS		
S.NO.	NAME	APPLICATION
01.		
02		

25. Calculation and Comparison of the Network Speed between Windows and Linux OS on 5(PC)+1(Server) Environment.

17.4 CHM4-R3 Working and Maintenance of Computer System

1. Performing AND, OR, NOT, XOR, EX-OR, EX-NOR, NAND and NOR Logical operations using Logic Gates ICs.
2. Implementation of all Logic Gates using NAND.
3. Implementation of all Logic Gates using NOR.
4. Half Adder Implementation using Logic Gates
5. Full Adder Implementation using Logic Gates.
6. Half Subtraction Implementation using Logic Gates.
7. Full Subtraction Implementation using Logic Gates.
8. Implementation of 1-Bit Multiplier using Logic Gates
9. Implementation of 4:1 MUX using IC 74153.
10. Implementation of 1:4 DE-MUX using IC 74139.
11. Implementation of SR and JK Flip-Flop using Logic Gates.
12. Implementation of T and D Flip-Flop using Logic Gates.
13. Implementation of 4-Bit UP/DOWN Counter using IC 74LS669.
14. Implementation of 4-Bit Bi-Directional Universal Shift Register using IC 74LS194.
15. Use of Datasheet for specification, electrical Properties and Application of Intel i7 Processor.
16. Use of Datasheet for specification, electrical Properties and Application of Intel i9 10980XE Processor.
17. De-Assembly, Component Identification and Assembly of Laptop.

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18.   De-Assembly, Component Identification and Assembly of Laptop Power Supply.
19.   De-Assembly, Component Identification and Assembly of Battery Charging Circuit of Laptop.
20.   Formatting and Installation of Windows OS and Driver on Laptop.
21.   Formatting and Installation of Ubuntu Linux OS and Driver on Laptop.
22.   Installation of Dual OS (Windows and Linux Both) on Laptop.
23.   Open the Laptop BIOS Setup and note down the setting and operation of following
    -    CPU Configuration.
    -    On Board device configuration.
    -    Power Management Configuration.
    -    Hardware Health Configuration.
    -    Booting Process Configuration.
24.   Practically identify failure of Hardware and Software component of Desktop PC during POST test and remove the failure.
25.   Practically identify failure of Hardware and Software component of Laptop during POST test and remove the failure.
26.   Visit Market, Technical Institution and Industries for survey and comparison of Work Station, Laptop, Mid Range Computer, Main Frame Computer and Super Computer in terms of specification, electrical properties, cost and Applications.

18.   Sample Question Paper: Basics of Computer Hardware (CHM1-R3)

1. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.

2. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.

3. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3HOURS   TOTAL MARKS: 100
                                        (PART ONE: 40; PART TWO: 60)

PART ONE
(Answer all the questions; each question carries ONE mark)

1. **Each question below gives a multiple choice of answers. Choose the most Appropriate one.**

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1.1 A 10 μF, 20 μF, 22 μF, and 100 μF capacitor are in parallel. The total capacitance is
    (a) 2.43 μF
    (b) 4.86 μF
    (c) 100 μF
    (d) 152 μF

1.2 3 No's of Resistance of value 1.5 KΩ each is connected in series. Total equivalent resistance is
    (a) 1.5 KΩ
    (b) 2.5 KΩ
    (c) 3.5 KΩ
    (d) 4.5 KΩ

1.3 Unit of Capacitor is Ohm
    (a) True
    (b) False
    (c) True and False Both
    (d) None of the Above

1.4 Unit of resistance is Farad
    (a) True and False Both
    (b) False
    (c) True
    (d) None of the Above

1.5 Diode has _____ Terminal
    (a) 1
    (b) 2
    (c) 3
    (d) 4

1.6 Diode is used for _____
    (a) Half Wave Rectification
    (b) Full Wave Rectification
    (c) Half and Full Wave Rectification both
    (d) None of the above

1.7 Zener Diode is used for
    (a) Voltage Regulation
    (b) Current Regulation
    (c) Current and Voltage Regulation both
    (d) None of the above

1.8 What is motherboard

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(a) Scanner and other things are part of motherboard
(b) Keyboard otherwise known as motherboard
(c) A circuit board which connects all the elements
(d) It is a type of file server

1.9 Which Motherboard form factor uses one 20 pin connector
(a) ATX
(b) AT
(c) BABY AT
(d) All of the above

1.10 Your operating system will detect and install the appropriate device drivers for this type of device is
     (a) Plug and Play
     (b) Plug and Go
     (c) Plug and Continue
     (d) Plug and Commence

1.11 Different components of the motherboard of a PC unit are linked together by sets of parallel electrical conducting lines. What are these lines called?
     (a) Conductors
     (b) Buses
     (c) Connectors
     (d) Consecutives

1.12 Where does the motherboard store the keyboard controller support program?
     (a) DRAM
     (b) Hard Drive
     (c) RAM
     (d) ROM Chip

1.13 Which chip acts as a clock to keep the current date and time
     (a) CMOS
     (b) DVRAM
     (c) RAM
     (d) ROM Chip

1.14 How can you easily clear the CMOS, including clearing the password
     (a) Unplug the PC
     (b) Unplug the PC and remove the CMOS Battery
     (c) Issue a Clear CMOS command from the command line
     (d) This can't be done

1.15 Computer expansion slots connects the interface cards to the
     (a) Ports

(b) Peripheral Devices
(c) Mother Board
(d) System Bus

1.16 SCSI must be terminated with
(e) Dip Switch
(f) Resistor
(g) BNC
(h) All of the Above

1.17 Which of the following handles the interconnection between most of the devices and the CPU
(a) Northbridge
(b) RAM
(c) ROM
(d) Southbridge

1.18 Which Intel processor fit into socket LGA 2066
(a) All Core 4.0 GHz
(b) Single Core 4.3GHz
(c) Core i9-7900X
(d) None of the above

1.19 Intel LGA 2066 Socket is also called as
(a) Socket R4
(b) Socket R3
(c) Socket R2
(d) Socket R1

1.20 Intel LGA 1200 Socket is used in
(a) Intel 9th Generation Processor
(b) Intel 10th Generation Processor
(c) Intel 10th Generation Processor
(d) Intel 10th and 11th Generation Processor

1.21 Intel 11th Generation Core Processor is code named as
(a) Rocket Lake
(b) Ice Lake
(c) Cypress Curve
(d) Sunny Curve

1.20 Socket sTRX4 is also called as
(a) Socket AM4
(b) Socket SP3r3
(c) Socket AM5
(d) None of the above

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1.21   Socket SP3r2 is a
        (a) Circular Grid Array CPU Socket
        (b) Circular and Land Grid Array CPU Socket
        (c) Land Grid Array CPU Socket
        (d) None of the Above

1.22   Which type of memory can read data but can't write data
        (a) Random Only Memory
        (b) Random Access Memory
        (c) Read Only Memory
        (d) None of the Above

1.23   Which one is volatile
        (a) DROM
        (b) Secondary Memory
        (c) RAM
        (d) Random Only Memory

1.24   RAM of a Computer is
        (a) External Memory
        (b) Internal Memory
        (c) Auxiliary Memory
        (d) None of the Above

1.25   Primary Memory is used for storing
        (a) Data Only
        (b) Calculations Only
        (c) Programs Only
        (d) All of the Above

1.26   Memory is a Part of
        (a) Input Device
        (b) Output Device
        (c) CPU
        (d) Control Unit

1.27   Main Memory of Computer is
        (a) Internal Memory
        (b) External Memory
        (c) Both (a) and (b)
        (d) Auxiliary Memory

1.28   Which statement is valid
        (a) 1KB=1024Bytes
        (b) 1MB=2048 Bytes
        (c) 1MB=10000 Kilobytes
        (d) 1KB=100 Bytes

1.29   Which type of memory can speed up computer processing
        (a) ROM
        (b) Cache Memory

(c) Registers
(d) Both (a) and (b)

1.30 Which memory is onboard storage
(a) Random Access Memory
(b) Cache Memory
(c) Virtual Memory
(d) Random Only Memory

1.31 From where the processor can access data fastly
(a) Random Access Memory
(b) Cache Memory
(c) Registers
(d) Secondary Memory

1.32 The program which are as permanent as hardware and stored in ROM is known as
(a) Hardware
(b) Software
(c) Firmware
(d) All of the above

1.33 Which type of ROM contains no Initial storage at the time of manufacturing
(a) PROM
(b) EROM
(c) DROM
(d) Both (a) and (b)

1.34 Which one is not kno0wn as type of Computer Memory
(a) DRAM
(b) SRAM
(c) FRAM
(d) EPROM

1.35 Communication between the components, processor and memory takes place via the address and
(a) I/O Bus
(b) Data Bus
(c) Address Bus
(d) Control Bus

1.36 The full form of PCI in the context of processor is
(a) Peripheral Component Interconnect
(b) Personal Computer Interface
(c) Personal Computer Information
(d) Peripheral and Component Information

1.38 The serial port is used to connect basically _____ and processor
(a) I/O Devices
(b) Speakers
(c) Printer
(d) Monitor

1.39 The disadvantage of using a parallel mode of communication is
(a) It is Costly
(b) Leads to erroneous Data Transfer

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      (c) Security of Data
      (d) All of the Above

1.40   The video devices are connected to_____ bus
      (a) PCI
      (b) USB
      (c) HDMI
      (d) SCSI

PART TWO
(Answer any FOUR questions)

2.   (a)   Explain the Basic Working of SMPS in Detail
      (b)   Describe the Working of MOSFET   **(6+6)**

3. (a) Define Motherboard and its Form Factor in Detail with Suitable Diagram
     (b) Explain in details each Motherboard Components.   **(6+6)**

4. (a) Explain in Detail Northbridge Chipset Architecture with Suitable Diagram
     (b) Explain working of Socket LGA1200 in Detail   **(6+6)**

5. (a) Explain in brief the basic working principle of RAM with Suitable Diagram
     (b) Explain in brief the basic working principle of HDD with suitable Diagram   **(6+6)**

6. Briefly explain the following(Any Two):
    a. Data Organization in Memory
    b. Virtual Memory
    c. Control Bus
    d. SSD Operation
    e. General Fault Tree Analysis for Mother Board   **(6*2=12)**

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19. Sample Question Paper: Peripheral and Data Storage Devices (CHM2-R3)

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4. There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
5. **PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.
6. Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3HOURS   TOTAL MARKS: 100
                                          (PART ONE: 40; PART TWO: 60)

PART ONE
(Answer all the questions; each question carries ONE mark)

1. **Each question below gives a multiple choice of answers. Choose the most Appropriate one.**

1.1 _____is the longest key on the keyboard
   (a) Spacebar
   (b) Enter
   (c) Arrow
   (d) Shift

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1.2 Small blinking line on the monitor screen is called
    (a) +
    (b) Cursor
    (c) -
    (d) *

1.3 Small led light on the keyboard tells us caps lock key is
    (a) ON/OFF
    (b) ON/ON
    (c) OFF/OFF
    (d) None of the above

1.4 Mouse is a _____ device
    (a) Pointing
    (b) Clicking
    (c) Pointer
    (d) Scroll

1.5 Mouse wire is attach to the
    (a) UPS
    (b) Keyboard
    (c) CPU
    (d) USB

1.6 Which printer is used to print only characters and symbols and cannot print graphics
    (a) Ink Jet Printer
    (b) Thermal Printer
    (c) Daisy Wheel Printer
    (d) Laser Printer

1.7 Which test indicates that the motor laser scanners drive assemblies and sensors are working correctly
    (a) Event Log Test
    (b) Printer Configuration Test
    (c) Self Test
    (d) Engine Test

1.8 Which type of display is the latest to be used for portable computer
    (a) LED Display
    (b) LCD Display
    (c) Plasma Display

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(d) Electroluminescent Display

1.9 LEDs operates at _____ bias
   (a) Forward
   (b) Reverse
   (c) Neutral
   (d) None of the Above

1.10 The Full Form of LCD is
   (a) Liquid Crystalline Display
   (b) Liquid Crystal Display
   (c) Logical Crystal Display
   (d) Logical Crystalline Display

1.11 Electro-Optical effect is produced in
   (a) LED
   (b) LCD
   (c) OFC
   (d) OLED

1.12 LCD operate from a voltage ranges from
   (a) 3 to 15V
   (b) 10 to 15V
   (c) 10V
   (d) 5V

1.13 The main advantages of Electronic Paper over LCD Display is
   (a) Paper Like Readability, High Resolution and Low Power Consumption
   (b) LCD Like Readability, High Resolution and Low Power Consumption
   (c) Paper Like Readability, Low Resolution and Low Power Consumption
   (d) None of the Above

1.14 Electronic Paper, is the Technology that mimics the appearance of
   (a) Ink on Paper
   (b) Ordinary Ink on Paper
   (c) LCD on Paper
   (d) None of the Above

1.15 Plasma Panel are also called as
   (a) Liquid Crystal Display
   (b) Gas Discharge Display
   (c) Non Emissive Display
   (d) Emissive Display

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1.16 What is Pixel
   (a) A term of Graphic or Video Display
   (b) A Software
   (c) A Hardware
   (d) A Point

1.17 Gray Scale is used in
   (a) Monitor that have no Colour Capability
   (b) Monitor that have Colour Capability
   (c) Random Scan Display
   (d) None of Above

1.18 What is the Full form of TFT in LCD Panels
   (a) Thick Film Transistor
   (b) Thin Film Transistor
   (c) Thread Film Transistor
   (d) Tube Film Transistor

1.19 The Full Form of OLED Display is
   (a) Original Light Emitting Diode
   (b) Organic Light Emitting Diode
   (c) Original Least Emitting Diode
   (d) Original Limited Electric Discharge

1.20 OLED Display is better than LED because
   (a) They are Cheaper
   (b) They have High Brightness
   (c) Don't require any illuminating Source
   (d) Easy to Manufacture

1.21 Aspect Ratio means
   (a) Number of Pixels
   (b) Ration of Vertical Point to Horizontal Point
   (c) Ration of Horizontal Point to Vertical Point
   (d) Both a and b

1.22 The Primary output device in a Graphics System is
   (a) Scanner
   (b) Video Monitor
   (c) Neither a nor b
   (d) Printer

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1.23 Higher the number of pixels, _____ the image quality
  (a) Bad
  (b) Better
  (c) Smaller
  (d) None of the Above

1.24 Each Bit Represent
  (a) One Colour
  (b) Two Colour
  (c) Three Colour
  (d) None

1.25 What do you call the programs that are used to find out possible faults and their causes
  (a) Operating System Extensions
  (b) Cookies
  (c) Diagnostic Software
  (d) Boot Diskettes

1.26 Which of the following is not Anti-Viruses Software
  (a) NAV
  (b) F-Prot
  (c) Oracle
  (d) McAfee

1.27 Windows OS System Diagnostic Report can be generated by
  (a) perfmon
  (b) mdsched
  (c) perfmon /report
  (d) None of the Above

1.28 What is Microsoft Window
  (a) Operating System
  (b) Graphics Program
  (c) Word Processing
  (d) Database Program

1.29 Which is the Linux Operating System
  (a) Private Operating System
  (b) Windows Operating System
  (c) Open Source Operating System

(d) None of the Above

1.30 _____ allows the user to interactively monitor the system's vital resources or server's processes in real time in Linux OS
   (a) htop
   (b) h_top
   (c) h
   (d) None of the Above

1.31 Information about used and unused memory usage and swap memory of a Linux OS System is given by
   (a) vmstat
   (b) free
   (c) fdisk
   (d) hw info

1.32 "lsscsi" Linux OS command gives information about
   (a) Various Transport being used in the system
   (b) IEEE 1304 (SBP)
   (c) SCSI Parallel Interface
   (d) FC

1.33 Linux OS "hwinfo" command gives information about
   (a) Software
   (b) Hardware
   (c) Hardware and Software Both
   (d) None of the Above

1.34 Linux OS "lsusb" command gives information about
   (a) USB Buses and Devices Connected to Them
   (b) Only about USB Port
   (c) Only About COM Port
   (d) Only About LPT Port

1.35 Disk IO usage details and IO Utilization process information in Linux OS is gathered by
   (a) lsblk Command
   (b) Vmstat Command
   (c) Io Command
   (d) Iotop Command

1.36 Linux OS gives CPU Architecture Information by Running
   (a) lsblk Command
   (b) Vmstat Command
   (c) Io Command

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(d) Iotop Command

1.37 Effectively Presenting your thoughts and Ideas, verbally and in Writing is
    (a) Teamwork
    (b) Perseverance
    (c) Communication
    (d) Respect

1.38 Working without being told, being self-motivated and being the first to begin work shows
    (a) Motivation
    (b) Initiative
    (c) Leadership
    (d) Persistence

1.39 What is Teamwork
    (a) The ability to do something without being asked
    (b) The ability to work with others to get the job done
    (c) The ability to get people to do what you want
    (d) The ability to clearly express yourself
    (e) The ability to get people to do what you want

1.40 In active listening, you should always maintain _____ contact
    (a) Hand
    (b) Eye
    (c) Feet
    (d) Arm Length

PART TWO

(Answer any FOUR questions)

2.   (a)   **Explain the Construction and Working of Laser Jet Printer**
    (b)   **Describe the Construction and Working of Wireless Optical Mouse**   **(7+6=13)**

3.   (a)   **Explain the operation of Plasma Display with Suitable Diagram**
    (b)   **Explain in detail Operation and Working of OLED Display.**   **(7+6=13)**

4.   (a)   **What are the various inbuilt diagnostic tools available in windows OS for System diagnostic. Explain in Detail**
    (b)   **Explain in detail about the information gathered by running "iotop" command in Linux OS System**

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(7+6=13)

5.   **(a)**   **Explain in detail the methodology of understanding oneself.**
     (b)   **Explain in detail how you will manage your stress and emotion in a working envvo4rnment.**

(5+6=11)

6.   **Briefly explain the following(Any Two):**
     a.   **Innovative Thinking**
     b.   **Communication Skill Development**
     c.   **Leadership**
     d.   **Letter Writing and Composition**   **(5*2=10)**