NIELIT

# CHM-O level, Curriculum

**Total duration of the Courses: 400 Hours**
**Theory and Conceptual Classes: 214 Hours**
**Practical Classes: 186 Hours**

**The theory exam would be of 100 marks & the practical exam would be of 50 marks. To pass the course, 50% marks are required in both theory and practical component in all six courses.**

## Module 1 - H1: PC Hardware & Components

**60 Hours**

**Course Prerequisites:**
Basic electricity and digital electronics, basic knowledge about the computer systems (identification with/ without working units) will be an added advantage.

**Learning outcome of the Course**
On completion program the students will be able to understand the fundamentals of Hardware, handling, testing & troubleshooting of personal computer problems.

**Course details**

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|---|---|
| Section 1: PC hardware<br>The PC hardware consisting input, processing and output sections and basic building components. Introduction to computer hardware components of mother boards, CPU, chip-set, various ports, slots, connectors, addon cards, etc., Protection of PC hardware, anti static wrist band, protection and safety devices. | Hours: 6 |
| Section 2: Primary Memory<br>ROM,PROM, EPROM, EEPROM, L1, L2 RAM, types of memory, static, dynamic, DRAM, SDRAM, DDR2, DDR3. Virtual memory, Cache memory, Linear & Physical memory, video memory. | Hours: 6 |
| Section 3: Secondary storage<br>HDD like IDE, SATA, e-SATA, SCSI, Introduction to HDD controllers like SCSCI controllers and RAID controllers their requirement and configuration. Backup devices magnetic tape drives, UBS Pen-drives, External HDDs, CDROM, CDRW, DVD, Blue-Ray Discs, etc. | Hours: 6 |
| Section 4: Power Supply<br>Switched Mode Power supply block diagram, working principles, testing and troubleshooting, power rating, requirement of SMPS wattage depending parameters like processor, HDDs used, etc. | Hours: 6 |
| Section 5: Cabinet types<br>Various types of cabinets of PCs & it's handling, servers, gaming PCs. Introduction to server cabinets, Rack mount and blade servers. | Hours: 6 |
| Practicals | Hours: 30 |

Practical-I (Hardware Components Identification): Identify and handling of Internal components in the PC Cabinets like SMPS and its connection to Motherboard and various devices, Motherboard, CPU, Chipset, Slots, Memory modules, memory slots, Hard Disc Drives, CDROM/DVD/Blue-Ray Disc, etc. 5Hrs

Practical-II (System Integration) : Assembly of PC using various parts, Interconnection between devices, cable polarities and connections, SMPS installation and power connection. Various types of Add-on Cards, Motherboard slot and their application. 5 Hrs

Practical-III (OS and Application Software Installation) : Multiple HDD installation and creation single large volume out of it, Installation of Operating System like Windows7, Windows8, Windows 2008, various Linux flavors like Ubantu, SUSE, RedHat, Introduction to VMware Virtualization etc. 10 Hrs

Practical-IV (Troubleshooting) : Troubleshooting of various hardware problems like SMPS failure, Display not there, missing OS or re-installation of user software or system software. CDROM, DVD lens cleaning or replacement, CMOS setup, Battery replacement on motherboard in case BIOS is not retaining correct values. Driver software Downloading and installation, Antivirus Software installation, scanning for viruses, removing .tmp files from WINDOWS machine, etc 10 Hrs

**Module 2 - H2: PC Architechture** **50 Hours**

**Course Prerequisites:**
Basic knowledge of Digital Electronics , Number Systems (Decimal, Binary, Octal, Hexa).

**Learning outcome of the Course**
Able to diagnose the problem Desktop /Laptop /Mobile/ Note pad etc. and repair

**Course details**

Section 1: Introduction to Microprocessor Hours: 6

Evolution of Microprocessor, architecture of Microprocessor

Section 2: ARM PROCESSORS Hours: 12

ARM Programmer's Model – Registers – Processor Modes – State of the processor – Condition Flags – ARM Pipelines – Exception Vector Table – ARM Processor Families – Introduction to ARM Memory Management Unit
ARM Addressing Modes – ARM Instruction Set Overview – Thumb Instruction Set Overview – LPC210X ARM Processor Features

Section 3: Troubleshooting & General PC Problems Hours: 12

Introduction, General Troubleshooting rules, Preventive Maintenance.
Typical Motherboard BIOS, BIOS Features, BIOS & Boot Sequences, BIOS Shortcoming & Compatible Issues, BIOS Troubleshooting, BIOS Upgrades.
POST, Error Code: Beep Code, Post Code, Post Reader Card
Basic Memory Concepts: Introduction, Installing Memories, Upgrade Options & Strategies

Printers: Printer Technology, How Printer Works, Attaching Printer, Installing Network Printer Drivers, Common Printer Problems & Solution

Practicals

1. Study of different types of motherboards.
2. Study of jumper settings on Pentium mother boards.
3. Installation of memory modules.
4. Study of Various adapter cards and their functioning and installation.
5. Study of different buses and the number of pins in the different slots corresponding to different buses.
6. Opening the PC and identification and study of its different blocks, assembling and disassembling.
7. Study of various types of display Graphic cards
8. Assembly and disassembly of different Desktop /Laptop /Mobile/ Note pad etc.
9. Identification of all chips and crystals on laptop and desktop motherboard
10. Installation of DVD/USB..
11. Study of faults diagnosis based on different beeps.
12. Configure CMOS, BIOS setup.
13. Installation of hard disk, Partitioning.
14. Installation of hard disk in master and slave mode.
15. How to access the configured space of ISA slot.
16. Study of Desktop /Laptop /Mobile/ Note pad etc specification.
17. Study of preventive maintenance of latest gazettes .
18. Examining various error codes and their causes
19. Study of various Operating sytems.
20. Replacing Mobile Processor, FPC belts, DVI cables, switches, speakers, web cams, ventilation fans, Bluetooth cards, WI-FI cards, WI-FI antenna cables of laptops

**Module 3 - H3: Advanced networks and networking peripherals**

**80 Hours**

**Course Prerequisites:**

Basic understanding of computers networks and Internet,
MSCIT course will be an added advantage

**Learning outcome of the Course**

Subject contents are designed with an intention to provide an Introduction to Computer Networks, other relevant networks and extensively used Network peripherals. it also focuses on various types of internet connections , network services , network security and finally deals with general troubleshooting and maintenance of Networks and networking peripherals.

**Course details**

Section 1: Networking Basics — Hours: 6

What is networking, Basic types of network, server client & peer to peer, Types of topologies, Types of Networks, Local Area Network(LAN), Metropolitan Area Networks (MAN) and Wide Area Networks (WAN), Personalized area Network (PAN), Storage area network (SAN), campus area Network(CAN), Network attached storage (NAS) , OSI & TCP/IP Model and layers, The need of layered solutions.

Section 2: Network components & Management — Hours: 3

Transmission mediums (wired, radio frequency, electromagnetic waves) , types of cables, Modems,

routers, switches, Hubs, Wireless Routers , Network management, effect of Natural elements on Networks.

Section 3: Data Communication, protocols and filters — Hours: 6

Data Transmission Mode, Digital and Analog Data Transmission , circuit Switching and packet switching , Introduction to Communication Protocols(TCP, UDP, ICMP, DHCP, HTTP, POP, FTP, IMAP etc), data Packets Structure, Packet Filters, Application-Level , Circuit-Level and Dynamic Packet Filters, packet filtering with Proxy

Section 4: Transmission Media and Networking Connectivity Hardware — Hours: 5

Network interface cards–Ethernet, Cabling Concepts ( designing, installing, and maintaining modern communications infrastructures and electronic physical security systems. Fiber optics, wireless networks) CAT 5 & 6 Structured Cabling, Crimping etc.

Section 5: Types of Internet connections and protocols — Hours: 4

Dialup, DSL/ADSL, Cable broadband, cable TV, leased line, satellite(V-Sat) , Wi-Fi, WI-Max, (3G-4G) Internet service provider (ISP) , Networking protocol, Internet protocol (IP), IP grouping.

Section 6: Network services — Hours: 6

Introduction to Internet , World Wide Web, E-mails, Chat, Search Engines, types of portals, Social Networking , cloud based application, Virtual private network (VPN), Enterprise private network (EPN), Intranets and extranets , Audio/video intercoms, Video teleconferencing, various Security cameras, voice over internet protocol (VOIP).

Section 7: Network security — Hours: 5

Need of network security, Types of Attacks(Active and Passive), Threats, Vulnerabilities, Access control, security in wireless networks, Introduction to firewalls , Intrusion detection system (IDS), Intrusion prevention system (IPS), need of network security in E-commerce and E-governance.

Practicals — Practical Hours: 40

| Sr. no. | List of Practical's |
|---|---|
| 1 | Demonstration of LAN-client/server, user creation, password protection and peer to peer network |
| 2 | Demonstration and installation of networking cables co-axial , twisted pair, optic fibre, crimping of cables straight cable , cross cable , RJ 45 |
| 3 | Installation of Network card in system and connecting system in LAN |
| 4 | Using basic Networking commands- like ping, IP Config, etc with various switches. |
| 5 | Demonstration and installation of networking components Modems, routers, switches, Hubs, Wireless Routers |
| 6 | IP configuration and working with various protocols |
| 7 | Personalized Area Network Setup |

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|---|---|
| 8 | wireless network setup |
| 9 | VPN and EPN setup |
| 10 | Broadband Router installation in networks |
| 11 | Working with advance network diagnosis and connectivity command |
| 12 | Software based Firewall Installation & understanding firewall logs |
| 13 | Installation and working of Audio/video intercoms, |
| 14 | Installation and working of Video teleconferencing |
| 15 | Installation and working of Security cameras (CCTV) |
| 16 | Working and understanding of FTP and remote access |
| 17 | Demonstration of Networking administration services |
| 18 | Demonstration of VOIP |
| 19 | Demonstration of IDS/IPS |
| 20 | Demonstration of E-commerce/E-tendering |

**Module 4 - H4: Operating System, Software & Tools**

**80 Hours**

**Course Prerequisites:**

Basic understanding of computers Operating system ,

**Learning outcome of the Course**

Subject contents are designed with an intention to provide an Introduction to the Operating system ( windows 7,8 & Linux), types of software , software engineering basic, and understanding various programming languages and platforms, it also focuses on inbuilt diagnostic tools of windows. with additional information about file system, memory management, system backup and restore , viruses and anti viruses.

**Course details**

Section 1: Basics of Operating System — Hours: 5

Computer organization, Central Processing Unit , Introduction to Operating system, types of Operating system (single user , multiuser etc ),
Concepts of process management, concurrency, scheduling, synchronization,
Different types of operating system (DOS, UNIX, LINUX, Windows 7, Windows 8, Mac , Android etc.
Working with existing programs in WINDOWS 7,8 and Linux, working with files and folders, working with different explorers, study of control panel and its settings.

Section 2: Memory management and file systems — Hours: 5

Types of Memory – RAM, ROM etc, Understanding working of internal and external Storage devices.
Memory units, memory structure and management.
Introduction to FAT/NTFS, difference between FAT/NTFS. data storage and data access principles of FAT/NTFS, FAT and MFT structure, attributes in FAT/NTFS, file management and memory management in FAT/NTFS, data deletion and data recovery Concept. formatting,

Section 3: Operating system Back-up and restore — Hours: 4

System Image backup, backup and restore, freeing up disk space, defragmentation, taking updates,

network firewall, spyware and unwanted software protection, run maintenance, and other operating system security features

Section 4: Advanced operating system concepts — Hours: 6

Operating systems in Mainframe systems, Desktop Systems, Multiprocessor Systems, Distributed Systems, Clustered Systems, Real Time Systems, Handheld Systems, Operating System Services, System Calls, Process Scheduling. Deadlock, Methods for handling Deadlocks ,Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlocks. Storage Management, Swapping, Contiguous Memory allocation, Paging, Segmentation Virtual Memory, File Sharing, File System Implementation, Directory Implementation, Free-space Management, Disk Management.

Section 5: Viruses & anti-viruses — Hours: 4

What are virus, types of virus , worms, malware, adware, spyware, virus signatures , how antivirus works, concept behind Virus prevention and removing, various Antivirus programs and installation, difference between virus removal and quarantine, introduction to zero day/zero hour attacks, no single antivirus is perfect

Section 6: Operating system security — Hours: 4

Creating accounts with proper privileges, Authentication, program threats , system threats , network threats in various operating system. Protected objects and methods of protection, Memory address protection, Control of access to general objects, File protection mechanism, file & resource access control security in various operating system.

Section 7: Introduction to Software and software engineering — Hours: 12

Types of software's, Application Software and System Software, device drivers, firmware's. development software's.
Definitions, Characteristics of Software , Software Life Cycle Models ,Requirement Analysis, Prototyping, Specification, Analysis model, Software Design: Abstraction, modularity, Software architecture, Architectural design and procedural design – Data flow oriented design. User Interface Design: Human computer interface design, basic understanding and working of various programming/scripting languages and platform.

Practicals — Practical Hours: 40

| | |
|---|---|
| 1 | Installation of Windows 7, 8 , Linux |
| 2 | Study of control panel and settings |
| 3 | Adding of new hardware, and software |
| 4 | Creating and administration of User accounts |
| 5 | Installing/scheduling/Running of Anti-virus program |
| 6 | Taking the backup of directories, files & complete hard disk |
| 7 | Installation of Windows NT Server /Linux, clients and practice of using the network |
| 8 | Running of Scan disk and Disk defragmenter as part of preventive maintenance |
| 9 | Use of different commands of Windows 7,8 in command prompt. |
| 10 | Patches in Linux/ service pack in Windows and its update in both. |

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|---|---|
| 11 | Installation of Multiple operating Systems |
| 12 | Configuring System as server. |
| 13 | Creating a backup files on CD/ DVD etc. |
| 14 | Personalizing desktop |
| 15 | Creating partition and file system in Windows/ Linux |
| 16 | Adding and removing user accounts. |
| 17 | understanding windows registry |
| 18 | Basic programs in various programming languages |
| 19 | understanding system configuration of various development platforms |
| 20 | Trouble shooting Linux |

**Module 5 - H5: Personality Development**

**40 Hours**

**Course Prerequisites:**
Student should be prepared for changing some habits, attitudes, beliefs and outlooks etc.

**Learning outcome of the Course**
Student will be capapale for performing better in their roles as leader/ manager/ well behaved/ well mannered personality in their future.

**Course details**

Section 1: Personality Development — Hours: 5

PERSONALITY DETERMINANTS
Self Awareness, Self-analysis, Self-disclosure, Personality ,Attitudes, Perceptions
Building Positive Personality, Habits, Personal Grooming (Dressing Well) & Etiquettes Health and Hygiene, Body Language

Section 2: Self Esteem and Stress Management — Hours: 9

SELF ESTEEM
Poor Self-Esteem vs. Healthy Self-Esteem, Consequences of Low Self-Esteem, Steps to Better Self-Esteem, Self Efficacy, Self-motivation,
Time management, Stress Management, Job Demands, Job Security, Relations With Your Supervisor And Co-Workers, Emotional Component- Factors That Determine Our Attitude, Types of Attitude, Etiquette

Section 3: Communication — Hours: 10

Introduction to Communication
Classification Of Communication, Verbal & Non-Verbal, Purpose, Process, Elements, Effective Communication, Major Difficulties In Communication,
Barriers To Communcation, Successful Communication
Written Communication, Letter Writing, Report Writing, E-Mail
Oral Communication, Public Speaking Skills, Presentation Skills
Group Discussion, Personal Interviews, Communication Skills
Non-Verbal Comunication, , Assertiveness (Ability To Express Yourself), Body Language

Section 4: Emergencies and management — Hours: 5

Health emergencies, first aid, electric shock, protection from electricity, other emergencies and management in energencies.

Section 5: Environmental Studies — Hours: 5

Polution, types, disadvantages of polution and how to reduce.
waste Management, Solid waste, liquid waste, harmful waste and e-waste .
Means for improving environment,

Practicals — Practical Hours: 16

1. Write about Possitive personalities.
2. Write about your Good or Bad Habbits.
3. Write some Good Ideas about Social Work.
4. Group discussion on any of the topic on personality.
5. Mock events / competitions.
6. Extempore speech on any subject / topic.
7. Personality building exercises, Yoga, Physical activities, - Humour
8. Collect some thoughts about Motivation write it down on Drawing Sheet in Bold Letters
9. Collect Information about Good Books for Motivation read carefully & collect Good Thoughts
10. Discussion with Teacher on Positive Attitude
11. Collect new & statics of e-waste from news papers
12. Deminstration and application of First aid techniques,
13. Demo and practice of CPR technique.
14. Waste management, practice of segregation, disposal methods.

**Module 6 - H6: Devices and Applications**

**80 Hours**

**Course Prerequisites:**
Basic knowledge of computer and its Devices.

**Learning outcome of the Course**
1. Students will be able to Identify existing configuration of the computer and peripherals and also to troubleshoot and repair common problems with these devices of computers
2. Students will be able to understand the applications of devices.

**Course details**

Section 1: Input Devices and Applications — Hours: 8

Mouse, Keyboard, Scanners: Flatbed scanner, Fingerprint scanner, Retina scanner, Iris scanner, Micro Phone, Webcam, Digital Camera, Bio-Metric system, Bar code reader ,Optical mark reader, Optical character reader, Magnetic strip reader, Smart card reader, RFID reader, Touch screen, Audio Input device, MIDI(musical instrument digital interface.OMR Software

Section 2: Display devices classification and its use — Hours: 6

Types of display, Liquid Crystal Display, Models of LCD Display, How LCD display works, Cold cathode fluorescent lamp (CCFL), display layers ,Components of LCD module, Comparison of display, Manufacturers, LCD panels, TFT-LCD, layers of TFT screen, CCFL inverter, CCFL for TFT LCD backlighting

CCFL lamp TFT-LCD VGA connector Different between LCD & TFT

Section 3: Output Devices and Applications — Hours: 8

Types of Output Devices: text, graphics and audio and video, Visual Display Unites, Sound output Electronic paper, Classification of printers: Impact Printer Inkjet Printer Laser printer, Thermal printer, Personal printer, shared printer, portable plotter printer, Photo Printer, Dot-Metrics Printer, Audio output devices: speakers and Head phones Multimedia Systems. Other Devices Fax machine, Projectors, Jammers.
Introduction to 3D printers and Applications

Section 4: Secondary Storage Device media and Applications — Hours: 8

Magnetic media Hard disk Magnetic Tape drive CD-ROM CD-R CD-RW Solid-state memory USB(memory stick) Flash Drive Memory cards, digital video camera, CCTV.

Section 5: Trouble Shooting related to device and its use — Hours: 10

I/O Devices ,Display Devices, Storage Devices, Power Device

Practicals — Practical Hours: 40

1. Identification of Components(input/output)
2. Identification of Ports
3. Functions of each devices
4. Installation of Input Devices (mouse, keyboard, scanner micro phone, webcam, Digital camera etc....)
5. Installation and use of display devices(CRT, LCD, LED)
6. Installation of Output Devices(printers speakers, multimedia devices
7. Working structures of 3D printers
8. Troubleshooting on devices(input/output)
9. Installation and use of projectors
10. Working status of FAX machines
11. Test of knowledge on storage devices( Hard disk , DVD, CD, Memory cards)