National Institute of Electronics and Information Technology

Name of the Course: CHM (Computer Hardware Maintenance) A Level

Course Code: LTC-4

Duration of the Course (in hours): 520 Hours

Yearly Session: Jan to June session, July to December session**.**

Minimum Eligibility: 'O' Level in CHM

Total duration of the Subjects: 520 Hours
Theory and Conceptual Classes: 260 Hours
Practical Classes: 260 Hours

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

SUBJECT CODE: A1   **Hours: 60**
        Advanced PC Hardware and Networking Components.

Subject Prerequisites:
Candidate should have basic knowledge of troubleshooting desktop PCs, Fundamentals of wireless communication technologies available in the market. Also have some level of hands on practice for driver installation, configuration basic wireless networks.

Subject Outcome:
Candidate should able to handle and repair laptops, tablets, identify the faults and troubleshoot. candidate should be able to establish secured wireless network for given assignment.

1. Introduction to Portable Mobile Computers, Laptops, Tablets   **Hours: 10**
    Types and classes of portable computers: - Laptops, Notebooks, Tablets, Smart Phones, Palmtops. Portable System models and configurations from different manufacturers: - IBM, DELL, Apple, Samsung, HP, Toshiba, Fujitsu, Acer, Compact Version Operating Systems and applications for portable Computers: - WINDOWS 8, Android and various various releases, various flavors of Linux that being loaded on handheld devices, Apple Macintosh and iOS. Low powered Portable system Processors and Graphics Processors GPU:- Intel Mobile Pentium, Mobile Celeron Processors, ARM Cortex processors, AMD Mobile Athlon-4 and Mobile Duron. Mobile processor packaging and compact Motherboards.

2. Compact devices used in Portable Mobile Computers   **Hours: 5**
    Compact Hard Drives, CD/DVD R/W used in Mobile computers. Various type of secondary memory

deployed in compact devices like Compact FLASH, MicroSD Cards, Wireless blutooth based Keyboards and mouse: - Inbuilt and External keyboards, Compact multimedia keyboards, TrackPoint, Touchpad's, Wireless mouse.

3. Specialized output devices used in Portable Mobile Computers.   Hours: 5
Display used in portable computers:- Dual Scan(passive Matrix) Displays. Active Matrix, Flat- Panel LCD/LED/AMOLED/IPS Displays, Active TFT Displays, touch panel, etc.

4. Interfacing used with Portable Mobile Computers   Hours: 3
PCMCIA Cards:- PCMCIA Ethernet LAN card, PCMCIA Wireless Card. Type –I, Type –II Type –III types of cards, and their slots. Infrared ports, Docking Stations, USB port, OTG USB, Mini USB, HDMI, micro HDMI port, etc

5. Preventive maintenance for Portable Mobile Computers   Hours: 2
Power Supply constraints, Battery charging, Handling and Storage, Cleaning of Displays, Running diagnostic software tools, Antivirus Software, Handling Plug-in /Plug-out Hardware.

6. Portable Mobile Computers in wireless LANS   Hours: 10
Wireless Standards :- IEEE 802. 11(a/b/g/n/ac), 802. 16 (Wi-max) RF Data Communication. Types of wireless networks IBSS Ad-Hoc, BSS and ESS Network Fundamentals and deployment, Key Characteristics of 802. 11 Wireless LANs, Typical Range of 802. 11a/b/g/n/ac WLAN, Access Point, Bridging, Wireless Router A WLAN Architecture, Typical Bluetooth Network—A Scatter-net, Bluetooth Ad Hoc Topology, Bluetooth Operating Range, Key Characteristics of Bluetooth Technology, Device Classes of Power Management. Introduction to Wireless Communication NFC. Emerging Wireless Technologies, wireless Internet, e-mail, and global positioning system(GPS) capabilities. General Packet Radio Service (GPRS), Enhanced Data GSM. Environment (EDGE), and Universal Mobile Telecommunications Service (UMTS), Wimax, LTE 4G services in mobile communication. Wireless Security Threats, Authenticity, Authorization, Accountability, Wireless Security of 802. 11b/g/n/ac in Typical Network, Taxonomy of 802. 11 Authentication Techniques, Shared-key Authentication Message Flow, WEP Privacy Using RC4 Algorithm, Taxonomy of Security Attacks. Encryption Algorithms WEP, WPA, TKIP, AES to secure Wi-Fi communication, etc.

List of Experiments   Hours: 25
1. Visit the Websites (IBM.com, hp.com, dell.com etc.) and get the configurations of various models of portable computer, laptops and notebooks.
2. A customer has lost the driver CD of an IBM ThinkPad series Laptop. Download all the drivers and Burn a CD for this system.
3. An old Laptop doesn't support a hard disk size >10 GB. Download a latest version of the BIOS and carefully upgrade the BIOS of the given System.
4. A Laptop hard disk has to be connected to a PC IDE port. Suggest a suitable converter.
5. Connect a PC IDE disk to a Laptop system on a USB port.
6. Using Infrared port, transfer files between two Laptops.
7. A customer wants to communicate between some model of a Nokia mobile phone, and a Laptop. Download a suitable driver, and communicate using infrared ports on two systems.
8. Install a PCMCIA WLAN card on a laptop & establish a connection with wireless access point in the vicinity.
9. Connect two Laptops in peer configuration using Radio based wireless LAN card.
10. Install PCMCIA Ethernet card on an old laptop, which doesn't have an inbuilt Ethernet card.
11. configure wireless router/ Access point for establishing secured wireless network.
12. remotely access the wireless router for its configuration and disable the configuration through wireless access.

SUBJECT CODE: A2   **Hours: 75**
     Data Communication and Computer networks

Subject Prerequisites:
Basic understanding of computers networks and Internet

Subject Outcome:
Subject contents are designed with an intention to provide details of various networking aspects such as data communication, multichannel communication, recent trends in networking and network services along with recent threats in and security paradigm.

1. Basic of Data communication and transmission medias   Hours: 5
     What is data communication, Need of data communication, transmission modes, synchronous and asynchronous transmission, guided and unguided media role of types of networks in data communication, how data communication differs in various networks i. e. LAN, MAN, WAN. Working methodology of Transmission mediums (wired & wireless). Data loss reasons and solutions.

2. Multichannel data communication   Hours: 8
     Introduction to multiplexing (FDM, TDM, CDM, WDM), Access techniques (FDMA, TDMA, CDMA etc), SONET - DWDM -Fiber to the Home - DSL - CATV - ISDN – Broadband ISDN. Internetworking with ATM, Multiprotocol over ATM.

3. Internet architecture, DNS and in-depth Protocol study   Hours: 7
     Working model/architecture of Internet, Working of Communication Protocols(TCP, UDP, ICMP, DHCP, HTTP, POP, FTP, IMAP etc), Understanding TCP/IP at actual, how DNS works, types of DNS, understanding open DNS and managed DNS.

4. In-depth Network services   Hours: 6
     Understanding NIC cards, MAC ID, IP (Static, Dynamic, internal, public) in Internet and mobile Networks cards, video on demand, video telephony, 4G services

5. Advanced trends in networking   Hours: 9
     Mobile Communications technologies, Network design, Bluetooth technology   ,   threats   in Bluetooth technology, Optical Networks, VoIP, Advanced intelligent Networks. cloud networking concepts, detailed IPv6

6. Network threats and Advanced Network security   Hours: 5
     Data protection, cryptography application in networks, barriers to effective security, DNS security, Security in E-commerce and E-governance.

List of Experiments   Hours: 35
     1. Installation of Network card, altering MAC address and revealing original MAC.
     2. Working with LAN connection, terminal connection and remote LAN connection
     3. Working with various access point devices
     4. Understanding data loss issues and preventive measures
     5. Working with various types of DNS

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6. Understanding various types of IP's (static, dynamic, internal, public)
7. Demonstrating threats in Bluetooth technology
8. Working with IPv6 addressing
9. Applying cryptography in networks
10. IP configuration and IP masking
11. Installing Wi-Fi network and understanding Wi-Fi ranges and limitation
12. Understanding firewall/IDS/IPS logs
13. Working and troubleshooting Video teleconferencing devices
14. Working and troubleshooting VOIP
15. Implementation of security features in E-commerce/E-tendering

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SUBJECT CODE: A3   **Hours: 80**
        Network Management and Administration

Subject Prerequisites:
The primary purpose of this course is to provide candidates with fundamental network management principles, and to teach them introductory programming techniques for use with
solving common network management problems such as:

•   Managing configuration files & storing log information for multiple network devices
•   Identifying patterns in network behavior to ensure optimal performance
•   Alerting management when faults or unexpected changes occur within the network
•   Analyzing current state of security within a network to help prevent & detect compromises

Subject Outcome:
Candidates will become familiar with the protocols, with how large-scale Network Management Systems operate and are configured, and with advanced network configuration and also maintenance of system administration with Linux system

1.   Introduction to Network Management   Hours: 5
Cabling, Addressing, Managing Basic Switches Managing Advanced Switches Managing Basic Routers

2. Network Protocols analysis   Hours: 6
Introduction to ISO/OSI & TCP/IP Stack, DNS/UDP/IP, TCP/HTTP/HTTPS, ICMP/ARP/RARP/DHCP

3. Windows Server Administration   Hours: 8
Installing Windows Server, Setting Active Directory, Managing Active Directory, Managing User & Group, Active Directory Security & Policy, Setting File, Web and DHCP Server

4. Linux Server Administration with Shell Scripting   Hours: 8
Introduction to Linux Fundamentals & Commands, Advanced Linux   Commands,   Regular Expression with Text Processing, Bash Scripting

5. Network Monitoring Tools   Hours: 8
Network Monitoring Tools, Integrated Network, Application & Server Monitoring, Techniques for Monitoring LAN/WAN/MAN, Ethical Hacking, What is Qos Network Quality of service

6. Optimizing and Troubleshooting   Hours: 5
Trouble Shooting, Network components, Protocols, client server, Internet configuration

List of Experiments   Hours: 40
1.   Installation of desktop operating systems
2.   Installation of periparals and devices
3.   Installation of Windows Server operating systems
4.   architectures and understanding and different Protocols
5.   Identifications of Different in Cabling And Switches And Routers
6.   Install And Configure DHCP Service On Both Server And Clint End
7.   Converting From FAT32 to NFTS
8.   Upgrading From Lower Versions to Higher Versions Of Desktops And Servers

9.   Creating enabling and monitoring Remote access on servers and desktop systems
10.   Creating and configure connections like modem switches, routers, internet connection sharing's
11.   Shell scripting network administrations using GNU/LINUX
12.   To experiment on DNS Configuration, Zone delegation manually creating resource records
13.   Experiment on configuration of DHCP Server, mail &Web server
14.   Check your security by brute force attack
15.   Troubleshooting The Devices Like Physical And Software Related and Network Related

SUBJECT CODE: A4   **Hours: 80**
        Linux Administration

Subject Prerequisites:
This course covers, skills in systems administration on Linux, that are like Control common system hardware, Linux file system, user and group administration to a level where you can attach and configure a workstation on an existing network and also Back up file systems performance, memory, and process management

Subject Outcome:
•   Understand the relationship between the UNIX and Linux Operating Systems
•   Understand and navigate the directory structure
•   Obtain information on files and directories and also use of Linux commands
•   Create, delete, move and rename files and directories
•   Manage file and directory access permissions and manipulate running processes
•   Combine several simple commands in order to produce more powerful operations
•   Compile simple programs under Linux
•   View, set and change environment variables
•   candidates can able to work as system administrator in respective field

1. Introduction to Linux System   Hours: 5
    Various parts of an operating system, Important parts of the kernel Major services in a UNIX system

2. Overview of the Directory Tree, Hardware Devices and Tools   Hours: 10
    Directories, File Structure, mounting File and Directory Permissions Software RAID, LVM Configuration, CD Burners and Linux, Bootable CDROMs, Configuring PCMCIA Devices. Troubleshooting tools

3. Boots And Shutdowns   Hours: 5
    Boot loader Initialization, shutdowns and Run levels

4. Logging In And Out, Managing user Accounts   Hours: 10
    logging, Creating a user, scheduling, memory management. resource monitoring, package management. kernel management, Shell Scripting, Printing and Documentation

5. Network Management   Hours: 10
    General networking, network layers, LAN/WAN/MAN, interface configuration, unicast, multicast, broadcast, any cast, Internet, Intranet, TCP/IP configuration and Troubleshooting

6. Backup Procedure   Hours: 5

Importance of backed up, Selecting the backup medium, backup tool, Simple backups Multilevel backups, Compressed backups

List of Experiments   Hours: 35

1. Various versions of Linux systems and also distributions
2. Install a Linux server According to your available specifications
3. File management
4. Experiments on Text editor
5. Experiments on File content
6. File permissions and Techniques
7. Install mail server
8. Install a printer Local and Network making Print sever
9. Archival and compression
10. Experiments on creating users on server mage group accounts
11. kernel management at run time
12. Searching
13. experiments on using shell scripting
14. Basic networking Related to LAN/MAN/WAN
15. Backup and Recovery Data and Network

SUBJECT CODE: A5   **Hours: 45**
        Entrepreneurship Development

Subject Prerequisites:
None

Subject Outcome:
The learner will understand the concept of entrepreneurship and its close relationship with enterprise and owner-management, will also understand the nature of business development in the context of existing organizations and of new business start-ups. Important factors for starting a new venture and business development will be comprehended. Lerner will get to know issues and decisions involved in financing and resourcing a business start-up and essential aspects of account management. The importance of Industrial safety and other vital issues related to entrepreneurship will be identified.

1. Introduction   Hours: 5

Concept, meaning and definition of Entrepreneur and Entrepreneurship. Evolution of Entrepreneurship, Role of Entrepreneurship in economic Development; Managerial vs. entrepreneurial approach; Classification and types of Entrepreneurs. Characteristics and qualities of successful Entrepreneurs; Women Entrepreneurs; Corporate & Social entrepreneurship.

2. Entrepreneurship Development and Leadership   Hours: 7

Entrepreneurial Motivation: motivating factors, Types of startups; Characteristics of entrepreneurial leadership, Components of Entrepreneurial Leadership; Factors influencing entrepreneurial development and motivation, Entrepreneurial Opportunities and challenges, Entrepreneurship process.
Types of Enterprises and Ownership Structure: small scale, medium scale and large scale enterprises: Meaning and definition (evolution), role of small enterprises in economic

development; proprietorship, Policies governing SMEs, partnership, Ltd. companies and co-operatives: their formation, capital structure and source of finance.

3. New Venture Planning & Project Development   Hours: 8
Methods to Initiate Ventures; Acquisition-Advantages of acquiring an ongoing venture and examination of key issues; Developing a Marketing plan-customer analysis, sales analysis and competition analysis, Business Plan-benefits of drivers, perspectives in business plan preparation, elements of a business plan; Business plan failures.
Project Development: Idea generation and classification. Environmental Scanning and SWOT analysis Components of an ideal business plan – market plan, financial plan, operational plan, and HR plan. Project formulation –project report significance and contents, Project appraisal– Aspects and methods : (a) Economic oriented appraisal (b) Financial appraisal (c) Market oriented appraisal.

4. Financing & Managing Venture   Hours: 10
Financing Stages; Sources of Finance; Venture Capital; Criteria for evaluating new- venture proposals & Capital- process; Sources of financing for Indian entrepreneurs. Accounting basics, operating bank accounts, maintaining books of accounts, introduction to taxes, accounting transactions.
Management of venture: objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.

5. Industrial Safety and other Special Issues for Entrepreneurs   Hours: 5
Industrial Safety: (a) Use of Fire-fighting Equipment (b) Electrical Safety (Equipments and use) (c) First Aid in electrical hazard; Legal issues – Forming business entity, considerations and criteria, requirements for formation of a Private/Public Limited Company, Intellectual Property Protection-Patents, Trademarks and Copyrights – importance for startups, Legal acts governing business in India; institutional support towards the development of entrepreneurship in India, technical consultancy organizations.

List of Experiments   Hours: 10
Part-1: Project Formulation:
1. Identification and selection of projects by a public survey and market study.
2. development of a project as group activity.
3. Submission of the project report along with contents and formulation and concept of   project.
4. Evaluation of project using internal rate of return method and net present value method.

Part-2: Industrial safety:
5. Assessment of the fie safety of your own home.
6. Assessment of fire safety of your institute.
7. Assessment of electrical safety of various electrical equipment.
8. Drill of rescue of victim of electrical hazard.
9. Suggested CPR training (a trained Compounder/nurse or doctor should impart training)

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SUBJECT CODE: A6   **Hours: 60**
         Project

Subject Prerequisites:
Knowledge and understanding of computers, networks and programming with an element of research

Subject Outcome:
An experience to execute a task in a given time frame, with given conditions and constraints.

SUBJECT CODE: A7. 1   **Hours: 70**
         I. T. Security

Subject Prerequisites:
Basic understanding of computers and internet

Subject Outcome:
Subject contents are designed with an intention to provide knowledge about Information security, access controls, security policies and risk management with introduction to biometrics and digital signatures, with a overview of IT act 2000 and Cyber forensic

1. Introduction to Information security   Hours: 3
    Attributes of information security(confidentiality, integrity, Availability) Threats and vulnerabilities (unauthorized access, Denial of Service, Viruses, Trojans, etc.)

2. Authentication and access control   Hours: 5
    types of authentication (password, one time password, token based authentication, vulnerabilities and attacks, password policies,

3. Security policies and risk management   Hours: 6
    Access control techniques, mandatory access, discretionary access, access control list, role based access, access control structure, windows and Linux access controls

4. Digital signatures and biometrics   Hours: 7
    Digital signatures, certifying authorities, PKI, certificate installation, types of digital signature algorithm, introduction to biometrics, types of biometrics, why biometrics, biometric model, FAR, FRR, FTE, etc

5. Web security and application security   Hours: 5
    web server security, browser security, security in active content, SSL, secured mail, introduction to program security, operating system security, database security etc

6. Security policies, IT Act 2000 and Cyber forensic   Hours: 14
    Need of security policy, assets identification, risk management, security architecture, secure audits, secure backups, security awareness, training, Incident response, incident handling. IT act 2000 objectives, provisions, offences, cyber crimes, and introduction to cyber forensic

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List of Experiments   Hours: 30
1. Demonstrate strong password techniques
2. Demonstrate various information security threats
3. Demonstrate various kinds of authentication techniques
4. Demonstrate various types of access controls
5. Demonstrate access control in windows
6. Demonstrate access controls in Linux
7. Demonstrate working of digital signatures
8. Case study on biometric techniques
9. Demonstrate secured email
10. Case study on assets identification and risk assessment
11. Prepare a Incidence response report
12. Case study on Acts in IT act 2000
13. Case study on Cyber crimes discussed in IT act 2000
14. Case study on modus operandi of Cyber crimes
15. Demonstrate preventive and precautionary measures for one of cyber-crimes

SUBJECT CODE: A7. 2   **Hours: 70**
          Networking with Advanced Components

Subject Prerequisites:
Candidate should have knowledge about basic LAN and WAN technologies. Hands on practice for small LAN of 10-20 PC. Internet connectivity knowledge is added advantage.

Subject Outcome:
Candidate will be able to handle network 150-200 nodes and able to connect remote location branches or user location using WAN implementation. Candidate will be able to trouble shoot problems in LAN and WAN protocol implementation.

1. OSI Reference Model & TCP/IP Model   Hours: 5
Explain both model individually and comparison. Identify services which generate data for network users. Data is generated using application. Same data used by subsequent layer and perform encryption or format in which it is expected, Multiple sessions, mode of communications, RPCs, Transporting data using reliable and unreliable transmission protocols like TCP and UDP. Network layer protocol IP and its characteristics, media independent feature, unreliable, for data forwarding, IP addressing topic like Classes, subnetting VLSM, FLSM and supernetting or route summarization. Routing process handled by router. Introduction to Layer3 protocols and devices like router and Multilayer switches. Describe data link and network addresses like MAC, switching techniques, Framing standards and WAN protocols. Physical layer, various types of media and their characteristics, various types of connectors for LAN and WAN implementation.

2. Routing Protocols   Hours: 5
Various type network layer protocols IP, IPX, CLNS, etc. configuration Ip address to an interface, Static routing, default routing, IP packet Forwarding, structures of routing table, traversal of routing table and lookup process, Dynamic Routing protocols like RIP, EIGRP and OSPF configuration and verification. ARP, RARP and ICMP working principles.

3. LAN Switching   Hours: 5

Types of switching methods like cut-through, fragment-free or Modified cut-through and store and forward. Prolems in switched network and its remedy, implementation of Port-security on switches. Introduction to VLANs, configuration of VLAN, VLAN Routing using IEEE802. 1Q OR ISL. Router on stick scenario, VTP and implementation and configuration, Introduction to Spanning-tree Protocol (STP). Redundancy in network and requirement of STP in switched network. various types of STP, PVST+, RSTP etc.

4. WAN Protocols   Hours: 5

Types of WAN link leased Line, Packet Switching, cell switching and circuit switching technologies and their Layer2 protocols. HDLC protocol configuration and verification, PPP WAN protocol its frame types, configuration for PAP and CHAP authentication and troubleshooting. Recognize key Frame Relay terms and features, List commands to configure Frame Relay LMIs, maps, and sub interfaces, List commands to monitor Frame Relay operation in the router.

5. Network Management using ACLs   Hours: 5

Describe Access control Lists its types configuration on router and verification for standard ACL, extended ACL and Named ACLs. Introduction to complex ACL like time based, context based ACL or lock and key.

6. IOS Basics, versions, backup and restore of IOS and IOS modes   Hours: 15

various component of router, Booting process of router, operating system IOS for router, its versions, various mode of IOS like usermode, privileged mode and Global execution mode, router mode, Router mode, Configuration Files like running-config, Startup-config, and IOS image. Control router passwords, banner, Identify the main IOS software commands for router startup, Log in to a router in both user and privilege modes, Check an initial, configuration using the setup command, Use the command history and editing features, List the commands to load IOS software from: Flash memory, a TFTP server, or ROM, Prepare to backup, upgrade, and load a backup IOS software image, List problems that each routing type encounters when dealing with topology changes, and describe techniques to reduce the number of these problems, Prepare the initial configuration of your router and enable IP.

List of Experiments   Hours: 30
1.   Select Router components & navigate within IOS Software.
2.   Configure a terminal server to access routers.
3.   Configure host names & set pass records.
4.   Configure router interfaces like Ethernet /LoopBack /Serial.
5.   Configure multiple routing protocols.
6.   Troubleshoot of common network failures.
7.   Configure IP Addresses.
8.   Configure std. access list to figure IP traffic.
9.   Monitor and verify selected access list operations on the router
10.   Manage configuration files from the privilege exec mode.
11.   Identify the main IOS Software commands for router start up.
12.   Check initial configuration of router using the set up command.
13.   Use the context sensitive help facility
14.   Use the command history & editing features.
15.   List the commands to load IOS Software from : flash memory; a TFTP server and ROM.
16.   List various problems that each routing type encounters when dealing with topology change.
17.   Prepare the initial configuration of your router & enable IP.
18.   Configure a terminal server to access switches.