



# Punjab Technical University Jalandhar

**Syllabus Scheme**  
**(1<sup>st</sup> to 4<sup>th</sup> Semester)**  
**For**

**Masters of Science in Hardware &  
Networking Technologies**

**Applicable from September 2010 & Onwards**

## Semester-I

MScHNT – 101

Computer Organization & System Software

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### INSTRUCTIONS FOR PAPER-SETTER

The question paper will consist of Two parts, A and B. Part A will have 15 short answer questions (40-60 words) of 2 marks each. Part B will have 12 long answer questions of 5 marks each.

The syllabus of the subject is divided into 3 sections I, II and III. The question paper will cover the entire syllabus uniformly. Part A will carry 5 questions from each section and Part B will carry 4 questions from each section.

### INSTRUCTION FOR CANDIDATES

Candidates are required to attempt all questions from Part A and 9 questions of Part B out of 12.

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### Section I

#### Concepts and Terminology

Digital computer components Hardware & Software and their dual nature  
Role of Operating Systems (OS).

#### The ALU

ALU organization, Integer representation  
Serial and Parallel Adders  
1s and 2s complement arithmetic  
Multiplication of signed binary numbers  
Floating point number arithmetic  
Overflow detection  
Status flags.

#### Memory Unit

Memory classification, Bipolar and MOS storage cells  
Organization of RAM, address decoding,  
Registers and stack, ROM and PROM-basic cell  
Organization and erasing schemes  
Magnetic memories-recording formats and methods  
Disk and tape Units. Concept of memory map  
Timing diagrams, T-States, Timing diagram  
Controlling arithmetic and logic instructions  
Instruction sequencing with examples  
Introduction to Microprogramming

Variations in Micro-programming configuration

## **Section II**

### **General Organization**

Instruction work formats  
Addressing modes registers  
Von-Neumann concept  
Interconnecting system components  
Interfacing buses, Timing diagrams  
Examples from popular machines

### **Introduction to Operating Systems**

OS Functions; Evolution of OS Functions  
Batch Processing Systems  
Multiprogramming Systems  
Time Sharing Systems.

### **Scheduling**

Scheduling Policies: Job Scheduling; Process Scheduling

### **Deadlocks**

Definitions, Resource Status Modeling, Handling Deadlocks  
Deadlock Detection and Resolution, Deadlock Avoidance.

### **Process Synchronization**

Process Definition, Process Control, Implementing Control Synchronization, Classical Problems, Semaphores

## **Section III**

### **Memory Management**

Preliminaries  
Contiguous Memory Allocation ,Noncontiguous Memory Allocation  
Virtual Memory Using Paging  
Virtual Memory Using Segmentation

### **I/O Organization**

IO Organization, IO Devices, file Organizations, Directory Structures, File Sharing

### **Protection and Security**

Encryption of Data, Protection and Security Mechanisms, Protection of User Files

## Section I

### Introduction to Analog Electronics

Conductors, Semiconductors and Insulators: electrical properties, band diagrams.  
Atomic Model, Ohm's Law, Electrical Devices and Circuits, Inductors, Transformers  
Semiconductors: intrinsic and extrinsic  
Energy band diagram  
P-type and N-type semiconductors  
Drift and diffusion carriers

Formation of P-N junction, Energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics, junction capacitance and varactor diode.

Simple diode circuits, load line, linear piecewise model; rectifiers: half wave, full wave, its DC voltage and current

## Section II

### Introduction to Transistors

Formation of PNP / NPN junctions  
Energy band diagram  
Transistor mechanism and principle of transistors, CE, CB, CC configuration  
Transistor characteristics: cut-off, active and saturation mode, early effect.  
Biasing and Bias stability: calculation of stability factor with variation of  $I_{con}$  Different operating modes  
CE, CB, CC and their properties; small signal low frequency operation of transistors  
Equivalent circuits  
Transistors as amplifier: expression of voltage gain, current gain, input impedance and output impedance, frequency response for CE amplifier with and without source impedance (qualitative)

## Section III

### Logic gates

Basic gates, Universal Gates

### Combinational circuits

Adder, subtractor, encoder, decoder, comparator, multiplexer, de-multiplexer, parity generator, etc

## **Sequential Circuits**

Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology

## **Memory devices**

ROM, RAM, EPROM, EEPROM, etc

**MSchNT – 103**

**Core Hardware**

## **Section I**

### **Mouse**

Types of mouse

- Interface wise

- Mechanism wise

- Button-wise

Functioning of mouse

- Mechanical

- Opto-Mechanical

- Optical

Mouse component identification

Mouse troubleshooting and practical covering the following

- Mouse connection to the motherboard and problems relating to connection

- Wheel misplacement

- LED / Photo transistor misalignment

- Button replacement

- Mouse speed, double click rate

- Disabling / enabling a mouse from Device Manager and CMOS

- Continuity test

Preventive maintenance of mouse

### **Keyboard**

Types of keyboard

- Interface wise

- Key wise

- Mechanism wise

Functioning of keyboard

- Keyboard Matrix

- Generation of Scan code

- De-bouncing

- System to keyboard Communication

Typematic Delay and Typematic Rate  
Keyboard troubleshooting and practical covering the following  
Keyboard connection to the motherboard and problems relating to connection  
Typematic Delay and Typematic Rate settings from Control Panel and CMOS  
Problems relating to a particular key (mechanical and membrane)  
Changing the keyboard language and related problems  
Continuity test  
Preventive maintenance of mouse

### **Floppy Disk Drive**

Floppy drive- overview  
Types  
Identification of different parts with through details  
Read/write technology  
Floppy Disk overview  
Floppy Disk Material

### **Floppy Disk**

Tracks  
Sectors  
Data Area  
System Area  
Different Storage specification  
Single Sided  
Double Sided  
Double Density  
High Density  
Extra High Density  
Data storage standards  
FM  
MFM  
RLL  
Brief idea about FAT  
Formatting of a floppy Disk  
Creating bootable floppy  
Identification of different parts  
Floppy drive troubleshooting and practical covering the following  
Floppy drive cabling, problems with cross cabling  
Displaying both A and B drives  
Booting through floppy  
Sys command  
Swapping  
Disabling floppy drive and FDD controller  
Head Cleaning

## Head Alignment

### **Hard disk drive**

Introduction

Brief history

Component description

Identification of different parts of HDD

Hard Disk Geometry

Tracks

Sectors

Cylinder

Hard disk Reading/Writing techniques

Hard disk Media

Writing on the disk media

Reading from the Disk Media

ZBR

Interleave

Skew

Write pre-compensation

Land Zone

Hard Disk Data Organization

- MBR

- DBR

- FAT

- BPB

- Root Directory

File Access Procedure (FAT)

Different File system

- FAT

- FAT 16

- FAT 32

- NTFS 4

- NTFS 5

Identifying different parts of HDD

Hard disk drive troubleshooting and practical covering the following

- Hard disk drive cabling

- Auto detecting hard disk from CMOS

- Disabling / enabling HDD controllers from CMOS

- Boot sequence

- HDD partitioning and formatting using FDISK

- Low level formatting from CMOS option (idea only)

Different power modes

- Spin up

- Seek

- Read/Write
- Idle
- Stand by
- Different modes of HDD
  - ST506
  - IDE
  - EIDE
  - ATA
  - Ultra ATA
- SCSI
  - Different types of SCSI and their properties (NARROW, WIDE, FAST, ULTRA, HVD, LVD or Low Voltage Differential)
  - Daisy chain
  - LUN
  - SCSI ID
- Jumper Settings (master, slave, cable select, 30 GB limit, Master with non-ATA slave)
  - Jumper settings
  - Demonstration of Disk Manager utility

### **CDROM Drive**

- Opening of a CDROM drive and identification of different parts
- Working of a CDROM Drive, Different CD media
- Use of a CD-R/CD-RW
- CD writing
- Formatting a CD-RW
- DVD concepts
- CD drive troubleshooting and practical covering the following
  - Cabling
  - Lens cleaning
  - Booting through CDROM
- Discussion on the following problems
  - CD breaks frequently inside the drive
  - Tray does not come out
  - CD not rotating
- Tips and tricks about CD writing
- Identifying different parts of CD drive
- CD writing
- Difference of CD and DVD.
- Blue Ray Disk Concept

## **Section II**

### **BIOS and Boot process**

- What is BIOS?

Different types of BIOS

BIOS sections

POST

Setup or CMOS

System Service Routines

Identifying boot process

Applying power

The Bootstrap

Core Tests (POST)

Finding the OS

Loading the OS

### **DMA and IRQ**

What is DMA?

Brief idea about how DMA operates in a system

What are Interrupt Controller and IRQ?

Brief idea about how Interrupt Controller handles device requests through IRQ.

Brief idea about how Processor handles device requests through IRQ.

Interrupt Service Routine

Vector Table

### **RAM**

Types

EDORAM

DRAM

SRAM

VRAM

SDRAM

DDR

DDR2 & DDR3 difference and specification

RAMBUS

Form Factors

SIMM

DIMM

So DIMM

Micro DIMM

RIMM

Operational characteristics

Memory chips(8,16,32 Bits)

Parity Chips and non-parity chips

ECC vs. non-ECC

Single Sided vs. Double Sided

### **CMOS**

- CMOS Settings
- Default Settings
- Date and time
- Passwords
- Plug and Play BIOS
- Disabling on board devices
- Disabling On board/Chip Virus protection
- Power Management
- Problem with CMOS battery

Identify the most popular types of Motherboards, their components and bus architecture

Practice and Trouble shooting on CMOS setup

### **Printer**

Type of printer

- Mechanism

- Image formation

Interface

- Parallel

- Network

- SCSI

- USB

- Infra Red

- Serial

- Wireless

Technology

- LASER

- Deskjet

Working of Laser in details

Printer driver

Paper feed/Paper Jam

Error message

Printer parallel port (Uni, Bi-directional, EPP, ECP)

Printer settings in CMOS

Preventive Maintenance

- Changing cartridge

- Cleaning nozzle

- Head alignment

- Head cleaning

### **Bus Architecture**

Bus Architecture

- ISA

- MCA

VESA

PCI

32 BITS

64 BITS

AGP

2X

4X

8X Pro

USB

AMR Slots

CNR Slots

Basic compatibility guidelines

PCI EXPRESS

MINI PCI

### **Processors**

Processor types

RISC

CISC

Voltage

VRMs

Speed (Actual vs. Advertised)

Cache level I, II, III

Popular CPU chips (Pentium class compatible)

Core to duo, Dual core, Quad core specification

PR-rating

Sockets/Slots

Slot 1

Slot 2

Socket A

Socket 7

Socket 8

Socket 370

Socket 423

Socket 478

### **Motherboard**

ATX

Components

Communication ports

Serial

USB

Parallel

IEEE1394/FirewireInfra Red

Processor Slots/Sockets

Latest Intel Chipset Desktop Boards like-Intel 3 series, 4series and 5 series information

### **Section III**

#### **SMPS**

Linear Vs Switch Mode Power supply

Working Principal of SMPS

- AT and ATX

- Power Specification

- Pin Description

Identification of Different parts/Sections

Trouble Shooting

Output Voltage checking

Power on SMPS when not connected to the Motherboard

#### **Monitor (VDU)**

Block diagram of CRT and discussion on Inner coating of CRT

Identification of Different Functional Block

Pixel, Colour Triad, Resolution, Aspect Ratio, Interlacing, Raster Scanning, Vector scanning, Shadow mask, Video bandwidth, Sync, Multisync, Horizontal scanning and Vertical Scanning, Frame. Display adapter unit.

Troubleshooting of Monitor

- Vertical and horizontal size setting

- Recall Default Setting

- Degaussing

- Color Patch

- Screen and Focus Control

- Signal Cable Problem

LCD and TFT monitor concept

#### **Identify the basic procedures for adding and removing of system modules**

Motherboard, Storage device, FDD, HDD, CD/CDRW, DVD/DVDRW, Tape drive, Removable storage, Power supply, AC adapter, AT/ATX, Cooling systems, Fans, Heat sinks, Liquid cooling, Processor /CPU, Memory, Display device, Input devices, Keyboard, Mouse/pointer devices, Touch screen, Adapters, IEEE 1394/Firewire, PCMCIA/Mini PCI Adapters, Network Interface Card (NIC), Sound card, Video card, Modem, SCSI, IEEE 1394/Firewire, USB, Wireless Adapter/controller & Antennae

#### **Assembling of computer**

Steps of Assembling Desktop PC

- Planning the configuration

- Procuring Essential Components and accessories

- Carrying out the Process of Assembling

- Precautions

## Section I

### Concept of Operating System

CUI & GUI

Single-user OS

Multi-user OS

### Windows 9x installation

Identify the procedure of installing

Verify Hardware compatibility and minimum requirement

Determine OS installation option

Installation type

File system types

Run appropriate setup utility

Setup

Installation methods

Bootable CD

Bootable floppy

### Driver Installation

Device driver configuration

Load default drivers

Loading and configuring Display and Sound Card

### Windows 98 System files and boot process

Win 9x—specific files

IO.SYS

MSDOS.SYS

AUTOEXEC.BAT

COMMAND.COM

CONFIG.SYS

HIMEM.SYS

EMM386.EXE

WIN.COM

SYSTEM.INI

WIN.INI

Registry data files

SYSTEM.DAT

USER.DAT

Windows 98 boot process

### **Installation of Windows 2003 Server**

Identify the steps of up gradation from lower version to upper version or service packs or patches

Available upgrade paths

Winnt vs. Winnt32

Application compatibility

Application of OS Service pack and patches and updates

Installation of additional windows components

Verify hardware compatibility and minimum requirement

Determine the OS installation option

Installation type

File System type

Dual boot support

Disk preparation order

Run the appropriate setup utility

Setup/Winnt

Installation methods

Bootable CD

Boot floppy

Start the installation

Load default drivers

### **Installation of Windows XP**

Verify the hardware compatibility and minimum requirement

Determine OS installation option

Installation type

File system type

Dual boot support

Disk preparation order

Run the appropriate setup utility

Setup/Winnt

Installation methods

Bootable CD

Boot floppy

Start the installation

Load default drivers

### **Identify the major Desktop components and interfaces - their functions**

Differentiate the characteristics of Windows 9x, Win2k and Windows XP.

Major OS components

Registry

Virtual memory

File systems  
Major OS interfaces  
Windows Explorer  
My Computer  
Control Panel  
Computer Management Console (idea)  
Accessories / System tools  
Taskbar / Systray  
Command Line  
Network Neighborhood / My Network Places  
Start Menu  
Device manager

**Identify the major OS utilities, their purpose, location and available switches**

Device Manager  
System Monitor  
Msconfig.exe  
System Management Tools (cont.)  
REGEDIT .EXE  
REGEDIT32.EXE  
SYSEDIT.EXE  
SCANREG  
Dr. Watson  
Event viewer  
Task Manager  
Windows Explorer

**Section II**

**Windows 2003 Basic system boot sequence, boot methods and creation of ERD**

Boot sequence  
Files require to boot- BOOT.INI, NTLDR, NTDETECT .COM, NTBOOTDD.SYS, NTUSER.DAT  
Boot steps of Windows 2000 Server  
Alternative boot methods  
Using startup disk  
Safe mode  
Last known good configuration  
Command prompt mode  
Recovery console  
Boot.ini switches  
Creating emergency disk with OS

**Procedure for installing and adding devices and their device drivers**

Device driver installation

PnP and non-PnP installation  
Install and configure device drivers  
Install different device drivers

Internet updates of device drivers  
Device driver signing for unsigned drivers  
Install additional windows components  
Determination of adequate permissions for installation

### **Section III**

#### **Internet Technology and Internet Protocols**

Technologies

- LAN
- DSL
- Cable
- Dial-up
- ISDN
- Wireless

Protocols

- ISP
- TCP/IP
- E-Mail (POP, SMTP, IMAP)
- HTML
- HTTP
- FTP
- DNS
- Telnet

Installing and configuring browser  
Configuring Proxy setting  
Configuring Security Setting  
Configuring Firewall under XP

Application of Internet— Physical Connectivity

Internet connection

- Surfing and Chatting
- Search Engine, Topic/Content Wise searching through Web

File Uploading and downloading process & E-mail

#### **Email Client Software: Microsoft Outlook**

Getting Started With Microsoft Outlook , Customizing Outlook Today  
Understanding and Exploring the Outlook Components  
Composing / Sending Email Messages using Outlook

Notification of arrival for New Messages in Inbox?  
Replying and Forwarding Messages in Outlook  
Setup Email Account in Outlook 2003  
Outlook message options, Outlook AutoSignature Feature  
Deleting Email Messages in Outlook  
Creating and Renaming Folder in Outlook  
Move, Copy and Delete Folder in Outlook

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**PC Maintenance & Trouble-shooting**

## **Section I**

### **Optimizing the operating system**

Virtual memory management  
Files and Buffers  
Caches  
Temporary file management

### **Diagnosing and trouble shooting of startup common error codes**

Startup messages  
Error in config.sys line xx  
Himem.sys missing or corrupt  
Devices or services have failed to start  
Common error codes  
Invalid boot disk  
Inaccessible boot devices  
Missing NTLDR  
Bad or missing command interpreter  
Device not found in system.ini or win.ini or registry  
Event log is full  
Failure to start GUI  
Windows Protection error  
Registry corruption  
User defined settings cause improper startup

### **Recovery utilities**

Recovering deleted files using recovery software

## **Section II**

### **Preventive maintenance and measures**

Liquid cleaning compounds

Non-static compounds  
Non-static vacuums  
Cleaning monitors  
Cleaning Removable Media  
Hard Disk Maintenance  
Verifying UPS  
ESD-precautions and procedure

### **Internet and Modem Configuration**

Internet Roadmap Introduction to Internet  
Difference between Internet and a Local Network  
Necessity of Internet  
Internet Addressing and Domain Naming System (DNS)  
Protocol: HTTP, FTP, WWW, TELNET, ARCHIE, and GOPHER  
Getting connected to the Internet  
Concept of Modem, Communication software, Internet Account, Client  
Program/Browser, Web Server  
Setting up an Internet connection  
Domain Naming System And DNS Server  
Theory of Modem  
Practical on modem installation and Internet Connectivity

### **Virus**

Concept Of Computer Virus  
Different type of Viruses  
Virus definition files  
Combating Computer Virus  
Installation and use of Antivirus Software  
Web update of anti virus software  
Creation of rescue disk and its use  
Recovery process of a virus affected hard disk using Antivirus installed in another Hard disk

## **Section III**

### **Installation of Application Software**

Application Packages—MS Office  
Multimedia Packages—Flash  
DTP Packages – CorelDraw

### **Installation, use and working of Different utility software's**

Norton system works  
Norton Ghost  
Norton Disk Doctor

## **Tweaking windows registry**

Tips and tricks

## **Backup and restore**

Concept of RAID

Different type of backup

Using MS Backup

Other Methods of Backup

File Extraction

## **Semester-II**

**MScHNT – 201**

**Basic Networking**

### **Section I**

#### **Basic Concept of Network**

Definition of Networks

Signals and Protocols

Broadband and Base band

Half Duplex & Full Duplex Communications

Segments and Backbone

Uses of Computer Networks

- Business Applications

- Home Applications

- Mobile Users

- Social Issues

Types of Network

LAN, MAN and WAN

Topology

- Physical Topologies

- Bus topology

- Mesh topology

- Star topology

- Ring topology

- Point to Point

- Point to Multipoint

- Hybrid

Physical Topology Comparison

## **Concept Of Media Access Control Techniques**

CSMA/CD

CSMA/CA

Token Ring

Network Hardware

- Network Interface Card

- Media Converter

Repeater

Hub and MAU

Bridge

Basic Switch

Wireless Access Point

Basic Router

Router

Basic Firewall

Gateways

## **Transmission Media**

Guided Transmission Media

Unguided Transmission Media

- Types of Cables

- Twisted Pair Cable

- UTP Cable Grades

  - CAT3, CAT5, CAT5e, CAT6

- STP Cable Grades

- Fiber Optics Cable

  - Multi-mode Fiber

  - Single-mode Fiber

- Coaxial Cable

  - RG-59

  - RG-6

- Serial

- Plenum Vs Non Plenum

- Description of the Properties

  - Transmission Speed

  - Distance

  - Duplex

  - Noise Immunity (Security, EMI)

  - Frequency

## **Section II**

### **Identification of Common Connector type**

RJ-11  
RJ-45  
BNC  
SC  
ST  
LC  
RS-232  
RG-59  
RG-6

### **Crimping Basics and Wiring Standards**

568A  
568B  
Straight Vs. Cross-over  
Rollover  
Loopback  
Practical on Crimping  
    Straight cabling  
    Cross-over Cabling  
Crimping Practice  
Connecting Different Systems using HUB/Switch  
Connecting Systems using Cross Cable  
Checking of Cables using Cable Tester  
Connectivity of Systems using Microsoft XP  
Assigning of IP Address  
Changing the default Workgroup and Name of System  
LAN Configuration

## **Section III**

### **OSI Layer Model**

Layer1 – Physical Layer  
Layer 2 – Data Link  
Layer 3 – Network  
Layer 4 - Transport  
Layer 5 – Session  
Layer 6 - Presentation  
Layer 7 – Application

### **Explain the Function of Common Networking Protocols**

TCP, FTP, UDP, TCP/IP Suite, DHCP, TFTP, DNS, HTTP(S), ARP, SIP (VoIP), RTP , (VoIP), SSH, POP3, NTP, IMAP4, Telnet, SMTP, SNMP 2/3, ICMP, IGMP, TLS

### **TCP ports**

FTP – 20, 21. SSH – 22. TELNET – 23. SMTP – 25. DNS – 53. HTTP – 80.  
POP3 – 110. NTP – 123. IMAP4 – 143. HTTPS – 443.

**UDP ports** TFTP – 69. DNS – 53. BOOTPS/DHCP – 67. SNMP – 161.

### **Identification of the Following Address Formats**

MAC Addressing, IPv6, IPv4

### **Addressing Technologies**

Classes and Categories of Address

Classless IP (e.g. CIDR, Supernetting)

Subnetting

NAT

PAT

SNAT

Public vs. Private IP Address

APIPA

**MSchNT – 202**

**Advanced Networking**

### **Section I**

Practice on Binary to Decimal and Decimal to Binary

Practice on IP Address and Subnetting

Basic Concept of Router

Role of a Router

Console Port

Ethernet/Fast Ethernet Port

AUX Port

Serial Port

### **Different modes of Routers**

Setup Mode

Command Line Modes

Privileged EXEC mode

Interface configuration mode

Line Configuration mode

The Router configuration mode

Practical on Router Basics (Using Two Routers or Boson Netsim)

Enabling a Router

Securing Ports using Password

Assigning IP Address to Ports

Connectivity of Two Routers

Checking a Router State and IP Addresses

Practice

### **Explain the Purpose and Properties of Routing**

IGP vs. EGP

Static Routing vs. Dynamic Routing

Next Hop

Routing table

Link state

OSPF

IS-IS

Distance Vector

RIP

RIPv2

BGP

Hybrid

EIGRP

### **Static Routing**

Advantage and Disadvantage of Static Routing

Practical on Static Routing

## **Section II**

### **RIP and RIPv2**

Features of RIP and RIPv2

Limitations of RIP

Practical on RIP and RIPv2

Concept of OSPF

Advantages of OSPF over RIP

Basic Configuration of OSPF

Practice

### **Explain the advanced features of switch**

PoE (Power over Ethernet)

VLAN

Trunking

Port Mirroring and Authentication

## **Wireless Communication Standard**

- 802.11 a/b/g/n
  - Speeds
  - Distance
  - Channels
  - Frequency
- Authentication and Encryption
  - WPA
  - WEP
  - RADIUS
  - TKIP

## **Implement a basic Wireless network**

- Install client
- Access Point Placement
- Install Access Point
- Check connectivity

## **WAN Properties**

- Circuit Switch
- Packet Switch
- WAN technologies
  - Frame Relay
  - E1/T1
  - E3/T3
  - xDSL (SDSL, VDSL)
  - Wireless

SONET

OC-x

ATM

MPLS

ISDN

BRI

PRI

POTS

PSTN

## **Section III**

### **LAN Technology Types**

- Ethernet
- 10BaseT
- 100BaseTX
- 100BaseFX
- 1000BaseT

- 1000BaseX
- 10GBaseSR
- 10GBaseLR
- 10GBaseER
- 10GBaseSW
- 10GBaseLW
- 10GBaseEW
- 10GBaseT

### **Explain common Network topologies and their characteristics**

Peer to Peer  
 Client/Server  
 VPN  
 VLAN

### **Explain Common Network TCP/IP Utilities**

Ping  
 Tracert and Traceroute  
 Ifconfig and IPconfig  
 Nslookup  
 Nostat  
 Netstat  
 Net share  
 Telnet

### **Network Security**

Filtering:  
     ACL  
             MAC filtering  
             IP filtering

Tunneling and encryption

SSL VPN  
 VPN  
 L2TP  
 PPTP  
 IPSEC

Explain Common types and features of Firewall

PKI

Kerberos

AAA

RADIUS

TACACS+

Network access control

802.1x

CHAP  
MS-CHAP  
EAP (Extensible Authentication Protocol)

### **Security Threats**

- DoS
- Viruses
- Attackers
- Man in the Middle
- Smurf
- Rogue Access Point
- Social Engineering (phishing)

Explain the purpose of Network scanner

- Packet sniffers
- Intrusion Detection Software
- Intrusion Prevention Software
- Port Scanners

**MScHNT – 203**

**Windows Server Administration**

### **Section I**

#### **An Overview of Windows Server 2003 Family**

- Hardware Requirements of Windows Server 2003 [For Each Editions]
- The Hardware Compatibility List (Hcl)
- Windows Server 2003 Family Feature
- Windows Server 2003 Installation Options
- Partitioning Hard Disk Space
- Disk Partition Configuration Option
- File System Selection
  - FAT 32
  - NTFS
- Licensing Mode
- Membership In A Domain and Workgroup
- Choosing Your Installation Method
- Installation Windows 2003 By CD
- Installing From Setup Boot Disks
- Microsoft Management Console
- Device Manager
- Digital Signing Issue
- Updating Drivers
- Rollback Drivers

- Viewing Hardware Resources
- Managing Other Hardware Driver
- Concept of Peer-To-Peer and Client Server Architecture.
- Overview of Active Directory
- The Benefits of Active Directory
- The Active Directory Logical Structure
- The Overview of Active Directory Domains Using Multiple Domains

### **Upgrading Windows Server 2003 as a Domain Controller**

- Crating A Domain Structure with Organization Units
- Adding Clients to the existing domain
- The Active Directory Service Objects
- Users, Computer and Group Object
- Server Role within Active Directory
- Overview of Forest and Domain Function Levels

### **Local and Active Directory User and Group Accounts**

- An Overview of User Accounts
- An Overview of Group Accounts
- Working with Local User and Group Accounts
- Working with Active Directory Users and Groups

### **Managing User Environment**

- User Profile
- Home Folder
- Logon Scripts
- Logon Hours
- Managing Group Polices From OU Level within Active Directory
- Managing Local Policy
- Managing Domain Policy
- Managing Domain Controller Policy

## **Section II**

### **Managing Disk**

- FAT 32 / NTFS
- Configuring Disk Storage
- Basic and Dynamic Storage
- Creating Partition and Volumes
- Upgrading Basic to Dynamic Disk
- Changing Drive Letter and Path
- Mounting Volume
- Converting File System

Managing Disk (Raid Level Concepts- Simple/Spanned / Striped / Mirrored/  
Striped with Parity)

### **Setting Disk Quotas**

- Configuring Disk Quotas
- Monitoring Disk Quotas
- Compressing Files and Folders
- Managing Data Encryption with EFS
- Managing Data Encryption with EFS with Cipher
- Recovering Encrypted Files
- Disk Cleanup and Defragmenter

### **Accessing Files and Folders**

- The Access Control List Editor
- Managing Local Access
- Applying NTFS Permission
- Permission Inheritance
- Determine Effective Permission
- Resource Ownership
- Setting Audit Policy
- Viewing Result of File and Folder Auditing
- Managing Network Share

### **Understanding DFS**

- Benefits of DFS
- The DFS Topology
- Configure and Managing The DFS
  - Creating DFS Root
  - Configure DFS Link
  - Configure Replication
- Checking DFS Shared Folder Status
- Configuring DFS Security

## **Section III**

### **Installing and Configuring Network Adapter**

- Installing and Configuring Network Protocols
- Planning Your Subnet
- Ping, ipconfig Utility
- Dynamic IP Configuration Using DHCP
- Practice

### **Installing and Configuring DNS Server**

- Integrating DNS with Active Directory Service

## **Configuring and Managing IIS**

Virtual Directory of IIS

### **Managing Printer**

- Local Printer
- Network Printer
- Printer Security
- Printer Spooling
- Printer Priority

- Publishing a Printer in Active Directory
- Support of Non Windows Print Clients (Concept Only)

### **Administrating Terminal Services**

- Terminal Services Modes-
  - Remote Administration Mode
  - Application Server Mode
- Benefits of Terminal Services
- Terminal Services Components
- Planning and Installing Terminal Services
- Installing Terminal Services Clients

### **Optimizing Windows Server 2003**

- Monitoring and Optimizing Usage of System Resources
- Managing Processes
- Network Monitoring
- Advance Startup Option
- Backup Jobs (Custom & System State Backup)
- Recover System State and Data Using Windows Backup.
- Recover Using System State

### **Group Policy Management**

- Determining Applied GPOs

**MSchNT – 204**

**Linux Server Administration**

## **Section I**

### **Introduction To Operating System(OS)**

- Basic Structure Of OS
- Concept of Shell and Kernel
- What is Linux
- Brief History of Linux and Unix,

Difference between Linux and other Operating Systems

What is login

Linux Virtual Terminal Concept

Concept of directory files and path

Running Commands

ls, ls -l, cp, rm, mkdir, mv, touch, pwd, rmdir, less, more, cat, man, who, whoami

## **Linux DVD Based Installation**

Introduction to Linux GUI

- About X windows
- About Display Manager (GNOME)
- Desktop properties
- File Manager ( nautilus)
- Creating files and folder
- Gedit a visual editor

Terminal

## **I/O redirection**

- <
- >
- >>
- <<
- 2>>
- 2<<
- |
- ;

## **Section II**

### **Users, Group and Permission**

- Creating User and Group
- Modify User and Group
- Understanding user, group, and password database
- Understanding password age

File and directory permission

### **Understanding Linux File System**

- Boot block
- Super block
- Data Block

Inode table

### **Jobs and Processes**

Job Control  
Foreground and background processes

### **Linux Booting**

- Understanding /etc/inittab
- Understanding Boot Loader (Grub)
- Single user mode
- Boot loader protection

### **Section III**

#### **Linux system administration**

- Understanding Disk partition
- Post installation Hard disk partitioning
- Mounting and Un-mounting file system
- Formatting partition

Understanding /etc/fstab

#### **Redhat Package Manager (RPM)**

YUM Client

#### **LVM concept**

Installation time LVM

#### **Understanding Software RAID**

Installation time RAID

Understanding ACL and QUOTA

Implementing ACL and Quota on local files system.

#### **Configure Network**

- system-config-network
- Dynamic IP addressing
- Static IP addressing

Virtual IP addressing

### **Semester-III**

**MScHNT – 301**

**Network Security**

### **Section I**

#### **Introduction**

Attacks, Services, Mechanisms, Security Attacks, Security Services, Model for Network Security

### **Conventional Encryption and Message Confidentiality**

Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution

### **Public Key Cryptography and Message Authentication**

Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital Signatures, Key Management

## **Section II**

### **Network Security Applications**

Kerberos Motivation, Kerberos Version 4, PGP Notation, PGP Operational Description

### **IP Security**

IP Security Overview, IP Security Architecture, Authentication Header

### **Web Security**

Web Security Threats, Web Traffic Security Approaches, Overview of Secure Socket Layer and Transport Layer Security, Overview of Secure Electronic Transaction

## **Section III**

### **Intruders and Viruses**

Intruders, Intrusion Techniques, Password Protection, Password Selection Strategies, Intrusion Detection, Malicious Programs, Nature of Viruses, Types of Viruses, Macro Viruses, Antivirus Approaches

### **Firewalls**

Firewall Characteristics, Types of Firewalls, Firewall Configuration

**MSchNT – 302**

**Microsoft Network Infrastructure & Security**

## **Section I**

### **Creating the security design framework**

Designing CA

Designing IP Sec Policy

Designing GPO

## **Designing Forest Domain trust model**

Securing Selection VPN Protocols

Designing RAS

Creating Site to Site VPN

## **Section II**

### **Designing Permission Structure**

Designing Client and Authentication Structure

Designing OU infrastructure

Securing a ROGUE Access point

### **SAC and !SAC**

MBSA requirements

Domain and forest functional levels

Password Policy technical controls

PPTP, L2TP

## **Section III**

### **Site To Site demand dial interface**

PRAS IAS Conditions

Profile properties

Remote access policy 1,2,3,4

### **Designing Network, Security and Infrastructure**

Design a security for IIS

Security Network from wireless access site

Designing domain control template

### **SUS infrastructure designing**

Backup plan

## **MSchNT – 303**

## **Advanced Linux Server Administration & Security Management**

## **Section I**

### **Linux File Server Management**

Installing and Configuring NFS server

Installing and Configuring Samba server

Installing and Configuring ftp server using vsftpd

Installing and Configuring Web server using apache

## **Section II**

### **Linux Proxy Server & Name Server Management**

Installing and Configuring Proxy server using Squid

Installing and Configuring DHCP server

Installing and Configuring DNS server

## **Section III**

### **Linux Security & Utilities**

Setup firewall With iptables

SELinux Security

Server Security With SELinux and iptables

( NFS, FTP, SAMBA, Mail Server etc. )

Configuration of Transparent Proxy and Get-way designing using Squid Proxy

Remote Installation Server Configuration Using ( DNS, DHCP, VSFTPD and YUM)

PXE Server Configuration

Endian & Untangle OpenSource UTM Appliance (DansGurdian Content Filtering,

Gateway Antivirus – ClamAV)

## **Nagios Administration**

**MSchNT – 304**

**Java Programming – Part 1**

## **Section I**

### **Introduction to Java Technology**

Brief history of Java

Java Development Kit (JDK)

Java Compiler

Java Interpreter

Source Code & Byte code with “Hello World” Application

### **Data types, Variables, Expressions**

Basic Data Types

Integers - example, size in bytes

Characters - example, size in bytes

Floating Points - example, size in bytes

Boolean - example, size in bytes

Variables

Declaration of variable

Assignment Statements  
Scope and life time of a variable  
Expressions  
A simple java program illustrating variables

### **Java Escape Characters, Keywords & Arithmetic Operators**

Special characters  
    \`n`, \`t`, \`\\`  
Output using `system.out.print` and `system.out.println`  
Recognize and use formatting parameters (`%b`, `%c`, `%d`, `%f`, `%s`) in format strings  
Comments  
    \`/* */`  
    \`//`  
Separators  
Keywords  
Arithmetic Operators : `+` `-` `*` `/` `%` `++` `--`  
A simple Java program illustrating operators  
Operator precedence  
A simple Java program illustrating operator precedence

### **Boolean Operators and Selection Statements**

Control statement  
If Statement  
Relational Integer operators: `>` `<` `>=` `<=` `==` `!=`  
Logical operators: `&&` `||` `!`  
Simple Java programs illustrating relational operators

### **Control statement contd.**

`if ... else`  
    `switch ... case ... default`  
Simple Java programs illustrating `if ... elseif`  
Simple Java programs illustrating `switch ... case`  
Conditional boolean operator (`? :`)

### **Iteration Statements**

Loops  
    `for`  
    `while`  
    `do...while`  
Program illustrating `for`, `while` and `do...while` loop  
Nested loop  
Program illustrating nested `for` loop  
Jump statements  
    `break;`  
    `continue;`

### **Introducing Classes and Methods**

Class and object fundamentals  
Declaring classes

Declaring object

The “new” operator

A Java program to show class declaration and class object creation

Introducing class variables

A Java program using class variables

Introducing methods

- Adding method to a class

- Adding a method that takes parameters

- Call by primitive value & call by object reference

- Method returning value

A Java program using class methods with no parameter

A Java program using class methods with parameter and return value

### **A Closer Look at Methods and Classes**

Method overloading

A Java program to illustrate method overloading

Final methods

Method with variable-length argument

Nested class

Object as a class member variable

A Java program to illustrate that Java objects can be used as class members

### **Constructors & Garbage collector**

Concept of Constructor

- Null constructor

- Explicit Constructor

- Parameterized constructor

A Java program with explicit constructors

Concept of garbage collection

Behaviors of System.gc and finalization

### **Inheritance**

Inheritance basics

Advantage of inheritance

Deriving classes – Extends

A Java program to illustrate class inheritance

Usage of super

Using super to call super class constructor

A Java program illustrating “super”

Method overriding

A Java program showing method overriding

Access modifiers: Private, protected, public

A Java program illustrating the accessibility of member variables and methods

### **Packages**

- Defining a package

- Import statement

- Understanding CLASSPATH

- A short package example

Access protection revised: Package (default)

- Classes in same package
- Classes in different package
- Sub classes in same package
- Sub classes in different package
- Concept of tight encapsulation, loose coupling, and high cohesion in classes
- Abstract Base Class and Methods
- A Java program showing usage of Abstract Base Class
- Interfaces
  - Why interfaces
  - Defining interfaces
  - Implementing interfaces
  - A Java program to illustrate interface and its implementation

### **Arrays in Java**

- Concept of array
- Rules for declaring arrays
- Array indexing
- Accessing array elements
- A Java program to demonstrate an array
- Array initialization
- One-dimensional array
- Array as class data member
- A Java program to illustrate array as class data member
- Two-dimensional array
- A Java program to demonstrate a two dimensional array.
- Array of objects
- A Java program illustrating array of objects
- Enum

### **String Handling**

- A brief idea about String
- Differences between the String, StringBuilder, and StringBuffer classes
- Format or parse dates, numbers, and currency values for a specific locale using java.text
- Purpose and use of the java.util.Locale class
- Sorting of String

## **Section II**

### **Exception Handling**

- Exception handling fundamentals
- Runtime exception, a checked exception, or an error
- Predefined exception
- Triggering a predefined exception (ArithmeticException)
- A Java program which triggers an exception with Command line arguments
- Handling the exception
  - try ... catch construct and finally clause
- A Java program to illustrate try...catch construct
- Multiple catch clauses and finally clause
- A program multiple catch clauses

(IndexOutOfBoundsException, NumberFormatException)

Usage of throws

Usage of throw

A program to demonstrate throws

Creating your own exception subclasses

A program using user defined exception.

Exceptions thrown by the virtual machine

Recognize situations that will result in any of the following being thrown:

ArrayIndexOutOfBoundsException, ClassCastException, IllegalArgumentException,

IllegalStateException, NullPointerException, NumberFormatException,

AssertionError, ExceptionInInitializerError, StackOverflowError or

NoClassDefFoundError.

### **Input/Output: Exploring java.io**

Java InputStream & OutputStream classes

System.in & System.out object

A Java program to read keyboard characters

DataInputStream & DataOutputStream class

BufferedReader & BufferedWriter class

StringBufferInputStream class

File, FileReader & FileWriter class

FileInputStream & FileOutputStream class

PrintStream class

PrintWriter class

PrintWriter.format/printf methods

ObjectInputStream, ObjectOutputStream

Concept of serializes and/or de-serializes objects and Serializable

Formatter and Scanner classes

### **Multithreaded Programming**

Concept of thread

Define, instantiate, and start new threads

    Extending Thread Class

    Implementing Runnable interface

Example illustrating multiple threads by Thread class & Runnable interface

Thread scheduling

Thread.isAlive() & Thread.join() method

Finalizer

Thread priorities

A Java program illustrating thread priorities

Synchronizing with other threads

Use of wait, notify, or notifyAll

### **Section III**

#### **Introducing the AWT: Working with Windows Graphics and Text**

The AWT package

Windows fundamentals

    Component

    Container

- Panel
- Window
- Frame
- Canvas
- Frame and Panel classes
- Working with Frame windows
  - Setting frame dimensions
  - Hiding and showing a window
  - Setting a frame title
- A Java program illustrating the above subjects
- Working with Frame windows
  - Closing a frame window
  - Displaying information within a window
- A Java program illustrating frame window
- Working with Graphics (Using Panel)
  - Drawing lines, rectangles, ellipses, circles, polygons
- Working with color and Font

### **Layout Managers**

Layout Manager: FlowLayout, BorderLayout, GridLayout, GridBagLayout

### **Menus, Events, Listeners & Adapter Classes**

- Handling menu
- A program showing menu and menu bars
- Event package
- Event handling with listener interfaces
  - ActionListener
- Handling events from multiple sources
- ItemListener
- WindowListener, KeyListener
- Handling events with Adapter class

### **Applet**

- What is Applet?
- Applets and web pages
- Limitation of applets
- Applet basics
- The applet class
- Applet initialisation and termination
  - init(), start(), paint(), stop(), destroy()
- Example of the simplest possible Java applet
- Running applet using applet viewer
- The "hello world" applet example
- The HTML APPLET tag- CODE, ALT, NAME, WIDTH, HEIGHT
- Drawing graphics
- The scribble applet
- Passing parameters to applet
- An example of getting parameters
- A Java applet to display an image
- GetDocumentBase(), GetCodeBase()

## **Section I**

### **Introduction to E-Commerce**

Definition, Scope of E-Commerce, Hardware requirements, Ecommerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

### **Business to Business E-Commerce**

Electronic Markets, Electronic Data Interchange (EDI):  
Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce

## **Section II**

### **Legal issues Risks**

Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract

### **Security Issues**

Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security.

## **Section III**

### **Business to Consumer E-Commerce**

Consumer trade transaction, Internet, Page on the Web, Elements of E-Commerce with VB, ASP, SQL.

### **E-business**

Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet

## Semester-IV

MScHNT – 401

**Internetworking Technologies**

### Section I

#### **An Overview on Internet**

The need for an Internet, The TCP/IP Internet, Internet services, Internet protocols and standardization, Review of Network technologies.

#### **Internetworking Concepts**

Architectural model introduction, Application level interconnection, Network level interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet

#### **Internet Address**

Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing.

### Section II

#### **Internet Protocol**

Internet Architecture and Philosophy, The concept of unreliable delivery, Connectionless delivery system  
The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing Protocol layering  
Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP)

#### **Routing**

The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing Gateway to Gateway Protocol (GGP),  
Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information

### Section III

#### **Enterprise Networking**

Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol

### **Internet Servers**

DNS, DHCP Servers, FTP, TELNET, E-Mail

### **Firewall & Networking**

Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL

### **HTML Basics**

Introduction of Markup Language, Basic Format of HTML Tags, Several Page Formatting tags, Anchoring, Frames etc.

## **MSchNT – 402**

## **Mobile Communications**

### **Section I**

#### **Introduction**

A General Overview: History, Transmission Medium, Need, Advantages, Disadvantages and Different Standards. AMPS, GSM, GPRS, 3G.

#### **Wireless LANs**

Characteristics, IEEE 802.11: Architecture, Physical Layer, MAC Layer, MAC Management, 802.11a and 802.11b.

HIPERLAN: History, WATM, BRAN and HiperLAN2.

Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Management Protocol, L2CAP and Security

### **Section II**

#### **Mobile Transport and Network Layer**

Introduction, Traditional TCP: Congestion Control, Slow Start, Fast Retransmit and Implications of Mobility

Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP and Fast Retransmit.

Mobile IP: Introduction, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations and Reverse Tunneling. Mobile Ad-hoc

Networks: Routing, Destination Sequence Distance Vector, Dynamic Source Routing and Alternative Metrics.

### **Section III**

#### **Cellular Networks**

Cellular Concept, Frequency Reuse, Channel Allocation Management, Call Setup, Location Management, Cell Handoffs, Interference: Co-channel and Adjacent Interference. System Capacity, Improving Cell Capacity and Coverage: Cell Splitting, Sectoring, Repeaters and Microcell Zone Concept.

#### **Wireless Application Protocol**

Introduction (WAP), Protocol Stack, Connections

### **MScHNT – 403**

#### **Server Virtualization & Configuration – Microsoft & Linux Environment**

### **Section I**

#### **Concept of Virtualization**

Virtualization with Windows Server 2008 Hyper-V Technology  
Reasons for Windows Server 2008 Hyper-Vxps  
Enhanced power management cuts hardware and facility costs  
Live Migration moves virtual machines without downtime

### **Section II**

#### **DirectAccess connects remote users without the need for establishing VPN**

Hyper-V virtualizes system resources without third-party software  
Interoperability with Windows 7  
Integrates with Windows Server 2008 R2

### **Section III**

#### **Linux Server visualization and configuration**

Xen and virtualisation overview  
Installation of Xen on RHEL5  
Creation of Xen virtual machines

Migration of Xen instances

**MScHNT-405**  
**Hours**

**Project**

**Duration: 50**

**Title:** LAN Setup in Linux Environment

**Team Size:** Max 4 Students

**Objective/ Aim:** Setup a LAN in a virtual Cyber Cafe of at least 10 PCs implementing the following features:

1. Remote installation server
2. User Authentication Server
3. DHCP Server
4. Internet Proxy Server
5. File & Printer sharing among the PCs

**Steps Involved:**

**Step 1:** Setup the rack of the network switch in the most convenient position of the room by considering the room measurement and computers' relative position.

**Step 2:** Establishing the physical wired connection between network switch & the computers by cabling CAT5 with RJ45 connectors.

**Step 3:** Installing the necessary servers & clients in Linux environment.

**Step 4:** Test run the LAN & establish the necessary security measures to run the setup in a secured environment.

**Step 5:** Submitting the project documentation.