



Swami Ramanand Teerth Marathwada University, Nanded
Choice Based Course Credit System (distribution and details of CBCS System)
M.Sc. (System Administration & Networking) First Year (Two Semester)

Semester-I					
Course Code	Title of the paper	External Credits	Internal Credits	Total Credits	Total No. of Classes
M.Sc. SAN-101	Fundamental of Computer	3	1	4	40hrs
M.Sc. SAN-102	Computer Network	3	1	4	40hrs
M.Sc. SAN-103	Fundamental of Linux OS	3	1	4	40hrs
M.Sc. SAN-104	TCP/IP	3	1	4	40hrs
M.Sc. SAN-105	Lab-1 (FC and DOS + Linux OS)	1	1	2	40hrs
M.Sc. SAN-106	Lab-2 (Computer Network/H/W)	1	1	2	40hrs
Total Credits		14	6	20	

Semester-II					
Course Code	Title of the paper	External Credits	Internal Credits	Total Credits	Total No. of Classes
M.Sc. SAN-101	Operating System	3	1	4	40hrs
M.Sc. SAN-102	Network Administration Part I	3	1	4	40hrs
M.Sc. SAN-103	Windows 2012 ADC Part-I	3	1	4	40hrs
M.Sc. SAN-104	Linux Administration - Part I	3	1	4	40hrs
M.Sc. SAN-105	Elective – II 1] Next Generation networking 2] Adhoc and Sensor network 3] System and N/W Administration	3	1	4	40hrs
M.Sc. SAN-106	Lab-1 (Network Admin Part I + Linux Administration - Part I)	1	1	2	40hrs
M.Sc. SAN-107	Lab-2 (Windows 2012 ADC Part-I)	1	1	2	40hrs
M.Sc. SAN-108	Seminar	0	1	1	40hrs
Total Credits		17	8	25	



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M.Sc. (SAN) – 101: Fundamental of Computers (4 – Credits)

UNIT I: Introduction

Characters of computers, The Evolution of computer, The computer generations Generations of Computer, Classification of computers.

UNIT II: Basic computer organization & Microprocessor.

Basic computer organization, Introduction to family of microprocessor, Ideal micro-computer, Memory system for microcomputer, Minimum micro-computer configuration.

UNIT III: Processor & Memory

Central processing UNIT, The control UNIT , Arithmetic logic UNIT , Instruction sets , Registers, Processor speed, Types of processors, The main memory, Storage evaluation criteria, Main memory organization, Main memory capacity, RAM, ROM, PROM, EPROM, Cache Memory

UNIT IV: Secondary Storage Devices

Sequential and Direct-Access Devices, Magnetic tape, Basic principals of operation Types of magnetic tapes, Advantages & disadvantages of magnetic tapes, Uses of magnetic tapes, Magnetic disks, basic principals of operations, types of magnetic disks, Advantages & limitations of magnetic disks, Magnetic disks, Optical disk, Basic principles of operation, Types of optical disks, Advantages & limitations of optical disks, Optical disks, Mass storage devices, Disk array, Automated tape library CD-ROM jukebox, Storage hierarchy.

UNIT V: Input Output Devices

Input devices ,Point-and-draw devices, Data scanning devices, Digitizer, Electronic card reader Output device, Monitors, Printers, Plotters, Screen image projector

UNIT VI: Computer Languages

Machine Language, Advantages & Limitations of Machine Language, Assembly Language Assembler, Advantages & limitations of Assembly Language , Level Language Compiler, Linker, Interpreter, Advantages & limitations of high level language language

Reference Books:

- 1) Fundamental of Computer –By Pradeep K.Sinha and Priti Sinha
(Sixth edition) Published by BPB Publications (2007)
ISBN 10: 8176567523 ISBN 13: 9788176567527
- 2) Computer Fundamental –By Rajaraman PHI publication -2010. Fifth Edition
ISBN: 978-81-203-4011-4



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M.Sc. (SAN) – 102: Computer Networks (4 – Credits)

UNIT I: Introduction

Uses of computer Networks, Network Hardware- LAN, MAN, WAN, Wireless Networks, Network Software-Protocol Hierarchy, Design and Issues for Layer. Client- Server Model, Peer to peer Network.

UNIT II : LAN Hardware

Network Interface Card, Drivers, Magnetic Media, Twisted Pair Cable, Coaxial Cable, Fiber optic cable, Network Topologies- Bus, Ring, Star, Tree and other Topologies, Networking Devices – Repeaters, Bridges, Routers, Gateways, Hub and Switch.

UNIT III: Multiplexing and Switching

Concept of modulation and their application, Multiplexing – Time division and Frequency division, Switching, Circuit Switching , Packet Switching , Message Switching.

UNIT IV: Network Standards and Network protocols

OSI reference model, TCP/IP reference model, IP protocol, SMTP, PPP, FTP, HTTP, SNMP. IP-addresses , Concept of DNS.

UNIT V: Introduction to ISDN, PBX, FDDI

ISDN Architecture, Use of PBX, FDDI. Ethernet Standards (IEEE 802.3), Introduction to Other Standards

UNIT VI: Internet

Definition, Internet verses Intranet, Internet Service Provider, E-mail–Architecture and Services, WWW-Client side and Server side,URL, Messenger, Search Engine.

Reference Book:

- 1) Willim Stallings”Data and Computer Communications”, (Fifth Edition), Prentice-Hall of India Pvt. Ltd, New Delhi-2008. ISBN: 0-13-243310-9
- 2) Andrew S. Tannenbaum,”Computer Networks”, (Third Edition), Prentice-Hall of India Pvt. Ltd, New Delhi-2008. ISBN-13: 978-8177581652



M.Sc. (SAN) – 103: Fundamental of Linux Operating System (4 – Credits)

UNIT I: Introduction to Fedora

Features of Fedora, Hardware Requirements, Fedora Installation.

UNIT II: First Steps with Fedora

Working with the Linux File System, Logging In to and Working with Linux, Changing User Information Reading Documentation, Using the Shell, Using the Text Editors, Working with Permissions.

UNIT III: Linux Commands and Utilities

Study of following command and utilities: adduser, alias, at, atrm, banner, batch, bind, cat, cd, chmod, chown, chroot, cp, cpio, dc, dd, df, dir, du, dump, ex, fax, fc, fdformat, file, find, finger, grep, gunzip, gv, gvim, gzip, halt, hostname, ifconfig, kill, in, locate, login, logout, look, lpc, lpd, lprm, ls, mail, man, mcopy, mdel, mdir, mformat, mkdir, mlabel, more, mount, mt, mv, netcft, netstat, passwd, ping, ps, pwd, quota, quotaoff, rm, rmdir, route, set, shutdown, sort, stat, strings, su, tar, tree, umount, unzip, vdir, vi, view, wc, who, whoami, xload, xset, zip.

UNIT IV: The X Window System:

Basic X Concepts , Using XFree86, Starting X , Selecting and Using X Window Managers.

UNIT V: Managing Services:

Fedora Core Linux Boot Process , System Services and Runlevels , Controlling Services at Boot with Administrative Tools, Starting and Stopping Services Manually.

UNIT VI: Managing Software and System Resources:

Using RPM for Software Management , Controlling Software from Source ,System Monitoring Tools.

Reference Books:

1. Red Hat Linux and Fedora Unleashed – By Bill Ball and Hoyt Duff.
Publisher: No Starch Press; First edition (March 1, 2004) ISBN-10:
0672325888; ISBN-13: 978-0672325885;
2. Enterprise Linux & Fedora Edition: The Complete Reference
-By Richard L. Petersen Edition 4, McGraw-Hill Professional, No Starch
Press, 2005, ISBN 1-59327-036-4.



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M.Sc. (SAN) – 104: TCP/IP (4 – Credits)

UNIT I: Introduction and overview

The motivation for Internetworking, The TCP/IP Internet , Internet services , History and scope of the Internet , The Internet Architecture Board , The Internet Society

UNIT II: Reviews of Underlying Network Technologies

Introduction, Two Approaches to Network communication, WAN, LAN , Ethernet Technology, Fiber Distributed Data Interconnection (FDDI) ,ATM.

UNIT III: Internetworking Concepts and Architectural Model

Introduction, Application level Interconnection, properties of the Internet , Network level Interconnection ,Internet Architecture .

UNIT IV: Internet Addresses

Introduction, Universal Identifiers , Three Primary classes of IP- addresses , Network and Broadcast addresses , Addresses specify Network connection

UNIT V: Internet Protocol - Connectionless Data gram Delivery

Introduction. A Virtual Network , Internet Architecture and Philosophy , The concept of Unreliable Delivery , Connectionless Delivery system , The purpose of the Internet Protocol , The Internet Datagram ,ARP,RARP.

UNIT VI: Reliable Stream Transport Service (TCP) .

Introduction, the Need for Stream delivery, Properties of the reliable delivery service, providing reliability , The Idea behind Sliding Window , The Transmission Control Protocol, Connections and Endpoints

Reference Books :

1. Internetworking with TCPIIP, PriDc, T, les, Protocols & Architecture - Douglas E. Comer (PHI)-2010 (Vol,-6 Ed.) ISBN-13: 978-0136085300 ISBN-10: 13608530X Edition: 6th
2. Internetworking with TCPIIP, Principles, and Protocols & Architecture - Douglas E. Comer (Vol-14th Ed.) (LPE) (Pearson Education) ISBN-13: 978-0136085300



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M. Sc. (SAN) – 201: Operating System (4 – Credits)

UNIT I: Importance of Operating System

Definition of Operating System , Basic Concept & Terminology , Multi-User, Multiprocessor , Multiprogramming , Multi Tasking , Extended Machine Concept , Hierarchical Machine Concept

UNIT II: Memory Management

Single Contiguous memory management , Partition Memory Management , Relocatable Partition Memory Management , Paged Memory Management , Demand Page Memory Management

UNIT III: Processor Management

Definition of Process , State Diagram of Process , Context Switching , Process Control Block Multiprocessor System

UNIT IV: Process Synchronization

Race Condition, Synchronization mechanism, Deadlock, Deadlock Prevention, Deadlock Avoidance

UNIT IV: Device Management

Techniques of device Management - Dedicated, Shared, Virtual , Device Characteristics , Channels & Control UNIT s , I/O Traffic Controllers ,I/O Scheduler Device Handler

UNIT V: Information Management

Simple File System, General Model of file System .

Reference Books -

1. Operating System - Stuart E. Madnic & John J. Donovan edition-13, reprint, publisher- McGraw-Hill, 1974, ISBN-007085467X, 9780070854673
2. Operating System - Achyut Godbole Operating Systems, Second Edition, Tata McGraw-Hill Education. (India), 2006. ISBN: 0070611947.



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M.Sc. (System Administration & Networking) First Year (Two Semester)

M. Sc. (SAN) – 202: Network Administration Part – I (4 – Credits)

UNIT I: The TCP/IP and OSI Networking Models

The TCP/IP Protocol Architecture , The TCP/IP Application Layer , The TCP/IP Transport Layer , The TCP/IP Internet Layer , The TCP/IP Network Access Layer ,Data Encapsulation Terminology, Comparing OSI and TCP/IP, OSI Layers and Their Functions , OSI Layering Concepts and Benefits OSI Encapsulation Terminology.

UNIT II: Fundamentals of LANs & WANs

An Overview of Modern Ethernet LANs , A Brief History OF Ethernet , Ethernet UTP Cabling UTP Cables and RJ-45 Connectors , Transmitting Data Using Twisted Pairs , UTP Cables Pinouts for 10BASE-T and 100BASE-TX , 1000BASE-T Cabling ,Improving Performance by Using Switches Instead of Hubs ,Increasing Available Bandwidth Using Switches, HDLC , Point-to-Point Protocol

UNIT III: Fundamentals of IP Addressing and Routing

Overview of Network Layer Functions , PC1's Logic. Sending Data to a Nearby Router , R1 and R2's Logic. Routing Data across the Network, R3's Logic. Delivering Data to the End Destination, Network Layer Interaction with the Data Link Layer , IP Packets and the IP Header, Network Layer (Layer3) Addressing, Routing Protocols , IP Addressing, IP Routing.

UNIT IV: LAN Switching

LAN Switching Concepts , Historical Progression. Hubs, Bridges, and Switches , Switching Logic LAN Switching Summary , Collision Domains and Broadcast Domains , Broadcast Domains The Impact of Collision and Broadcast Domains on LAN Design, Virtual LANs (VLAN)

UNIT V: Operating CISCO LAN Switches

Foundation Topics , Accessing the Cisco Catalyst 2960 Switch CLI , Cisco Catalyst Switches and the 2960 Switch , Switch Status from LEDs , Accessing the Cisco IOS CLI , CLI Access from the Console , Accessing the CLI with Telnet and SSH , Password Security for CLI Access , 6.9 User and Enable (Privileged) Modes , CLI Help Features .

UNIT VI: Routing Protocol Concepts

Connected and Static Routes , Connected Routes , Static Routes , Extended ping Command, Default Routes ,RIP-2 Basic Concepts , Comparing and Contrasting IP Routing Protocols , Interior and Exterior Routing Protocols



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Reference Book -

1. CCENT/CCNA ICND1 (Official Exam Certification Guide, Second Edition) – Wendell Odom Third Edition (ISBN: 978-1-58720-425-8)



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**M. Sc. (SAN) – 203: WINDOWS SERVER 2012 ACTIVE DIRECTORY
CONFIGURATION (Part-I) (4 – Credits)**

UNIT I: Installing and configuring servers

Install servers, Configure servers , Configure local storage

UNIT II: Configuring server roles and features

Configure file and share access, Configure print and document services, Configure servers for remote management

UNIT III: Configuring Hyper-V

Create and configure virtual machine settings , Create and configure virtual machine storage, Create and configure virtual networks

UNIT IV: Deploying and configuring core network services

Configure IPv4 and IPv6 addressing, Configure servers , Deploy and configure the DNS service

UNIT V: Installing and administering Active Directory

Install domain controllers , Create and manage Active Directory users , Create and manage Active Directory groups

UNIT VI: Creating and managing Group Policy

Create Group Policy Objects, Configure security policies, Configure application restriction policies, Configure Windows Firewall

References Books :

- 1) MCTS Self-Paced Training Kit (Exam 70-410): Installing and Configuring Windows Server 2012 By- Craig Zacker ISBN-13: 978-0735673168 ISBN-10: 0735673160 Edition: 1st
- 2) MCTS Self-Paced Training Kit (Exam 70-410): Installing and Configuring Windows Server 2012 By - Ian Maclean (Microsoft prepress) Zacker ISBN-13: 978-0735673168 ISBN-10: 0735673160 Edition: 1st



स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड.

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M. Sc. (SAN) – 204: Linux Administration Part – I (4 – Credits)

UNIT I: Managing Users

User Accounts, Managing Groups , Managing Users , Managing Passwords , Getting System Administrator Privileges to Regular Users , The User Login Process , Disk Quotas .

UNIT II: Managing the File system

The Fedora Core Linux File system Basics, Working with ext3 File system , Other File system Available to Fedora Core Linux , Creating a File system , Mounting File systems , Relocating a File system .

UNIT III: Backing Up, Restoring, and Recovery

Choosing a Backup Strategy , Choosing a Backup Hardware and Media, Using Backup Software Copying Files , Undeleting Files ,System Rescue

UNIT IV: Printing with Fedora

Overview of Fedora Printing , Configuring and Managing Print Services, Creating and Configuring Local Printers , Creating Network Printers , Console Print Control , Using the Common UNIX Printing System (CUPS) GUI

UNIT V: Network Connectivity

Networking with TCP/IP , Network Organization , Hardware Devices for Networking , Using Network Configuration Tools , Dynamic Host Configuration Protocol , Using the Network File System , Putting Samba to work

UNIT VI: Managing DNS

Configuring DNS, Essential DNS concept , Overview of DNS Tools ,Configuring Name servers with BIND , providing DNS for Real Domain

Reference Books

- 1) Red Hat Linux and Fedora Unleashed – By Bill Ball and Hoyt Duff.
Publisher: No Starch Press; First edition (March 1, 2004) ISBN-10: 0672325888; ISBN-13: 978-0672325885;
- 2) Enterprise Linux & Fedora Edition: *The Complete Reference*
-By Richard L. Petersen Edition 4, McGraw-Hill Professional, No Starch Press, 2005, ISBN 1-59327-036-4.



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M. Sc. (SAN) – 205: Elective – II Next Generation Networks (4 – Credits)

UNIT I: Converged Services for Next Generation Networks

GSM/UMTS Network protocols: SS7 and 11 standard basics, Supplementary Services: UMTS procedures. Intelligent Network: IN principles, CAMEL, Services: what are the challenges? , Integration, deployment issues.

UNIT II: Introduction to Next Generation Networks

IMS: the convergence. NGN architecture, NGN control architectures and protocols, Multi-access to the services: 3G, WiFi, DSL, Cable. TISPAN, SIP, Service architectures, Transition of networks (PSTN, IP-based) to NGN, Ipv6-based NGN, MEGACO, H.248, P2P systems, P2P SIP, Social Networks: Web-NGN convergence, Telco 2.0, IPTV, RCS. UMTS standardized 11 on at 3GPP: Standardisation process and principles in ETSI and 3GPP, Functionalities standardized in UMTS from Release 99 to Release 9. Latest 3GPP updates: what happened in 2010?

UNIT III: Wireless Access and Transport Technologies

RAN architecture : Radio Access Network Architecture for GSM, GPRS and UMTS, network devices, interfaces and protocols , QoS definition and management in GPRS and UMTS, Access methods and radio resource management in mobile networks, mainly for: TDMA systems

UNIT IV: CDMA systems and OFDMA systems.

Scheduling issues for GPRS, UMTS and WiMAX : downlink, uplink Physical to logical channel mapping : for GSM , for UMTS Procedure and protocol used for resource allocation , PDP Context and TBF allocation.

UNIT V: WPAN, WLAN, WMAN and Broadcast technologies

WLAN, WPAN, WMAN, DVB-H: Introduction ,WiFi: Standards, performance, usage and applications, new evolutions ,WiMAX, DVB-H :Usage and standard, Security :Basics, architectures, algorithms, Bluetooth: Standard, performance, usage and applications , Zigbee, UWB: Standards and usage, Service discovery in wireless Networks (jxta, UPnP,...) , Security in Wireless Networks: PANs, LANs and cellular Wireless Networks Simulation (tools and methods)

UNIT VI: Optimization: Theory and Network applications

Graph algorithms, linear programming basics, Introduction to Integer programming, Traffic engineering, Network topology calculus, Network optimal routing and dimensioning, Frequency assignment, Pricing, Game theory.



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Reference Books:

1. Next Generation Network Services: Technologies & Strategies by Neill Wilkinson, Publication-2008, Edition: 1. ISBN-13: 978-0471486671
2. Next Generation Networks: Perspectives and Potentials by Jingming Li Salina, Pascal Salina, Publisher:John Wiley & Sons, 2008 ISBN-10: 0471486671
3. Next-Generation Network Services: By Robert Wood, Published Nov 1, 2005 by Cisco Press. Part of the Networking Technology series ISBN-13: 978-0471486671



M. Sc. (SAN) – 205: Elective – II ADHOC AND SENSOR NETWORKS

(4 – Credits)

UNIT I: Ad Hoc Wireless Networks

Introduction. Issues in Ad Hoc Wireless Networks. Ad Hoc Wireless Internet.

MAC Protocols for Ad Hoc Wireless Networks:

Introduction, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks. Design Goals of a MAC Protocol for Ad Hoc Wireless Networks. Classifications of MAC Protocols. Contention-Based Protocols. Contention-Based Protocols with Reservation Mechanisms. Contention-Based MAC Protocols with Scheduling Mechanisms. MAC Protocols in Directional Antennas. Other MAC Protocols

UNIT II: Routing Protocols for Ad Hoc Wireless Networks:

Introduction to Routing algorithm, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks. Classifications of Routing Protocols. Table-Driven Routing Protocols. On-Demand Routing Protocols. Hybrid Routing Protocols. Routing Protocols with Efficient Flooding Mechanisms. Hierarchical Routing Protocols. Power-Aware Routing Protocols.

UNIT III: Transport Layer and Security Protocols for Ad Hoc Wireless Networks:

Introduction. Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks. Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks. Classification of Transport Layer Solutions. TCP Over Ad Hoc Wireless Networks. Other Transport Layer Protocols for Ad Hoc Wireless Networks. Security in Ad Hoc Wireless Networks. Network Security Requirements. Issues and Challenges in Security Provisioning. Network Security Attacks. Key Management. Secure Routing in Ad Hoc Wireless Networks.

UNIT IV: Wireless Sensor Networks:

Introduction. Sensor Network Architecture. Data Dissemination. Data Gathering. MAC Protocols for Sensor Networks. Location Discovery. Quality of a Sensor Network. Evolving Standards. Other Issues.

UNIT V: Hybrid wireless Networks:

Introduction. Next-Generation Hybrid Wireless Architectures. Routing in Hybrid Wireless Networks. Pricing in Multi-Hop Wireless Networks. Power Control Schemes in Hybrid Wireless Networks. Load Balancing in Hybrid Wireless Networks.



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UNIT VI: Wireless Geolocation Systems:

Introduction. What is wireless Geolocation? Wireless Geolocation System Architecture. Technologies for Wireless Geolocation. Geolocation Standards for E-911 Services. Performance Measures for Geolocation Systems. Questions. Problems.

Recent Advances in Wireless Networks:

Introduction. Ultra-Wide-Band Radio Communication. Wireless Fidelity Systems. Optical Wireless Networks. The Multimode 802.11 -IEEE 802.11a/b/g. The Meghadoot Architecture, introduction to vehicular sensor networks.

Reference Books

1. Toh, C. K., Ad hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, PTR, (2001) 3rd Edition. **ISBN: 978-1-4503-0181-7**
2. Pahlavan, Kaveh., Krishnamoorthy, Prashant., Principles of Wireless Networks, - A UNIT ed approach - Pearson Education, (2002) 2nd ed. **ISBN: 978-1-4503-0181-2**
3. Wang X. and Poor H.V., Wireless Communication Systems, Pearson education, (2004) 3rd ed. **ISBN: 978-1-4503-0181-9**



M. Sc. (SAN) – 205: Elective – II System and network administration

(4 – Credits)

UNIT I: System Hardware

PC and Server Hardware Architecture, Operating System Administration: UNIX, Windows, MAC OS. Centralization and Decentralization: Centralized Authentication, Active Directories; LDAP; Storage: RAID, Storage Area Network (SAN), Direct Attached Storage (DAS), Network Attached Storage (NAS); Data Integrity Backup and Recovery.

UNIT II: System Configuration

Cloning, Monitoring and Administering them; workstations, server, Data centers Data Center Management: Administering, Surveillance, Access Control, High Performance Computing, Virtualization and Cloud Computing.

UNIT III: Network Administration:

Network administrator (definition and functions), Network Planning, Routine system maintenance Computer Networks: OSI & TCP/IP Model, clean architecture;

UNIT IV: Switching & Routing

Layer 2 & Layer 3 switching; Routing; VLAN; Cisco L2 and L3 Switch Configuration; DHCP Configuration; IPv6, Wireless LAN: 802.11 a/b/g/n/ac WiFi; Access Point and Wireless Router configuration.

UNIT V: Internet Architecture

ISP Architecture; DNS Resolution; Content Mirroring, Internet Applications: DNS, Web, Mail, Proxy, NTP; Perimeter Security: Firewall, UTM,

UNIT VI: Network Security

LAN and WLAN Security issues; IP Spoofing; Dictionary Attack; DoS and DDoS Attack; Rogue/Misconfigured/External APs; Network Troubleshooting: ping, traceroute, nslookup, dig, tcpdump; Network Monitoring: SNMP; MRTG.

References Books:

1. Subramaniam Mani, Subramaniam " Network Management: Principles And Practice" Thomas A Limoli, Christina J. Hogan , Strata R. Chalup " Theory and Practise of System and Network administration " Addison-Wesley Professional; 2 edition 2007, ISBN-10: 0131480057;
2. Evi Nemeth, Garth Snyder, Trent R. Hein , Ben Whaley "UNIX and Linux System Administration Handbook" (4th Edition), 2010 , ISBN-10: 0131480057;