Course Objectives:
· To become familiar with the basics of Computer Networks.
· To learn Network architectures.
· To learn Concepts of fundamental protocols.
· To gain the knowledge of internetworking concepts.
· To understand the knowledge of internetworking concepts in various applications.
· To acquire knowledge of implementation concepts in congestion control and error detections.

Course Content:
T1: Chapter 1.1, 1.2, 1.5.1, 1.5.2., 2.1, 2.5 T2: Chapter 4
10 Hours

MODULE II: Internetworking - I: Switching and Bridging, Datagrams, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, sub-netting and classless addressing, Address Translation(ARP), Host Configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels.
T1: Chapter 3.1, 3.2.
10 Hours

MODULE III: Internetworking - II: Network as a Graph, Distance Vector(RIP), Link State(OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems(BGP), IP Version 6(IPv6), Mobility and Mobile IP
T1: Chapter3.3, 4.1.1,4.1.3 T2:Chapter13.1-13.18,Chapter18
10 Hours

MODULE IV: End-to-End Protocols: Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ MultiplicativeDecrease, Slow Start, Fast Retransmit
and Fast Recovery.

T1: Chapter 5.1, 5.2.1 to 5.2.8, 6.2, 6.3

**Hours**

**MODULE V:** Congestion Control and Resource Allocation, Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System (DNS), Electronic Mail (SMTP, POP, IMAP, MIME), World Wide Web (HTTP), Network Management (SNMP).

T1: Chapter 6.4  
T2: Chapter 23.1 to 23.16, Chapter 24, Chapter 25, Chapter 27.1 to 27.8

**COURSE OUTCOMES**

Students will be able to

- Classify network services, protocols and architectures, explain why they are layered.
- Knowledge on key Internet applications and their protocols, and ability to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Practical knowledge gained by hands-on sessions.
- Gain the knowledge of application layer protocol.

**Text books:**


**References:**


**Information and Network Security**

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**Course Objectives:**

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology.
Course Content:

**MODULE I: Classical Encryption Techniques:** Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Play air Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad. **Block Ciphers and the data encryption standard:** Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm. **10 Hours**

**MODULE II: Public-Key Cryptography and RSA:** Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems, public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves over GF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA. **10 Hours**

**MODULE III: Key Management and Distribution:** Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure. **User Authentication:** Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation, Kerberos version 4, Kerberos version 5, Remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification. **10 Hours**

**MODULE IV: Wireless network security:** Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function, .. **Web Security Considerations:** Web Security Threats, Web Traffic Security Approaches. **Secure Sockets Layer:** SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. **Transport Layer Security:**
MODULE V: Electronic Mail Security:
Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow.

IP Security:

Course Outcomes:
- Students will be able to:
  - Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
  - Identify the security issues in the network and resolve it.
  - Evaluate security mechanisms using rigorous approaches, including theoretical.

Text Books:

References
COURSE OBJECTIVES

• To understand the mathematical foundations needed for performance evaluation of computer systems

• To understand the metrics used for performance evaluation

• To understand the analytical modeling of computer systems

• To enable the students to develop new queuing analysis for both simple and complex systems

• To understand the concept of planning and design in computer system.

Course Content


10 Hours


10 Hours

MODULE III: Monitors, Program Execution Monitors and Accounting Logs: Monitors: Terminology and classification; Software and hardware monitors, Software versus hardware monitors, Firmware and hybrid monitors, Distributed System Monitors, Program Execution Monitors and Accounting Logs, Program Execution Monitors, Techniques for Improving Program Performance, Accounting Logs, Analysis and Interpretation of Accounting log data, Using accounting logs to answer commonly asked questions.

10 Hours

MODULE IV: Capacity Planning and Benchmarking: Steps in capacity planning and management; Problems in Capacity Planning; Common Mistakes in Benchmarking;
Benchmarking Games; Load Drivers; Remote- Terminal Emulation; Components of an RTE; Limitations of RTEs. Experimental Design and Analysis: Introduction: Terminology, Common mistakes in experiments, Types of experimental designs, 2k Factorial Designs, Concepts, Computation of effects, Sign table method for computing effects; Allocation of variance; General 2k Factorial Designs, General full factorial designs with k factors: Model, Analysis of a General Design, Informal Methods.

10 Hours

MODULE V: Queuing Models: Introduction: Queuing Notation; Rules for all Queues; Little’s Law, Types of Stochastic Process. Analysis of Single Queue: Birth-Death Processes; M/M/1 Queue; M/M/m Queue; M/M/m/B Queue with finite buffers; Results for other M/M/1 Queuing Systems. Queuing Networks: Open and Closed Queuing Networks; Product form networks, queuing Network models of Computer Systems. Operational Laws: Utilization Law; Forced Flow; Little’s Law; General Response Time Law; Interactive Response Time Law; Bottleneck Analysis; Mean Value Analysis and Related Techniques; Analysis of Open Queuing Networks; Mean Value Analysis; Approximate MVA; Balanced Job Bounds; Convolution Algorithm, Distribution of Jobs in a System, Convolution Algorithm for Computing G(N), Computing Performance using G(N), Timesharing Systems, Hierarchical Decomposition of Large Queuing Networks: Load Dependent Service Centers, Hierarchical Decomposition, Limitations of Queuing Theory. 10 Hours

COURSE OUTCOMES

Students will be able to:

• Identify the need for performance evaluation and the metrics used for it

• Define Little’e law and other operational laws

• Apply the operational laws to open and closed systems

• Use discrete-time and continuous-time Markov chains to model real world systems

• Develop analytical techniques for evaluating scheduling policies

Text Book:


Reference Books:

Wireless Networks and Mobile Computing

COURSE OBJECTIVE

- To introduce the concepts of wireless communication.
- To understand various propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.
- To understand CDMA, GSM, Mobile IP, WiMax
- To understand Different Mobile OS
- To learn various Markup Languages
- CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns

Course Content


MODULE II: Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6 . 10 Hours

MODULE IV: Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

10 Hours

MODULE V: J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

10 Hours

COURSE OUTCOMES:
The students shall able to:
- Work on state of art techniques in wireless communication.
- Explore CDMA, GSM, Mobile IP, WiMax
- Work on Different Mobile OS
- Develop program for CLDC, MIDlet model and security concerns

TEXT BOOKS:

REFERENCE BOOKS:

Wireless Sensor Networks

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COURSE OBJECTIVES
- Architect sensor networks for various application setups.
- Explore the design space and conduct trade-off analysis between performance and resources.
- Devise appropriate data dissemination protocols and model links cost.
- Determine suitable medium access protocols and radio hardware.
- Prototype sensor networks using commercial components.
- Provision quality of service, fault-tolerance, security and other dependability requirements while coping with resource constraints.

Course Content

MODULE I: Introduction: Overview and Applications of Wireless Sensor Networks
Introduction, Basic overview of the Technology, Applications of Wireless Sensor Networks: Introduction, Background, Range of Applications, Examples of Category 2 WSN Applications, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology (Chapter 1: 1.1, 1.2, Chapter 2: 2.1-2.6) 10 Hours


MODULE V: Network Management and Operating System for Wireless Sensor Networks

COURSE OUTCOMES
The student will be able to:
- Develop applications of wireless sensor actuator networks
- Implement the elements of distributed computing and network protocol
- Explore various hardware, software platforms that exist for sensor networks

TEXT BOOKS:

REFERENCE BOOKS:
1. Ian F. Akyildiz, Mehmet Can Vuran "Wireless Sensor Networks", Wiley 2010

Optical Networks

<table>
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<th>Sub Code: SCN152</th>
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Course Objectives:
- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration
- To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM
- To acquire knowledge about fault and congestion management.


10 Hours
10 Hours


MODULE V: WDM Network Design: Cost Trade-OFFS: A Detailed Ring Network Example LTD and RWA Problems, Light path Topology Design, Routing and Wavelength Assignment, Wavelength Conversion. Dimensioning Wavelength- Routing Networks, **Statistical Dimensioning Models**: First-Passage Model, Blocking Model, Maximum **Load Dimensioning Models**: Offline Light path Requests, Online RWA in Rings 10 Hours

COURSE OUTCOMES
The student will be able to:
- Design a system, component or process as per needs and specification.
- Gain knowledge on optical network architectures ranging from optical access networks to backbone optical transport networks.
- Gain the knowledge on methodologies of optical network design optimization;
- Explore techniques of optical network survivability.
- Solve the Problems in the discipline of optical networks.

Text Books:

References:
Course Objectives:

- To understand Switching and multiplexing.
- To understand the transmission technology
- To understand the transmission control.
- To understand basic knowledge on telecommunication.

Course Content


10 Hours


10 Hours

MODULE III: Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-stage, Three-stage and n-stage Networks. Digital Transmission and Multiplexing: Sampling, Quantization and Binary Coding, Quantization Noise, Companding, Differential Coding, Vcoders, Pulse Transmission, Line Coding, Time Division Multiplexing.

10 Hours

MODULE IV: Time Division Switching: Basic Division Space and Time Switching, Time Multiplexed Space and Time Switching, Combination Switching, Three-stage and n-stage Combination Switching.

10 Hours

Course Outcomes:

The student will be able to:

- Gain the knowledge about switching and multiplexing
- Gain the knowledge about telecommunication
- Learn transmission control in telecommunication.

TEXT BOOKS:


Digital Image Processing

Course objectives

- A general understanding of the fundamentals of digital image processing
- Basic components of an image processing system
- Key concepts in image file formats
- Image restoration, enhancement and compression and other functionalities

Course contents:


**10 Hours**


**12 Hours**


**10 Hours**


**10 Hours**


**10 Hours**

Course outcomes:

- Know how to manipulate histograms for image enhancement; including stretching, shrinking, equalization and specification followed with corresponding algorithms and equations.
- Expertise in how to use filters, both spatial and frequency.
- Concepts of entropy and its relation to image compression will be known.
TEXT BOOKS

REFERENCES:

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Information and Network security Laboratory

**Course Objectives:**
- To understand the fundamentals of Cryptography through practical implementation.
- To implement standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to use cutting edge simulation tools.
- To design security applications in the field of Information technology.

**LABORATORY WORK**

**Note: Use C/C++/Java or equivalent tool to implement the following experiment**

1. Consider a file with composite data, substitute the content and transpose the ciphers.
2. Consider an alphanumeric data, encrypt and Decrypt the data using advanced encryption standards and verify for the correctness.
3. Apply the RSA algorithm on a text file to produce cipher text file.
4. Develop a mechanism to setup a security channel using Diffie-Hellman Key Exchange between client and server.
6. Implement secure hash algorithm for Data Integrity. Implement MD5 and SHA-1 algorithm, which accepts a string input, and produce a fixed size number - 128 bits for MD5; 160 bits
for SHA-1, this number is a hash of the input. Show that a small change in the input results in a substantial change in the output.

7. Using any simulation tool: demonstrate packet filtering firewalls, create the ACL, create VLAN [Subnetting].

8. Develop a mechanism to setup(configure) a port scanner and identify the intrusion.

**Course Outcomes:**
Students will be able to:
- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

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**Course Objectives:** To understand the Multimedia Communication Models
- To study the Multimedia Transport in Wireless Networks
- To solve the Security issues in multimedia networks
- To explore real-time multimedia network applications.
- To explore different network layer based application.

**Course Content**

**MODULE I:** Introduction to Multimedia Communications: Introduction, Human communication model, Evolution and convergence, Technology framework, Standardization framework.  

10 Hours

**MODULE II:** Framework for Multimedia Standardization: Introduction, Standardization activities, Standards to build a new global information infrastructure, Standardization processes on multimedia communications, ITU-T mediacom2004 framework for multimedia, ISO/IEC MPEG-21 multimedia framework, IETF multimedia Internet standards.  

10 Hours

**MODULE III:** Application Layer: Introduction, ITU applications, MPEG applications, Mobile servers and applications, Universal multimedia access.  

10 Hours
MODULE IV: Middleware Layer: Introduction to middleware for multimedia, Media coding, Media Streaming, Infrastructure for multimedia content distribution.  

10 Hours


10 Hours

Course Outcomes:

Students will be able to:
- Release Real-time network issues.
- Identify wireless network applications.
- Implement network layer based application.

TEXT BOOKS:


REFERENCE BOOKS:


Distributed Computing

Course Objectives

- To learn Basic Concepts of DSM, Hardware DSM
- To understand File Sharing, DFS Implementation, Replication in DFS
- To understand the concepts of Cryptanalysis, Secure channels, Access control
- To understand some of the security concepts in distributed computing.

Course Content

MODULE II: Distributed Shared Memory: Introduction, Basic Concepts of DSM, Hardware DSM, Design Issue in DSM Systems, Issue in Implementing DSM Systems, Heterogeneous and Other DSM Systems, Case Studies. 10 hours


MODULE IV: Security in distributed systems: Introduction, Cryptography, Secure channels, Access control, Security Management, Case studies. 10 hours

MODULE V: Real-Time Distributed operating Systems: Introduction, Design issues in real-time distributed systems, Real time communication, Real-time scheduling, Case study: Real-time communication in MARS. Emerging Trends in distributed Computing: Introduction to emerging trends, Grid Computing, SOA, Cloud computing, the future of emerging Trends. 10 hours

COURSE OUTCOMES: The student will be able to

- Realize shared memory concept
- Realize Advantages of DFS
- Implement mechanisms to manage security in DS

Text Book:

1. Sunitha Mahajan, Seema Shah: Distributing Computing, Published by Oxford University press 2010

Network Management
COURSE OBJECTIVES

- To understand the need for interoperable network management.
- To learn to the concepts and architecture behind standards based network management.
- To understand the concepts and terminology associated with SNMP and TMN.
- To understand network management as a typical distributed application

Course Content


MODULE II: Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1 - Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model. 10 Hours


MODULE IV : Broadband Network Management: Broadband Access Networks and Technologies: Broadband Access Networks, Broadband Access Technology; HFCT Technology:


Course Outcomes

Upon completion of this course, the students will be able to

- Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
- Apply network management standards to manage practical networks.
- Formulate possible approaches for managing OSI network model.
- Use on SNMP for managing the network
- Use RMON for monitoring the behavior of the network
- Identify the various components of network and formulate the scheme for the managing them

TEXT BOOKS:


REFERENCE BOOKS:

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**COURSE OBJECTIVES**

- To learn how to use Cloud Services.
- To gain knowledge Virtualization
- To gain knowledge Task Scheduling algorithms.
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- To gain knowledge in cloud resource virtualization and scheduling.

**Course Content**

**MODULE I: Introduction:** Cloud Infrastructure Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems. **10 Hours**

**MODULE II: Cloud Computing:** Application Paradigms Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The GrepTheWeb application, Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing. **10 Hours**


**MODULE IV: Cloud Resource Management and Scheduling:** Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-
based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems. 10 Hours


Course Outcomes: The student will be able to:
· Demonstrate simple Cloud Applications
· Apply resource allocation, scheduling algorithms.
· Implement Map-Reduce concept.
· Create virtual machines from available physical resources.
· Setup a private cloud.

Text Book:

REFERENCES:

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COURSE OBJECTIVES
· To understand Client-Server software, Context Switching and Protocol Software, I/o.
· To understand System Calls, Basic I/O Functions available in UNIX
· To understand the Socket interface, TCP, UDP in detail.
• Various client software applications and their issues.
• To understand the concept of Socket interface in client server programming.

Course Content


10 Hours


10 Hours


10 Hours


COURSE OUTCOMES

The student will be able to:
• Gain in depth knowledge about Client-Server software, Context Switching and Protocol Software, I/o.
• Programming System Calls, Basic I/O Functions available in UNIX
• Gain the knowledge on Socket interface, TCP, UDP in details.
• Pros and cons of Client Software Various applications and their issues.

TEXT BOOK:

Sub Code: SCN252 CIE:50 Hrs/ Week: 04 SEE:50

Advances in Storage Area Networks
Course Objectives:
- To understand the fundamentals of storage centric and server centric systems
- To understand the metrics used for Designing storage area networks
- To understand the RAID concepts
- To enable the students to understand how data centre’s maintain the data with the concepts of backup mainly remote mirroring concepts for both simple and complex systems
- To appreciate the use of cables technologies used in SAN technology.

Course Content


10 Hours

MODULE II: I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

10 Hours

MODULE III: Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

10 Hours

MODULE IV: SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. Software Components of SAN: The switch’s Operating system; Device Drivers; Supporting the switch’s components; Configuration options for SANs.

10 Hours

Course Outcomes:
Students will be able to:
- Identify the need for performance evaluation and the metrics used for it
- Have Knowledge on various RAID levels.
- Apply the techniques used for data maintenance.
- Develop techniques for evaluating policies for LUN masking, file systems.

Text Book:
1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013.

Reference Books:

Ethernet Technology

COURSE OBJECTIVES

- To become familiar with the basics of Ethernet
- To learn concepts of different types of Ethernet
- To gain the knowledge of building an Ethernet system
- To acquire knowledge of hubs and repeaters

Course Content

MODULE II: Ethernet Media Systems: Ethernet Media Fundamentals
Twisted-Pair Media System(10Base-T) Fiber Optic Media System(10Base-F)
Fast Ethernet Twisted-Pair Media System(100Base-TX) 10 Hours

MODULE III: Fast Ethernet Fiber Optic Media System(100Base-FX)
Gigabit Ethernet Twisted-Pair Media System(1000Base-T)
Gigabit Ethernet Fiber Optic Media System (1000Base-X) 10 Hours

MODULE IV: Multi-Segment Configuration Guidelines
Building Your Ethernet System: Structured Cabling
Twisted-Pair Cables and Connectors Fiber Optic Cables and Connectors. 10 Hours

MODULE V: Ethernet Repeater Hubs Ethernet Switching Hubs
Performance and Troubleshooting: Ethernet Performance Troubleshooting 10 Hours

COURSE OUTCOMES

Students will be able to

- Classify different types of Ethernet systems
- Knowledge on Ethernet Media systems
- Practical knowledge on building a complete Ethernet system

Text Books:

REFERENCE BOOKS:

Mobile application Development

Course Objectives:
To understand system requirements for mobile applications.
- To learn basics of mobile development frameworks.
- To generate mobile application design.
- To learn & implement mobile application.

Course Content

**MODULE I:** Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.  

**10 Hours**


**10 Hours**

**MODULE III:** The Android Debug Bridge (ADB), Basic Widgets Understanding the Role of Android Application Components, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit ext Control Building Blocks for Android Application Design, Laying Out Controls in Containers, Utilizing Resources and Media, Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments.  

**10 Hours**

**MODULE IV:** Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments Advanced Android Programming: Internet, Entertainment, and Services, Implementing drawing and animations.  

**10 Hours**

**MODULE V:** Displaying web pages and maps, communicating with SMS and emails, Creating and using content providers: Creating and consuming services, publishing android applications.  

**10 Hours**

**Course Outcomes:**

On completion of this course students are able to

- Describe the requirements for mobile applications
- Explain the challenges in mobile application design and development
- Develop design for mobile applications for specific requirements
• Implement the design using Android SDK
• Implement the design using Objective C and iOS
• Deploy mobile applications in Android and iPhone marketplace for distribution

Text Books:
1. Mobile Computing: (technologies and Applications-N. N. Jani S chand
2. B.M Hirwani- Android programming Pearson publications-2013

Distributed Computing Lab

Course Objectives
• To understand the main ideas and concepts on web services.
• Studying and working on a related topic of internet applications such as information hiding, system security and E-learning.
• To understand the concepts of UDDI, SOAP, JMS remote procedure calls.

LIST OF EXPERIMENTS:
Note: Use appropriate tools/language to implement the following experiment:

1. Design and implement client server application using RMI (Remote Method Invocation) to invoke a service to calculate the income tax.

2. Design and implement EJB (Entity Java Beans) session bean business logic to calculate income tax and invoke the service using stub, i.e., client side proxy object.

3. Design and implement an EJB entity bean to persist the client submitted data into an enterprise information system.

4. Design and implement an offline database communication system using JMS (Java Message Service) to service the client request.

5. Design and implement the client code to call the Microsoft service like free service from UDDI (Universal Description Discovery Protocol).
6. Design and implement business logic and bind it as service using SOAP (Simple Object Access Protocol), also implement client to call service. NOTE: Use EJB 3.X or any equivalent tool.

**COURSE OUTCOMES:**

The student will be able to

- Develop and debug RPC based client-Server programs in UNIX.
- Realize the partial implementation of UDDI, SOAP, JMS in Web applications