# SYLLABUS

**AUTONOMOUS SYSTEM**

**For**
**M.Tech. I to IV Semester**

# Computer Network Engineering

With effect from the Academic Year 2015-16

Hyderabad Karnataka Education Society's

## Poojya Doddappa Appa College of Engineering, Kalaburagi

A Govt. Aided Autonomous College, Affiliated to VTU Belagavi, and Approved by AICTE, New Delhi

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**I Semester - M.Tech.** **COMPUTER NETWORK ENGINEERING**

| Code No. | Subject | CONTACT HRS. | | | | EVALUATION SCHEME | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | SS | Credits | CIE | SEE | |
| 15PCN11 | Mathematical Foundations of Computer Networking | 4 | 2 | 0 | 0 | 5 | 50 | 50 | 100 |
| 15PCN12 | Advanced Computer Networks | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN13 | Wireless Communication | 4 | 0 | 0 | 2 | 5 | 50 | 50 | 100 |
| 15PCN14X | Elective-I | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN15X | Elective-II | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN16X | Elective-III | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN17 | Advanced Computer Networks Lab | 0 | 0 | 3 | 0 | 2 | 50 | 50 | 100 |
| | **TOTAL** | **24** | **2** | **3** | **2** | **28** | **350** | **350** | **700** |

Note: L- Lecture, T - Tutorial, LW/P- Lab Work/Practical,SS-Self Study component, CIE - Continuous Internal Evaluation, SEE - Semester End Examination.

| ELECTIVE - I | |
|---|---|
| **CODE** | **SUBJECT** |
| 15PCN141 | Distributed systems |
| 15PCN142 | TCP/IP Protocol Suite |
| 15PCN143 | Data Compression |

| ELECTIVE - II | |
|---|---|
| **CODE** | **SUBJECT** |
| 15PCN151 | Mobile Application Development |
| 15PCN152 | Information Storage Management |
| 15PCN153 | Data Centre Virtualization |

| ELECTIVE - III | |
|---|---|
| **CODE** | **SUBJECT** |
| 15PCN161 | Artificial Inteligence and Agent Technology |
| 15PCN162 | Analysis Architecture and Design of Networks |
| 15PCN163 | Agile Technology |

**II Semester - M.Tech.** **COMPUTER NETWORK ENGINEERING**

| Code No. | Subject | CONTACT HRS. | | | | EVALUATION SCHEME | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | SS | Credits | CIE | SEE | |
| 15PCN21 | Cloud Computing | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN22 | Internet Measurement | 4 | 0 | 0 | 2 | 5 | 50 | 50 | 100 |
| 15PCN23 | Cyber Security | 4 | 2 | 0 | 2 | 5 | 50 | 50 | 100 |
| 15PCN24X | Elective - IV | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN25X | Elective - V | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN26X | Elective - VI | 4 | 0 | 0 | 0 | 4 | 50 | 50 | 100 |
| 15PCN27 | Seminar / Mini Project | 0 | 0 | 0 | 0 | 2 | 50 | 50 | 100 |
| | **TOTAL** | **24** | **2** | **0** | **4** | **28** | **350** | **350** | **700** |

Note: L- Lecture, T - Tutorial, P-Practical, CIE - Continuous Internal Evaluation, SEE - Semester End Examination, SS - Self Study

| ELECTIVE - IV | |
|---|---|
| **CODE** | **SUBJECT** |
| 15PCN241 | Big Data Analytics |
| 15PCN242 | soft computing |
| 15PCN243 | Network Programming |

| ELECTIVE - V | |
|---|---|
| **CODE** | **SUBJECT** |
| 15PCN251 | Multimedia Communication |
| 15PCN252 | Internet of Things |
| 15PCN253 | Grid and Cluster Computing |

| ELECTIVE - VI | |
|---|---|
| **CODE** | **SUBJECT** |
| 15PCN261 | Business Intelligence |
| 15PCN262 | Wireless Sensor Network |
| 15PCN263 | Analysis of Computer Networks |

**III Semester - M.Tech.** **COMPUTER NETWORK ENGINEERING**

| Code No. | Subject | CONTACT HRS. | | | | EVALUATION SCHEME | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | LW/P | SS | CIE | SEE | Total | Credits |
| 15PCN31 | Project - Phase I | - | - | - | - | 50 (25*+25**) | 50 | 100 | 12 |
| 15PCN32 | Industrial Traning/Industrial Visit/ Mini Project | 0 | 0 | 4 | 0 | 50 (25*+25**) | 50 | 100 | 8 |
| | **TOTAL** | **0** | **0** | **4** | **0** | **100** | **100** | **200** | **20** |

**Note: L- Lecture, T - Tutorial, LW/P- Lab Work/Practical,SS-Self Study components, CIE - Continuous Internal Evaluation, SEE - Semester End Examination.**

**EXPERT COMMITTEE:** Consists of minimum of 3 and maximum of 5 faculty memebers In the relevant field.

**PROJECT :**Project work will be for a period of 8 months out of which 4 months will be during third semester as Project Phase -I & Project Phase- II will be Continued in IV sem. During this semester student has to carry out literature survey and finalise the objective of the project work.

**CIE** will be evaluated by concerned guide along with the expert committee on the basis of the literature collection(10-15 journal papers) & Seminar delivered by the candiate. *Mid-Sem Seminar. **End Sem Seminar before the Committee.

**SEE** will be evaluated by the external and internal (Guide) Examiners.

**INDUSTRIAL TRAINING/INDUSTRIAL VISIT:** Student has to visit atleast one Industry and undergo traning for stipulated period of Four months and submit a report of their exposure in respective field and present a seminar before the Expert committee for evaluation of **CIE** marks

**SEE** will be evaluated by the external and internal Examiners.

**MINI PROJECT : CIE** will be evaluated by the expert committee along with the Guide

**IV Semester - M.Tech.** **COMPUTER NETWORK ENGINEERING**

| Code No. | Subject | CONTACT HRS. | | | | EVALUATION SCHEME | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | SS | P | CIE | SEE | Total | Credits |
| 15PCN41 | Project Phase-II | —- | —- | — | —- | 50+50 | 125*+75** | 300 | 24 |
| | **TOTAL** | **00** | **00** | **00** | **00** | **100** | **200** | **300** | **24** |
| **GRAND TOTAL (I TO IV SEMESTER)** | | | | | | | | **1900** | **100** |

Note: **L**-Lecture, **T**-Tutorial, **P**-Practical, **CIE** -Continuous Internal Evaluation, **SEE**- Semester End Examination

**EXPERT COMMITTEE**: CONSISTS OF MINIMUM OF 3 AND MAXIMUM OF 5 FACULTY MEMEBERS IN THE RELEVANT FIELD.

**CIE** DURING FOURTH SEMESTER STUDENT HAS TO PRESENT TWO SEMINARS (ONE AT THE MID SEM, ANOTHER AT THE END OF SEM) ON **PROJECT PHASE-II** BEFORE THE EXPERT COMMITTEE FOR EVALUATION.

**SEE**

* EVALUATION OF PROJECT THESIS BY INTERNAL AND EXTERNAL EXAMINERS.

** CANDIDATE HAS TO APPEAR VIVA- VOCE EXAMINATION IN THE PRESENCE OF INTERNAL AND EXTERNAL EXAMINER

Proposed Syllabus for I Semester M.Tech.

# MATHEMATICAL FOUNDATIONS OF COMPUTER NETWORKING

| Subject Code : 15PCN11 | Credits : 05 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) + 2 Hrs. (Tutorial) | | Total Hours : 52 |

**Course Outcome:**

**After studying this course the student will be able to:**

- Understand Bayes theorem, total probability theorem, Random variables and distribution.
- Study testing of hypothesis of all size of samples.
- Acquire knowledge about finding out the coefficient of correlation, regression, linear equations and queuing theory.
- Describe quantitative measures of information and analyze and characterize the fundamental limits of communication systems.

## MODULE - I

**Probability :** Introduction, Joint and Conditional Probability, Random Variables, Moments and Moment Generating Functions, Standard Discrete Distributions, Standard Continuous Distributions, Useful Theorems, Jointly Distributed Random Variables, Bayesian Networks. 11 Hours

## MODULE - II

**Statistics:**Sampling a Population, Describing a Sample Parsimoniously, Inferring Population Parameters from Sample Parameters,Testing Hypotheses about Outcomes of Experiments, Independence and Dependence: Regression and Correlation. Comparing Multiple Outcomes Simultaneously: Analysis of Variance, Design of Experiments,Dealing with Large Data Sets, Common Mistakes in Statistical Analysis. 10 hours

## MODULE - III

**Linear Algebra :**Vectors and Matrices, Vector and Matrix Algebra, Linear Combinations, Independence, Basis, and Dimension, Using Matrix Algebra to Solve Linear Equations.Linear Transformations, Eigen values, and Eigen vectors. 10 hours

## MODULE IV

**Stochastic process and QueueingTheory:** Stochastic Matrices, Overview , Stochastic Processes, Continuous-Time Markov Chains, Birth-Death Processes. The M/M/1 Queue, Two Variations on the M/M/1 Queue, Other Queueing Systems. 11 Hours

## MODULE V

**Information Theory:** Introduction, A Mathematical Model for Communication, From Messages to Symbols, Source Coding.The Capacity of a Communication Channel, The Gaussian Channel . 10 Hours

**TEXT BOOKS:**

1. **"Mathematical Foundations of Computer Networking"** Srinivasan Keshav, 2012 Addison-Wesley Professional

**Reference Books:**

1. Trivedi, KS, Probability and Statistics with Reliability, Queueing and computer science Applications Prentice Hall of India Reprinted in 1990.

# ADVANCED COMPUTER NETWORKS

| Subject Code : 15PCN12 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcome:**

**After studying this course the student will be able to:**

- Describe basic concepts of building a network and familiarize with architectural concepts of layering and circuit packet switching, various error control techniques and their analysis.
- Gain the knowledge of internetworking concepts and discuss internet routing protocols and its principles.
- Understand transport layer issues ,study related protocols, study congestion and resource allocation and gain the knowledge of application layer protocols.

## MODULE - I

**Review of Basic Concepts & Direct Link Networks:** Building a Network, Requirements-Connectivity, Cost-Effective Resource Sharing, support for Common Services, Network Architecture Layering and Protocols, OSI Architecture, Internet Architecture, Performance-Bandwidth and Latency, Delay×Bandwidth Product,High-Speed Networks. Hardware Building Blocks-nodes, links; Encoding (NRZ, NRZI, Manchester, 4B / 5B), Framing, Error Detection -Two-Dimensional Parity, Internet checksum Algorithm, cyclic Redundancy Check, reliable Transmission Stop-and-Wait, Sliding Window, Concurrent Logical Channels, Ethernet (802.3), Rings(802.5,FDDI)–Token Ring Media Access Control, Token Ring Maintenance, FDDI. 11 Hours

## MODULE - II

**Packet Switching & Internet Working:** Switching and forwarding – Datagrams, Virtual Circuit Switching, Source Routing, Bridgesand LAN Switches–Learning Bridges, Spanning Tree Algorithm, Broadcast and Multicast, Limitations of Bridges, cell switching(ATM)–Cells, Segmentation and Reassembly, VirtualPaths, Physical Layers for ATM. Simple internet

working (IP) - What is an Internet work?, Service Model, Global Address, Datagram Forwarding in IP. 10 Hours

**MODULE - III**

**Internetworking:** Address Translation(ARP), Host configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels, Network as a Graph, distance Vector(RIP), Link State(OSPF), Metrics, Routing for Mobile Hosts, Global Internet –Subnetting, Classless Routing(CIDR), Interdomain Routing(BGP), Routing Areas, IP Version6(IPv6); Multiprotocol Label Switching (MPLS). 11 Hours

**MODULE - IV**

**End–to-End Protocols& Resource Allocation:** Simple demultiplexer(UDP), Reliable byte stream(TCP)–End-to-End Issues, Segment Format, Connection Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, record Boundaries, TCP Extensions, Alternative Design Choices Issues in resource allocation–Network Model, Taxonomy, Evaluation Criteria, Queuing discipline–FIFO, Fair Queuing. 10 Hours

**MODULE - V**

**Congestion Control & Application protocols:** TCP Congestion Control–Additive Increase/Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery, Congestion Avoidance mechanisms, DECbit, Random Early Detection(RED),Source Based Congestion Control. Traditional applications–Electronic Mail (SMTP, MIME, IMAP), World Wide Web(HTTP), Name Service (DNS), Network management (SNMP), Web services–Custom APPLICATION Protocols(WSDL,SOAP),A Generic application Protocol(REST). 10 Hours

**TEXT BOOKS:**

1. Larry L. Peterson and Bruce S. Davie: *Computer Networks– A Systems Approach*, 4th Edition, Elsevier,2007.

**REFERENCEBOOKS:**

1. Behrouz A.Forouzan:*Data Communications and Networking*, 4thEdition,TataMc GrawHill, 2006.
2. William Stallings:*Data and Computer Communication*, 8thEdition,PearsonEducation,2007.

3. Alberto Leon-Garcia and Indra Widjaja,Communication Networks, Fundamental Concept and Key Architectures, 2nd Edition Tata McGraw-Hill, 2004.

## WIRELESS COMMUNICATION

| Subject Code : 15PCN13 | Credits : 05 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. SS | | Total Hours : 52 |

**Course Outcomes:**

**After studying this course the student will be able to:**

- Understand basics of propogation of radio signals and familiarize with different propagation models and channel modeling.
- Distinguish between small scale and large scale fading and study different fading models.
- Undestand single and multi signal carrier modulation technique and its working.
- Describe fundamentals of cellular technology and related concepts.
- Discuss smart antenna system, (MIMO).

### MODULE - I

**Radio Propagation over Wireless Channel:**General Considerations about radio waves and wireless channel, Basic propagation mechanisms, free space propagation model, Ground wave propagation, Lonospheric propagation, Tropospheric propagation, channel noise and losses, Multipath effect/fading in land mobile systems.Channel Models :Introduction to channel modelling, Representation of a discrete channel by filter, Stochastic/statistical channel modelling Considerations, Wideband time-dispersive channel modelling considerations, Rayleigh fading model, Rician fading model, Nakagami fading model, Comparison of Rayleigh, Rician, and Nakagami fading models. 10 Hours

### MODULE - II

**Spread Spectrum Techniques (Signal carrier Modulation)**: Spread spectrum modulation(SSM) concept, Concept of SSM bandwidth from

Shannon's theorem and SNR, Operations related to PN code or sequence, various pseudo-noise(PN) Codes or Direct sequences (DS) Fundamentals.Mathematics associated with the spread spectrum modulation / Demodulation, direct sequence spread spectrum receiverconsiderations(Rake receiver), signal processing at the rake receiver, Characteristics of DSSS system, frequency hopping spread spectrum transmitter and receiver, Time hopping, Comparison of spread spectrum modulation methods, Hybrid spread spectrum systems, Chirp spread spectrum. 11 Hours

**MODULE - III**

**Multicarrier Modulation:** Basic principles of Orthogonality, Signal vs Multicarrier systems, OFDM block diagram and ITS explanation, OFDM signal Mathematical representation, Selection parameters for Modulation, pulse shaping in OFDM signal and spectral efficiency, Windowing in OFDM signal and spectral efficiency, Synchronization in OFDM, Pilot insertion in OFDM transmission and channel estimation, Amplitude limitations in OFDM. 10 Hours

**MODULE - IV**

**Infrastructure to Develop Mobile Communication Systems: Cellular Theory 1:**Why cellular technology, Cellular radio communication infrastructure, Real-world cells, Cellular system components, Operations of cellular systems, Channel Assignment, Cellular interferences.Antennas for the base station, Sectorization, Mobile traffic calculation, spectrum efficiency of cellular system, Number of customers in the cellular system. 10 Hours

**MODULE - V**

**MIMO Systems:** Introduction, Space diversity and systems based on space diversity, Smart antenna system and MIMO, MIMO-based system architecture, MIMO exploits multipath, Space-time processing, Antenna considerations for MIMO, MIMO channel modelling, MIMO channel measurement, MIMO channel capacity, Cyclic delay diversity(CDD).MIMO applications in 3G wireless systems and beyond, MIMO-OFD.

11 Hours

**Text Book:**

1. Upena Dalal **"Wireless Communication"** Oxford university press.

**REFERENCE BOOKS:**


1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – GottapuSasibhushanaRao, Pearson Education, 2012.
4. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE.
5. Wireless Digital Communications – KamiloFeher, 1999, PHI.
6. Wireless Communication and Networking – William Stallings, 2003, PHI.

# DISTRIBUTED SYSTEMS

| Subject Code : 15PCN141 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. | | Total Hours : 52 |

**Course Outcomes:**

**After studying this course the student will be able to :**

- Describe distributed Systems and major recent developments in Distributed Systems technology.
- Master the concepts of Distributed System, Inter process communication, RMIs, Operating System support for distributed systems.
- Apply the concepts of fault modeling, fault tolerance, distributed objects and distributed multimedia systems along with security issues.

## MODULE - I

**Introduction:** Characteristics of Distributed Systems, Examples of Distributed Systems, Resource sharing and the web, Challenges.

**System Models:** Architectural Models, Fundamental Models, Networking: Internet Protocols.

**Interprocess Communications:** API for the Internet Protocols, Client-Server communication, group communication 11 Hours

## MODULE - II

**Distributed Objects &Remote Invocation:** Introduction, communication between distributed objects,Event and notification, Case Study: Java RMI.

**Operating System Support:** Introduction, The Operating System Layer, Protection, Processes and Threads. 10 Hours

## MODULE - III

**Security**: Overview of security techniques, Cryptographic algorithms, Digital signatures.

**Distributed file System:** File Service Architecture

**Name Services:** Name Services and Domain Name System, Directory Services. 10 Hours

**MODULE - IV**

**Time & Global States:** Introduction, Clocks, Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States.

**Coordination and Agreement:** Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

**Transactions & Concurrency Control:** Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of methods for Concurrency Control. 11 Hours

**MODULE - V**

**Distributed Transactions:** Introduction, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks and Transaction Recovery.

**Distributed Multimedia Systems:** Characteristics of Multimedia Data, Quality of Service Management, Resource Management. 10 Hours

**Text Books:**

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems – Concepts and Design", 4th Edition, Pearson Education.

**Reference Books:**

1. Andrew S. Tanenbaum and Marten Vansteen, "Distributed Systems – Principles and Paradigms", PHI, 2002.

# TCP/IP PROTOCOL SUITE

| Subject Code : 15PCN142 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. | | Total Hours : 52 |

**Course Outcomes:**

**After completion of the course the students will be able**

- Understand basic network technologies, OSI, RFC and protocol layering.
- Gain knowledge about the working of various network protocols.
- Studies multicast routing, transport application and network management protocols.

**MODULE - I**

**Introduction , Overview of Underlying Technologies, Addressing Issues:** RFC's, the importance of standards; underlying network technologies; OSI reference model & protocol layering,IP, Internet addresses (classful and classless), subnetting and supernetting, ARP, RARP, DHCP, DNS. 10 hours

**MODULE - II**

**Network Layer Protocols:**, NAT, Mobile IP, Router functionality, dynamic versus static routing, routing tables, unicast routing (RIP, BGP, OSPF), routing algorithms (link state, distance vector) 10 hours

**MODULE - III**

**Multicast Routing:** multicast, routing algorithm (path vector), multicast routing protocols (MOSPF, DVMRP, CBT, PIM). 10 hours

**MODULE - IV**

**Transport Layer Protocols, Next Generation IP:** UDP and TCP, SCTP, transitioning from IPv4 to IPv6. 10 hours

**MODULE - V**

**Application Layer and Network Management:** Introduction to the Application Layer, Remote Login: TELNET and SSH, File Transfer: FTP

and TFTP., World Wide Web and HTTP,Electronic Mail: SMTP, POP, IMAP and MIME, SNMP, Multimedia. 12 hours

**Textbook:**

**1. "TCP/IP Protocol Suite"**, 4th Edition, by Behrouz A Forouzan.

**REFERENCE BOOK**

1. Douglas Comer, **"Internetworking with TCP / IP"** ,Vol – 1, PHI, 2000.
2. Raj Pandya, "**Mobile and Personal Communication Systems and Services**", Prentice Hall of India, 2001

## DATA COMPRESSION

| Subject Code : 15PCN143 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Evaluate the fundamental concepts will Data Compression and Coding techniques.
- Analyze the operation of a range of commonly used coding and compression techniquies.
- Identify the basic software and hardware tools used for data compression.
- Identify what new trends and what new possibilities of Data Compression are available.

**MODULE - I**

Introduction : Compression techniquies, modeling and coding mathematical preliminaries for lossescompression: A brief introduction to information theory, models, coding, algorithmic information theory, minimum description length principle. 10 Hours

**MODULE - II**

**Huffman Coding**: The Huffman coding algorithm, non binary Huffman codes, adaptive Huffman coding, golomb codes, rice codes, Tunstall codes, application of Huffman coding. 10 hours

**MODULE - III**

**Lossless Image Compression**,**Mathematical Preliminaries For LossyCoding** Introduction, CALIC, JPEG-LS, multi resolution approaches, facsimile encoding, MRC-T.44. Introduction, distortion criteria, information theory revisited, rate distortion theory, models. 12 hours

**MODULE - IV**

**Wavelet Based Compression**: Introduction, wavelets, multi resolution analysis and scaling function,implementation using filters, image compression, embedded zero tree coder, set partitioning in hierarchical trees, JPEG zero.

**Audio Coding**: Introduction, MPEG coding, MPEG advanced audio coding, Dolby AC3(DOLBY DIGITAL) other standards. 10 hours

**MODULE - V**

**Video Compression**: Introduction, motion compensation, video signal representation, ITU-T recommendation H.261, model based coding, asymmetric applications, The MPEG-1 video standard, The MPEG-2 video standard, ITU-T recommendation H.263, ITU-T recommendation H.264, MPEG-4 part 1.0 advanced video coding, MPEG-4 part 2 , packet video, ATM networks. 10 hours

**TEXT BOOK**

1. "**Introduction to data compression"** 4th edition, Khalid sayood. *Elsevier.*Reprinted 2014. ISBN:978-81-312-3408-2.

**Reference:**

1. "**Data compression"**, The complete reference. 4th edition. David Salomon. Springer Year 2014

# MOBILE APPLICATION DEVELOPMENT

| Subject Code : 15PCN151 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes:**

**After studying this course the student will be able to:**

1. Describe Android OS architecture, Android application architecture, various tools used in Android development and handset Hardware.
2. Build user interfaces using various UI components and menus
3. Acquire knowledge about storing and retrievel data using native SQLITE database
4. understand to use the external services like Internet interfacing with Camera,Audio and Video in Android Apps

**MODULE - I**

**Internals Primer:** App Developers' view, Overall Architecture, Hardware support, Native User-Space, Dalvik and Android's Java, System Services, stock AOSP Packages, System Startup.

**Hardware Primer:** Typical System Architecture, What's in a System-on-chip (SoC)?, Memory Layout and Mapping, Development Setup.

10 hours

**MODULE - II**

**Fundamentals of Android Development:** Introduction to Android: The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.

**Basic Widgets** : Understanding the Role of Android Application Components, Event Handling , Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control. 10 Hours

**Module III Building Blocks for Android Application Design :** Laying

Out Controls in Containers – Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using ImageView, Frame \ Layout, Table Layout, Grid Layout, Adapting to screen orientation.

**Utilizing Resources and Media** – Resources, Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Image Switcher Application, Scrolling, Playing Audio and Video, Displaying Progress with ProgressBar, Using Assets.

11 Hours

**MODULE - IV**

**Building Menus and Storing Data :** Creating Interactive Menus and ActionBars – Menus and their types, Creating Menus through XML, Creating Menus through coding, Applying a context menu to a ListView, using ActionBar, Replacing a Menu with the ActionBar, Creating Tabbed ActionBar, Creating a DropDown List ActionBar.

**Using Databases –** Using the SQLiteOpenHelper Class, Accessing Databases with the ADB, Creating a Data Entry Form. 10 Hours

**MODULE - V**

**Displaying web pages and maps:** Displaying web pages, Using WebViewClient Class, Using Google Maps.

**Communicating with SMS and emails**:Understanding Broadcast Receivers, Using the Notification System, Sending SMS Messages with Java Code, Receiving SMS Messages, Sending Email, Working with the Telephony Manager.

**Publishing android applications** : Setting Versioning Information of an Application, Generating a Certificate, Digitally Signing the Android Applications and Generating APK, Distributing Applications with Google Play. 11 Hours.

**Text Books :**


1. Karim Yaghmour, Embedded Andriod SPD Oreily Media 2nd Edition 2014
2. B.M. Harwani, Andriod programming unleashed, SAMS pearson, 1st Edition 2013.

# INFORMATION STORAGE MANAGEMENT

| Subject Code : 15PCN152 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

Course Outcomes

After completion of this course, the students would be able to

- Recognize the role and use of technology in business systems and operations
- Identify and describe organizational structure and business processes within these
- Implement information systems in industry.
- Choose backup method and replication method.
- Provide security in the management storage infrastructure.

**MODULE - I**

**Introduction to Information Storage:** Information Storage, Evolution of Storage Architecture, Data center Infrastructure, Virtualization and cloud computing. Data Center Environment: Application, Database Management System(DBMS), Host(compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based On Application, Disk Native Command Queuing. Introduction to Flash Drives, Concept in Practice: VMware ESXi. Data Protection: RAID:RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID levels, RAID Impact on Disk Performance, RAID Comparison, Hot Spares. 11 Hours

**MODULE - II**

**Intelligent Storage Systems:** Components of an Intelligent Storage System, Storage Provisioning, Types of intelligent Storage Systems, Concepts in Practice: EMC Symmetrix and VNX. Fibre Channel Storage Area Networks: Fibre Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity. Switched Fabric Ports, Fibre Channel Architecture, fabric Services, Switched fabric Login Types, Zoning,

FC SAN Topologies, Virtualization in SAN, Concepts in Practice: EMC Connectrix and EMC VPLEX.IP SAN and FcoE: iSCSI, FCIP, FcoE.

10 Hours

**MODULE - III**

**Network-Attached Storage:** General-purpose Servers versus NAS Devices, benefits of NAS, File Systems and network File Sharing. Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, factors Affecting NAS Performance, File-Level Virtualization, Concepts in Practice: EMC Isilon and EMC VNX gateway. Object-Based and unified Storage: Object-Based Storage Devices, Content- Addressed Storage, CAS use Cases, unified Storage, Concepts in Practice: EMC atoms, EMC VNX, and EMC centera. 10 Hours

**MODULE - IV**

**Backup and Archive :** Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operation, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Dedupulication for Backup, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture, Concepts in Practice: EMC Networker, EMC Avamar, and EMC Data domain.Local Relication: Replication Terminology, Uses of Local Replicas, Replica Course Title: Information Storage Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas, Local Replication in Virtualized Environment, Concepts in Practice: EMC TimeFinder.

10 Hours

**MODULE - V**

**Remote Replication**: Modes of Remote Replication, Remote Replication Technologies, Three-Site Replication, Data Migration Solutions, Remote Replication and Migration in a Virtualized Environment, Concepts in Practice EMC SRDF, EMC Mirror View, and EMC RecoverPoint. Securing the Storage Infrastructure: Information Security Framework, Risk Triad, Storage Security Domains, Security implementations in Storage Networking, Securing Storage Infrastructure in Virtualized and Cloud Environments, Concepts in practice: RSA and VMware Security Products. Managing the Storage Infrastructure: Monitoring the Storage

Infrastructure, Storage Infrastructure Management Activities, Storage Infrastructure Management Challenges, Developing an Idea Solution, Information Lifecycle Management, Storage Tiering, Concepts in Practice: EMC Infrastructure. 11 Hours

**Text Book:**

1. G.Somasundaram,Alok Shrivastava, *Information Storage and Management* , EMC Education Servises ,Wiley Publishing, Inc 2009.

**References:**

1. EMC Corporation, Information Storage and Management, Wiley, India. ISBN-13: 978-8126537501, August 2012
2. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill , Osborne, 2003.
3. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001.
4. Additional resource material on www.emc.com/resource-library/resource-library.esp.

# DATA CENTRE VIRTULIZATION

| Subject Code : 15PCN153 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to:

- Learn fundamentals of Data center network and virtualization in network technologies
- Demonstrate virtualization in storage and server technologies
- Identify various server provisioning challenges, service profiles and policies in setting up a data center, learn and implement cloud example.

**MODULE - I**

**Virtualization History and Definitions:** Data Center Essential Definitions, The Origins of Data Center Virtualization, Classifying Virtualization Technologies

**Data Center Network Evolution:** Ethernet Protocol: Then and Now, Data Center Network Topologies, Network Virtualization Benefits.

10 hours

**MODULE - II**

**The Humble Beginnings of Network Virtualization:** Network Partitioning, Concepts from the Bridging World, Defining VLANs, Two Common Misconceptions About VLANs, Spanning Tree Protocol and VLANs, VLAN Specifics, Concepts from the Routing World, Overlapping Addresses in a Data Center, Defining and Configuring VRFs, VRFs and Routing Protocols, VRFs and the Management Plane, VRF Resource Allocation Control

**An Army of One:** ACE Virtual Contexts: Application Networking Services, The Use of Load Balancers, Load Balancer proliferation in the Data Center, ACE Virtual Contexts: Application Control Engine, Physical Connections.

11 hours

## MODULE - III

**Virtualized Chassis with Fabric Extenders:** Server Access Models, Understanding Fabric Extenders, Fabric Extender Topologies, Use Case: Mixed Access Data Center

**A Tale of Two Data Centers:** A Brief History of Distributed Data Centers, The Cold Age (Mid-1970s to 1980s),The Hot Age (1990s to Mid-2000s),The Active-Active Age (Mid-2000s to Today),The Case for Layer 2 Extensions, Ethernet Extensions over Optical Connections, Ethernet Extensions over MPLS, Ethernet Extensions over IP,VLAN Identifiers and Layer 2 Extensions, Internal Routing in Connected Data Centers, Use Case: Active-Active Greenfield Data Centers. 11 hours

## MODULE - IV

**Storage Evolution:** Data Center Storage Devices, Accessing Data in Rest, Storage Virtualization

**Server Evolution :** Server Architectures, x86 Hardware Evolution, Introducing x86 Server Virtualization, Unified Computing. 10 hours

## MODULE - V

**Changing Personalities:** Server Provisioning Challenges, Unified Computing and Service Profiles, Building Service Profiles, Verifying Stateless Computing, Using Policies, Firmware Policies, Industrializing Server Provisioning, Use Case: Seasonal Workloads

The Virtual Data Center and Cloud Computing: The Virtual Data Center, Automation and Standardization, What Is Cloud Computing?, Cloud Implementation Example, Journey to the Cloud, Networking in the Clouds, Software-Defined Networks, OpenStack Network Overlays, Cisco Open Network Environment, Before We Go... 10 hours

**Text Books:**

1. Gustavo Alessandro Andrade Santana,CCIE No. 8806 " Data Center Virtualization Fundamentals",Cisco Press[ISBN -13:978-1-58714-324-3]

**Reference Books:**


1. Mickey Iqbal 2010, "IT Virtualization Best Practices: A Lean, Green Virtualized Data Center Approach", MC Press [ISBN: 978-1583473542]
2. Mike Laverick, "VMware vSphere4 Implementation" [ISBN: 978-0071664523]
3. Jason W. McCarty, Scott Lowe, Matthew K. Johnson, VMware vSphere 4 Administration Instant Reference [ISBN: 978-0470520727]


## ARTIFICAL INTTELIGENCE AND AGENT TECHNOLOGIES

| Subject Code : 15PCN161 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Understand AI techniques and its fundamentals.
- Design intelligent agents for problem solving, reasoning, planning, decision making, and learning. specific design and
- Apply AI technique on current applications.
- Describe problem solving, knowledge representation, reasoning, and learning.

**MODULE - I**

**What is Artificial Intelligence:** The AI Problems, The Underlying assumption, What is an AI Technique? The Level of the model, Criteria for success, some general references, One final word and beyond. **Problems, problem spaces, and search:** Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs, Additional Problems.

**Intelligent Agents:** Agents and Environments, The nature of environments, The structure of agents. 10 Hours

## MODULE - II

**Heuristic search techniques:** Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis.

**Knowledge representation issues:** Representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, The frame problem.

**Using predicate logic:** Representing simple facts in logic, representing instance and ISA relationships, Computable functions and predicates, Resolution, Natural Deduction.

**Logical Agents:** Knowledge –based agents, the Wumpus world, Logic-Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic. 11 Hours

## MODULE - III

**Symbolic Reasoning Under Uncertainty:** Introduction to nonmonotonic reasoning, Logic for nonmonotonic reasoning, Implementation Issues, Augmenting a problem-solver, Implementation: Depth-first search, Implementation: Breadth-first search.

**Statistical Reasoning:** Probability and bayes Theorem, Certainty factors and rule-based systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy logic.

**Quantifying Uncertainty:** Acting under uncertainty, Basic probability notation, Inference using full joint distributions, Independence, Bayes' rule and its use, The Wumpus world revisited. 11 Hours

## MODULE - IV

**Weak Slot-and-filter structures:** Semantic Nets, Frames.

**Strong slot-and –filler structures:** Conceptual dependency, scripts, CYC.

**Adversarial Search:** Games, Optimal Decision in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-Of-The-Art Game Programs, Alternative Approaches, Summary. 10 Hours

## MODULE - V

**Learning From examples:** Forms of learning, Supervised learning, Learning decision trees, Evaluating and choosing the best hypothesis, The theory of learning ,PAC, Regression and Classification with linear models, Nonparametric models, Support vector machines, Ensemble learning.

**Learning Probabilistic Models:** Statistical learning, learning with complete data, learning with hidden variables: The EM algorithm.

10 Hours

### Text Books.


1. Elaine Rich, Kevin Knight, Shivashanka B Nair, Artificial Intelligence, Tata CGraw Hill 3rd edition. 2013
2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013.


### Reference Books:


1. Nils J. Nilsson: “Principles of Artificial Intelligence”, Elsevier, ISBN-13: 9780934613101

## ANALYSIS, ARCHITECTURE AND DESIGN OF NETWORKS

| Subject Code : 15PCN162 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

**After completion of this course, the students would be able to**

- Understand principles of network analysis, architecture, and design. Identify and apply the services and performance levels that a network must satisfy.
- Gain knowledge of network analysis including network service characteristics, performance characteristics, network requirements analysis, and network flow analysis.
- Learn principles of network architecture and design, addressing and routing, network management architecture, performance architecture and design, security and privacy architecture, and quality of service design.

**MODULE - I**

**Introduction :** Overview of Analysis, Architecture and Design Processes,A Systems Methodology, System Description, Service Description, Service Characteristics, Performance Characteristics,Network Supportability.

Requirements Analysis: ConceptsUser Requirements, Application Requirements, Device Requirements, Network Requirements, Other Requirements, The Requirements Specification and Map. 10 Hours

**MODULE - II**

**RequirementsAnalysis:Process** GatheringandListingRequirements, DevelopingService Metrics,Characterizing Behavior, Developing RMA Requirements, Developing Delay Requirements, Developing Capacity Requirements, Developing Supplemental Performance Requirements, Environment, Specific Thresholds and Limits, Requirements for Predictable and Guaranteed Performance, Requirements Mapping, Developing the Requirements Specification. 10 Hours

## MODULE - III

**FlowAnalysis:** Flows, IdentifyingandDevelopingFlows,DataSourcesand Sinks, FlowModels, Flow Prioritization, Flow Specification, Example Application of Flow Analysis.

**Network Architecture:** Component Architectures, Reference Architecture, Architectural Models, Systems and Network Architectures.

10 Hours

## MODULE - IV

**Addressing and Routing Architecture:** Addressing Mechanisms, Routing Mechanisms, Addressing Strategies, Routing Strategies, Architectural Considerations.

**Network Management Architecture:** Defining Network Management, Network Management Mechanisms, Architectural Considerations. Performance Architecture: Developing Goals for Performance, Performance Mechanisms, Architectural Considerations. 12 Hours

## MODULE - V

**Security and Privacy Architecture:** Developing a Security and Privacy Plan, Security and Privacy Administration, Security and Privacy Mechanisms, Architectural Consideration

**Network Design:** Design Concepts,Design Process, Vendor, Equipment, and Service, Provider Evaluations, Network Layout, Design Traceability, Design Metric. 10 Hours

**Text Book:**

1. James D.McCabe, Network Analysis, Architecture and Design, Third Edition, Elsevier, 2007. ISBN: 978,0,12,370480,1.

**ReferenceBooks:**

1. James D. McCabe, NetworkAnalysis, Architecture and Design, Second Edition, Elsevier, 2003. ISBN: 1,55860,887,7.

2. Andrew S. Tanenbaum, Computer Networks, Fourth Edition, Prentice Hall, Upper Saddle River, New Jersey, 2003. ISBN: 0,13,066102,3

# AGILE TECHNOLOGY

| Subject Code : 15PCN163 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Understand The XP Lifecycle, XP Concepts, Adopting XP
- Work on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests Implement Concepts to Eliminate Waste

**MODULE - I**

**Why Agile?:** Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility.

**How to Be Agile?:** Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor. 10 Hours

**MODULE - II**

**Understanding XP:** The XP Lifecycle, The XP Team, XP Concepts,

**Adopting XP:** Is XP Right for Us?, Go!, Assess Your Agility. 10 Hours

**MODULE - III**

**Practicing XP : Thinking:** Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives

**Collaborating:** Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.

**Releasing:**"Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

**Planning:** Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. Developing Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing. 11 Hours

## MODULE - IV

**Mastering Agility Values and Principles:** Commonalities, About Values, Principles, and Practices, Further Reading.

**Improve the Process:** Understand Your Project, Tune and Adapt, Break the Rules.

**Rely on People :**Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People.

**Eliminate Waste :**Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput. 11 Hours

## MODULE - V

**Deliver Value:** Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently.

**Seek Technical Excellence :**Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery.

10 Hours

**Text Books:**


1. **The Art of Agile Development** (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007


**Reference Books:**


1. Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1st edition, 2002
2. "Agile and Iterative Development A Manger's Guide", Craig Larman Pearson Education, First Edition, India, 2004.

## ADVANCED COMPUTER NETWORKS LABORATORY

| Subject Code : 15PCN117 | Credits : 02 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 3 Hrs. (Practical) | | Total Hours : 52 |

**PART - A**

**Implement the following using C/C++ or equivalent with LINUX/ Windows environment:**

1. Write a program to transfer the contents of a requested file from server to the client using TCP/IP Sockets (using TCP/IP Socket programming).
2. Write a program to achieve Traffic management at Flow level by implementing Closed Loop Control technique. ( using Leaky Bucket Algorithm)
3. Write a program for frame sorting technique used in buffers.
4. Write a program for implementing the error detection technique while data transfer in unreliable network using CRC-CCITT (16-bits) Technique.
5. Write a program for Hamming Code generation for error detection and correction.

**PART - B**

**Simulation Programs using Qualnet 7.1 / NS2 or any other equivalent software.**

**Note: (i) Analyze the network behavior by collecting the statistics on network performance and draw the conclusion.**

**(ii) Standard Network Parameters and supporting protocols may be assumed for simulation.**

1. Create a scenario for homogeneous WLAN (IBSS / BSS network) using Bellman ford routing protocol and analyze the network behavior for the following cases.

a. Network hub and without mobility

b. Network hub and with mobility.

c. Using 0.5 sq km terrain.

2. Design architecture for Universal Mobile Telecommunications System (UMTS) and analyze the network behavior.

3. Create a scenario for homogeneous WLAN (BSS Network/ Infrastructure mode) using 0.5 sq.km terrain using AODV routing protocol and analyze the network behavior.

4. Create a scenario for homogeneous WLAN (Mobile Ad hoc Network) using 2 sq.km terrain and analyze the network behavior.

   a. Without mobility

   b. With mobility

5. Create a scenario for homogeneous/ heterogeneous Mobile Ad hoc Network onto a terrain file using AODV routing protocol and apply the geographical parameters such as Cartesian latitude and longitude and analyze the network behavior.

6. Create a scenario for Heterogeneous Network analysis behavior and analyze the network behavior.

   a. Using Bellman ford routing protocol without mobility.

   b. Using Bellman ford routing protocol with mobility.

   c. Using AODV routing protocol and apply weather (rain fall) properties to it.

**Note: For S.E.E, programs similar to above list may be asked for the examination.**

# CLOUD COMPUTING

| Subject Code : 15PCN21 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Understand the key dimensions and the challenges of Cloud Computing and describe the benefits of cloud computing
- Understand the challenges of cloud computing and its infrastructure.
- Analyse/ manage cloud resource using scheduling algorithms its security.

**MODULE - I**

**Introduction:** Cloud Computing Overview, Applications, Internets and the cloud, First movers in the cloud, Your organization and cloud Computing,: When you can Use Cloud Computing, Benefits, Network-centric computing and network centric content, peer-peer systems, Cloud computing an old idea whose time has come , Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Major challenges faced by cloud computing.

**Cloud Infrastructure** :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. 11 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.

10 Hours

**MODULE - III**

**Cloud Resource Virtualization:** Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security, Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based, paravirtualization, Optimization of network virtualization, vBlades,

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.

10 Hours

**MODULE - V**

**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.

**Cloud Security:** Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization.

11 Hours

**Text Books:**

1. Antony T Velte, Cloud Computing : A Practical Approach, McGrawHill.

2. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

**References:**


1. Rajkumar Buyya, James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.


## INTERNET MEASUREMENT

| Subject Code : 15PCN22 | Credits : 05 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) + SS | | Total Hours : 52 |

**Course Outcome:**

**After studying this course the student will be able to:**

- Appreciate the importance of internet Measurement and understand the mathematics and special issues involved in Internet Measurement. Analyze and know where Measurements can be made and Gain Knowledge about various tools for Internet Measurement.
- Understand measurement properties, challenges and tools of Internet applications .
- Learn about data anonymization and role of Internet measurement in security.

**MODULE - I**

**Introduction to Internet Architecture and Analytic Background**: Why measure the internet? The Internet's Architecture, Details of the Internet Operation,,Linear Algebra**,** Probability, Statistics**,** Graphs,Metrics, Measurement and Modeling. 10 Hours

**MODULE - II**

**Practical Issue in Internet Measurement and Infrastructure :** Where can measurements be made?, Role of Time,Role of Internet Directories and Databases. Measurement Across Various Protocol Layers, Infrastructure, Properties, Challenges, Tools, State of the Art.

10 Hours

## MODULE - III

**Traffic:** Properties, Challenges, Tools, State of the Art, Applications.

8 Hours

## MODULE - IV

**Application:** Application Mix DNS, Web, Applications, Web, P2P, Online Games.Other application. 12 Hours

## MODULE - V

**Anonymization ,Security and Case studies, Conclusion and Prospects:** Definitions, General Motivation for Anonymizing Data, Obstacle and Risks in Sharing Data, What should be Anonymized: Data Categorization, How Data is Anonymized:How Data is Anonymized: Process Techniques, Anonymozation Examples at Different Layers, Attacks Against Anonymized Data, Anonymized Data Metrics for Success, Alternatives to Anonymization, Security, Role of Internet Measurement in Security, Intranet measurement in Aid of Security, Gateway Measurement in Aid of Security, Inter domain Measurements impact on Security, Wide-area Measurements in Aid of Security, Application level Measurements of Attacks, Case studies and prospects. Case studies, Low level Monitoring Tools, Individual Toolsets for Network Measurment, Large scale Measurement Projects. Trends in internet Mesurment, Difficulties,Future work. 12 Hours

### Text Books:

1. Internet Measurement : Infrastructure, Traffic &Application, Mark Crovella , balachander Krishnamurthy, Wiley, 1st Edition.

### Reference Books :

1. Comer Internetworking with TCP/IP, volume I Principles, Protocols and ArchitecureIIend, Edition.
2. D. Comer and D. Stevers, Internetworking with TCP/IP volume II designen and implementation and internal , PHI.

## CYBER SECURITY

| Subject Code : 15PCN23 | Credits : 05 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) + 2 Hrs. (Tutorial) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Learn fundamentals of cryotography & network security concepts.
- Analyze security, threats, vulnerabilities, and attacks of systems and networks.
- Demonstrate risk analysis methods for protecting infrastructure.

**MODULE - I**

**Cyber Security Fundamentals**: Network and Security Concepts: Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS) , Firewalls, Virtualization, Radio-Frequency Identification.

Microsoft Windows Security Principles: Windows Tokens, Window Messaging, Windows Program Execution, The Windows Firewall**.**

10 Hours

**MODULE - II**

**Attacker Techniques and Motivations:**How Hackers Cover Their Tracks (Anti-forensics).

**Tunneling Techniques:** HTTP, DNS, ICMP, Intermediariaries, steganography and other concepts, detection and prevention.Fraud Techniques: Phishing, Smishing, Vishing and Mobile Malicious Code, Rogue Anti-Virus, Click Fraud, Threat infrastructure: Botnets, Fast-Flux, Advanced Fast-Flux.

10 hours

**MODULE - III**

**Exploitation** : Techniques to Gain a Foothold :Shellcode , Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows , Format-String

Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions , Web Exploit Tools DoS Conditions, Brute-Force and Dictionary Attacks. Misdirection, Reconnaissance and Disruption Methods : Cross-Site Scripting (XSS), Social Engineering War Xing, DNS Amplification Attacks.

11 hours

**MODULE - IV**

**Malicious Code** : Self-Replicating Malicious Code : Worms, Viruses .Evading Detection and Elevating Privileges: Obfuscation ,Virtual Machine Obfuscation, Persistent Software Techniques, Rootkits, Spyware, Attacks against Privileged User Accounts and Escalation of Privileges, Token Kidnapping. Virtual Machine Detection ,Stealing Information and Exploitation. Form Grabbing , Man-in-the-Middle Attacks , DLL Injection, Browser Helper Objects. 11 hours

**MODULE - V**

**Defense and Analysis Techniques**:Memory Forensics , Why Memory Forensics Is important , Capabilities of Memory Forensics , Memory Analysis Frameworks , Dumping Physical Memory. Installing and Using Volatility ,Finding Hidden Processes, Volatility Analyst Pack, Honeypots ,Malicious Code Naming, Automated Malicious Code Analysis Systems : Passive Analysis , Active Analysis , physical or Virtual Machines. Intrusion Detection Systems. 10 hours

**Text Book:**

1. **Cyber Security Essentials**, James Graham, Ryan Olson, Rick Howard Auerbach Publications

**References Books:**

1. Computer Security Handbook, Seymour Bosworth, M. E. Kabay, Eric Whyne, John Wiley & Sons,2009

2. Cyber security: The Essential Body of Knowledge ,Dan Shoemaker, Cengage Learning 2011

3. Security in Computing, Charles B.P fleeger, Shari Lawrence P fleeger, Third Edition, Pearson Education,2003.

# BIG DATA ANALYTICS

| Subject Code : 15PCN241 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes:**

- Work with big data plat form and its analysis techniques.
- Implement search methods and Visualization
- Design efficient algorithms formining the data from large volumes and Model a frame work for Human Activity Recognition.

## MODULE - I

**UNDERSTANDING BIG DATA :**Types of digital data –classification of data, introduction to big data –characteristics of big data , evolution of big data, definition of big data, challenges with big data what is big data – why big data, traditional business intelligence (BI) versus big data, what is new today big data analytics – where do we begin?, what is big data analytics, what is big data analytics isn't, classification of big data analytics, greatest challenges that prevent business from capitalization on big data, top challenges facing big data why big data analytics important, data sciences, data scientist, terminologies, used in big data. 10 Hours

## MODULE - II

**Data Analysis :**Regression Modeling-Multivariate Analysis–Bayesian Methods–Bayesian Paradigm-Bayesian Modeling-Inference and Bayesian Networks-Support Vector and Kernel Methods-Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics. 12 Hours

## MODULE - III

**Search Methods & Virtualization:** Fuzzy Logic: Extracting Fuzzy Models fromData-FuzzyDecisionTrees. Searchbysimulated Annealing– Stochastic,Adaptive searchby Evaluation – Evolution Strategies. VisualizationTechniques Interactiontechniques– Specific Visual data analysisTechniques. 10 Hours

## MODULE - IV

**The Big Data Technology Landscape - NOSQL ,Hadoop:** Introduction to Hadoop-why Hadoop, why nor RDBMS, RDBMS vsHadoop, Hadoop overview, Hadoop distributed file system, processing data with Hadoop, Hadoop ecosystem. Introduction, Mapper, Reducer, combiner, Partioner, Searching, sorting , compression. 10 Hours

## MODULE - V

**Mining Data Streams :** IntroductionTo Streams Concepts– StreamData Model and Architecture- Stream Computing- Sampling Dataina Stream– Filtering Streams – Counting Distinct Elementsina Stream– Estimating Moments – Counting OnenessinaWindow – Decaying Window -Real time Analytics Platform(RTAP) Applications- Case Studies -Real Time Sentiment Analysis, Stockmarket Predictions, Genetic Programming. 10 Hours

### TEXT BOOKS


1. Michael Berthold,David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Big Data and Analytics- SeemaAcharya And Subhashini C – Wiley , India.


### REFERENCE BOOKS:


1. AnandRajaramanand Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge UniversityPress,2012.
2. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
3. Glenn J. Myatt, "Making Sense ofData", John Wiley & Sons, 2007
4. Pete Warden, "Big DataGlossary",O'Reilly,2011.
5. JiaweiHan, Micheline Kamber" Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

# SOFT COMPUTING

| Subject Code : 15PCN242 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Understand the role of soft computing technologies in engineering, artificial intelligence, expert system & Machine learning application
- To understand the features of neural network with supervised & unsupervised learning processes .
- Understand the basic concepts of Fuzzy Logic and rule based systems and provide Fuzzy Logic inference system
- Acquire the knowledge of Fuzzy arithmetic and will be able to apply these to the real life problems including engineering ones.

**MODULE - I**

**Introduction:** Learning and Soft computing, Examples of applications in diverse fields, Basic tools of Soft computing – Neural Networks and Fuzzy logic systems.What is a Neural Network?, Human Brain, Models of Neuron, Neural Networks viewed as directed graphs, Feedback, Network Architectures, Knowledge representation, Artificial Intelligence and Neural Networks. Learning Processes Introduction, Error-correction learning, Memory-based learning, supervised and unsupervised learning processes.

11 Hours

**MODULE - II**

**Single Layer Perceptrons:** Introduction, Adaptive filtering problem, Unconstrained optimization techniques, Linear least-squares filters, Least-mean square algorithm, Learning curves, Learning rate annealing techniques, Perceptron, Perception convergence theorem, Relation between the Perceptron and Bayes classifier for a Gaussian environment.

10 Hours

## MODULE - III

**Multilayer Perceptrons:** Introduction, Some preliminaries, Back-propagation Algorithm, Summary of back-propagation algorithm, XOR problem. 10 Hours

## MODULE - IV

**Introduction to Fuzzy logic:** Background, Uncertainty and Imprecision, Statistics and Random Information, Fuzzy Sets and Membership, Processes, Uncertainty in Chance versus Ambiguity.Classical Sets and Fuzzy Sets: Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions. Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets. Sets as Points in Hyper cubes.

10 Hours

## MODULE - V

**Classical Relations and Fuzzy Relations:** Cartesian Product, Crisp Relations - Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Compositional operators, fuzzy inference. Membership FunctionsFeatures of the Membership Function, Standard Forms and Boundaries, Fuzzification, Membership Value Assignments - Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Neural Networks 11 Hours

### Text Books:


1. Simon Haykin, *Neural Networks- A Comprehensive Foundation*, 2nd Edition, Pearson Education,
2. KishanMehrotra, Chilkuri K. Mohan,SanjayRanka, ,*Artificial Neural Networks*, Penrarn International Publishing
3. Timothy J. Ross, *Fuzzy Logic with Engineering Applications,* McGraw Hill, 1997.


### Reference Books:


1. Jacck M. Zurada, *Introduction to Artificial Neural Systems*, Jaico Publishing
2. B.Yegnanarayana, *Artificial Neural Networks,* PHI, 2001.
3. B Kosko. *Nural Networks and Fuzzy' systems, A Dynamical System approach*, Prentice Hall 1991.

# NETWORK PROGRAMMING

| Subject Code : 15PCN243 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

**After completion of this course, the students would be able to**

- Understand osi architecture and Client server Model.
- Master transport layer socket programming,
- Learn about different applications like RCE,Remote Login,TFTP.
- Gain Proficiency in Java Network programming.

## MODULE - I

**Review of Basic Concepts**: Layering, OSI model, Processes, A simplified model, Client-Server model, A history of Unix Networking; Review of TCP/IP. Sockets Introduction, Unix domain protocols, socket addresses, elementary socket system calls, advanced socket system calls, reserved ports, stream pipes, passing file descriptions, socket options, asynchronous I/O, Input/Output Multiplexing, Out-of-Band data, sockets and signals, Internet superservers, socket implementation. 12 hours

## MODULE - II

**TFTP Protocol**: Introduction, protocol, security, data formats, connections, client user interface, UDPimplementation, TCP implementation. 10 hours

## MODULE - III

**Remote Command Execution**: Introduction, Security issues, rcmd function and rshd server, rexecfunction and rexecd server. 10 hours

## MODULE - IV

**Remote Login**: Introduction, Terminal line disciplines, pseudo terminal, terminal modes, controlterminals rlogin overview, rlogin client, rlogin server. 10 hours

## MODULE - V

**JAVA Network Programming**: Introduction, Client-Server Computing, The InetAddress class,Serving multiple clients, Applet clients, Sending and receiving objects, Retrieving objects from Webservers, Datagram sockets. 10 hours

**TEXT BOOKS**:


1. W. Richard Stevens: Unix Network Programming, PHI, 2001.
2. Y. Daniel Liang: Introduction to JAVA Programming, 6th Edition, Pearson, 2007.


**REFERENCE BOOKS:**


1. W. Richard Stevens: TCP/IP Illustrated, Volumes 1, 2, and 3, Pearson, 2000.

# MULTIMEDIA COMMUNICATION

| Subject Code : 15PCN251 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Have an excellent understanding of multimedia data and enabling technologies services and applications.
- Understand audio and video compression techniques
- Learn multimedia information networks and their QoS parameters
- Analyse and study various multimedia transport and management protocols

**MODULE - I**

**Multimedia Communications:** Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS, application QoS**.**

**Multimedia Information Representation:** Introduction, digital principles, text, images, audio, video. 11 Hours

**MODULE - II**

**Text and image compression:** introduction, compression principles, text compression, image compression. 10 Hours

**MODULE - III**

Audio and video compression: introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, MPEG-4 and MPEG 7.

10 Hours

**MODULE - IV**

**Standards for multimedia communications:** Introduction, Reference models, Standards relating to interpersonal communications, Standards

relating to interactive applications over the internet, Standards for entertainment applications. 10 Hours

**MODULE - V**

**Multimedia Information Networks-1:** Introduction, network performance parameters, throughput, networking delay, delay variance, error rate, quality of service.QoS perspectives, QoS processing, multimedia transmission, requirements, transmission over WANs, Multimedia Transmission over LANs. ATM networks, Wireless LANs.

**Multimedia Transport Protocols and Management Protocols:** RTP, RTCP, H.323, SIP, SDP, SAP. 11 Hours

**Text Books:**


1. Fred Halsall, *Multimedia Communications*: *Applications, Networks, Protocols and Standards,* Pearson Education, Asia,Second Indian reprint 2002.
2. Nalin K. Sharda: *Multimedia Information Networking*, PHI, 2003.
3. James F.Kurose, keith W. Ross, *Computer Networking- A top Down Approach Featuring the internet,* Pearson Education, 3rd Ed.


**Reference Books:**


1. Ralf Steinmetz, Klara Narstedt: *Multimedia Fundamentals,* Vol 1-Media Coding and Content Processing, Pearson Education, 2004.
2. Prabhat K. Andleigh, Kiran Thakrar, *Multimedia Systems Design,* PHI, 2004.

# INTERNET OF THINGS

| Subject Code : 15PCN252 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcome:**

**After studying this course the student will be able to;**

- Understand internet of Things technology and relate it ubiquitous computing.
- Learn about the IOT definitions , frameworks and application examples
- Fundamental IoT mechanisms and key technologies and Evolving IoT standards

**MODULE - I**

**Internet Of Things Overview Definitions And Frameworks:** Motivations, Examples of Applications, IPv6 Role , Areas of Development and Standardization, Scope of the Present Investigation. IoT Definitions, General Observation, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities.Internet Of Things Application Examples **:**Overview, Smart Metering Advanced Metering Infrastructure , e-Health Body Area Networks ,City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking (Following and Monitoring Mobile Objects), Over-The-Air-Passive Surveillance Ring of Stee, Control Application Examples, Myriad Other Applications. 10 Hours

**MODULE - II**

**Fundamental Iot Mechanisms And Key Technologies:** Identification of IoT Objects and Services, Structural Aspects of the IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability , Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence , Communication Capabilities, Mobility Support, Device Power, Sensor Technology ,RFID Technology, Satellite Technology. 10 Hours

## MODULE - III

**Evolving Iot Standards:** Overview and Approaches, IETF IPv6 Routing Protocol for RPL Roll , Constrained Application Protocol (CoAP) , Background , Messaging Model, Request Response Model , Intermediaries and Caching, Representational State Transfer (REST), ETSI M2M , Third-Generation Partnership Project Service Requirements for Machine-Type Communications, Approach, Architectural Reference Model for MTC, CENELEC , IETF IPv6 Over Lowpower WPAN (6 LoWPAN), ZigBee IP (ZIP), IP in Smart Objects (IPSO). 10 Hours

## MODULE - IV

**Layer 1/2 Connectivity: Wireless Technologies For The Iot :** WPAN Technologies for IoTM2M , ZigbeeIEEE 802.15.4, Radio Frequency for Consumer Electronics (RF4CE), Bluetooth and its Low-Energy Profile , IEEE 802.15.6 WBANs, IEEE 802.15 WPAN TG4j MBANs , ETSI TR 101 557 , NFC , Dedicated Short-Range Communications (DSRC) and Related Protocols, Comparison of WPAN Technologies , Cellular and Mobile Network Technologies for IoTM2M, overview and Motivations Universal Mobile Telecommunications System, LTE. 11 Hours

## MODULE - V

**Layer 3 Connectivity: Ipv6 Technologies For The Iot :**Overview and Motivations, Address Capabilities, IPv4 Addressing and Issues,IPv6 Address Space, IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6, Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6 , Technical Approaches, Residential Broadband Services in an IPv6 Environment Deployment Opportunities.

**LAYER 3 CONNECTIVITY: MOBILE Ipv6 TECHNOLOGIES FOR THE Iot :** Overview , Protocol Details, Generic Mechanisms, New IPv6 Protocol, Message Types, and Destination Option, Modifications to IPv6 Neighbor Discovery , Requirements for Various IPv6 Nodes, Correspondent Node Operation, HA Node Operation, Mobile Node Operation, Relationship to IPV4 Mobile IPv4 (MIP). 11 Hours

**TEXT Books:**

1. Daniel Minoli. “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications” Author(s) wilay India 2013

**References Books:**


1. Designing the Internet of Things Adrian McEwen, Hakim Cassimally ISBN: 978-1-118-43062-0 November 2013, Wiley
2. Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2002 http://postscapes.com/
3. " Architecting the Internet of Things" **Uckelmann**, Dieter, Harrison, Mark, Michahelles, Florian (Eds.) 2011, XXXI, springerEbooks.


## GRID AND CLUSTER COMPUTING

| Subject Code : 15PCN253 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcome:**

**After the completion of the course the students will be able :**

- Understand and differentiate various distributed comparing techniques, such as grid computing and cluster computing.
- Acquire the knowledge of grid architecture and grid computing tool kits.
- Learn the approaches of cluster computing and cluster resource management and scheduling.
- Understand the advantages of cluster architecture for the high availability and performance metrics based on efficient resource utilization.

**MODULE - I**

**Introduction:** The data center, the grid and the distributed/high performance computing, cluster computing and grid computing, Metacomputing-the precursor of grid computing, scientific, business and e-governance grids, web services and grid computing, business computing and the grid-a potential win-win situation.Technologies and architecture for grid computing:Clustering and grid computing, issues in data grids, key functional requirements in grid computing, standards for grid computing, recent technological trends in large data grids. World wide

grid computing activities and organizations and projects: organizations developing grid computing toolkit, framework and middleware, grid projects and organizations building and using grid based solutions.

10 Hours

**MODULE - II**

**Web services and the service oriented architecture:** History and background, service oriented architecture, how a web service works, SOAP and WSDL, description, creating web services, server side.Globus tool kit: History of globus toolkit, version of globus tool kit, application of GT4-cases, GT4-approaches and benefits, infrastructure management, monitoring and discovery, security, data, choreography and coordination, main features of Gt4-functionality, GT4 architecture, GT4 containers.

11 Hours

**MODULE - III**

**Introduction to cluster computing:** Approaches to parallel computing, how to achieve low cost parallel computing through clusters, definition and architecture of a cluster, what is the functionality a cluster can offer?, categories of clusters,levels and layers of single system image, cluster middleware design and objectives, resource management and scheduling, cluster programming environment and tools. 10 Hours

**MODULE - IV**

**Networking, protocols & I/O for clusters:** Networks and interconnection switching devices, design issues in interconnection networking /switching, design architecture-general principal and trade offs, HiPPI, ATM, myrinet, gigabit Ethernet. Setting up and administering a cluster: how to set up a simple cluster?, design consideration for the front end of a cluster, setting up nodes, clusters of clusters, system monitoring, directory services inside the clusters, & DCE, global clock Sync, administering heterogeneous cluster. 10 Hours

**MODULE - V**

**Cluster technology for high availability:** Highly available clusters, high availability parallel computing, mission critical applications, types of errors and failures, cluster architecture and configurations for high availability, faults and error detection.

**Performance models and simulation:** Performance measures and metrics, profit effectiveness of parallel computing through clusters. Process scheduling: Job Management systems, resource management systems, queue, hosts, resources, jobs and policies, policies of resource utilization, scheduling policies. 11 Hours

**Text book:**

1. C.S.R Prabhu, *Grid and cluster computing*, PHI publication, 2008.

**Reference:**

1. Rajkumar Buyya, *High Performance Cluster Computing, Architectures and Systems*, Volume 1, Pearson Education – 2008

# BUSINESS INTELLIGENCE

| Subject Code : 15PCN261 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

**After completion of this course, the students would be able to**

- know the complete life cycle of BI/Analytical development
- Understand the technology and processes associated with Business Intelligence framework
- Given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

**MODULE - I**

Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation. 11 Hours

**MODULE - II**

Managing The BI Project, Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process. 11 Hours

**MODULE - III**

Differences in Database Design Philosophies, Logical Database Design, Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery. 10 Hours

**MODULE - IV**

Growth Management, Application Release Concept, Post Implementation

Reviews, Release Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge – ROI, BI Applications, The Intelligence Dashboard. 10 Hours

**MODULE - V**

**Business View of Information technology Applications:** Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics f enterprise reporting, BI road ahead. 10 Hours

**Text Books:**


1. Larissa T Moss and ShakuAtre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
2. R N Prasad, SeemaAcharya – Fundamentals of Business Analytics, Wiley India, 2011.


**Reference Books:**


3. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann, ISBN 1- 55860-196-4.
4. Brian Larson - Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill, 2006.
5. Lynn Langit - Foundations of SQL Server 2008 Business Intelligence –Apress, ISBN13: 978-1-4302-3324-4, 2011

# WIRELESS SENSOR NETWORKS

| Subject Code : 15PCN262 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcomes**

After completion of this course, the students would be able to

- Understand challenges, advantages applications and future directions of sensor networks.
- Discuss on network sensors, routing protocols and infrastructure establishments and database challenges.
- Understanding tasking and control techniques for sensor networks and acquires the Knowledge of various platforms and tools

**MODULE - I**

**Introduction:** Unique Constraints and Challenges, Advantages of Sensor Networks, Energy advantage, Detection advantage, Sensor Network Applications, Habitat monitoring, Wildlife conservation through autonomous, non-intrusive sensing, Tracking chemical plumes, Ad hoc, just-in-time deployment mitigating disasters, Smart transportation: networked sensors making roads safer and less congested, Collaborative Processing. 6 Hours

**Localization and Tracking :** Key Definitions of Sensor Networks, Canonical Problem: Localization and Tracking, Tracking Scenario, Problem Formulation, Sensing model, Collaborative localization, Bayesian state estimation, Distributed Representation and Inference of States, Impact of choice of representation, Design desiderata in distributed tracking, Tracking Multiple Objects, State space decomposition, Data association, Sensor Models, Performance Comparison and Metrics. 6 Hours

**MODULE - II**

**Networking Sensors:** Networking Sensors, Key Assumptions, Medium Access Control, The SMAC Protocol, IEEE 802.15.4 Standard and ZigBee, General Issues, Geographic, Energy-Aware Routing, Unicast Geographic Routing, Routing on a Curve, Energy-Minimizing Broadcast, Energy-Aware

Routing to a Region, Attribute-Based Routing, Directed Diffusion, Rumor Routing, Geographic Hash Tables. Infrastructures Establishment: Infrastructure Establishment, Topology Control, Clustering, Time Synchronization, Clocks and Communication Delays, Interval Methods, Broadcasts, Localization and Localization Services, Ranging Techniques, Range-Based Localization Algorithms, Other Localization Algorithms, Location Services. 10 Hours

**MODULE - III**

**Sensor Tasking and Control** :Task-Driven Sensing, Roles of Sensor Nodes and Utilities, Information- Based Sensor Tasking, Sensor selection, IDSQ: Information-driven sensor querying, Cluster leader based protocol, Sensor tasking in tracking relations, Joint Routing and Information Aggregation, Moving center of aggregation, Multi-step information-directed routing, Sensor group management, Case study: Sensing global phenomena.

**Databases:** Sensor Network Databases, Sensor Database Challenges, Querying The Physical Environment, Query Interfaces, Cougar sensor database and abstract data types, Probabilistic queries, High-level Database Organization, In- Network Aggregation, Query propagation and aggregation, Tiny DB query processing, Query processing scheduling and optimization**.** 10 Hours

**MODULE - IV**

**Database Platforms and Tools:** Data-Centric Storage, Data Indices and Range Queries, One-dimensional indices, Multidimensional indices for orthogonal range searching, Non-orthogonal range searching, Distributed Hierarchical Aggregation, Multi-resolution, Partitioning, Fractional cascading, Locality preserving hashing, Temporal Data, Data aging, Indexing motion data.

Sensor Network Platforms and Tools, Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms. 10 Hours

**MODULE - V**

**Tools Operating system:** Tiny OS, Imperative language: nesC, Dataflow style language: Tiny GALS, Node-Level Simulators, ns-2 and its sensor

network extensions, TOSSIM, Programming Beyond Individual Nodes: State-centric programming, Collaboration groups.

**PIECES:** A state-centric design framework, Multi-target tracking problem revisited. Applications and Future Directions.Tools Application and Future

**Directions:** Emerging application, Future Research Directions: Secure Embedded systems, Programming Model and Embedded operating systems, Management of collaborative groups,Lightweigth Signal processing, Networks of high data rate sensors, Google for physical world, closing the loop with actuators, Distributed Information architecture.

10 Hours.

**Text Book:**

1. Feng Zhao, Leonidas Guibas, *Wireless Sensor Networks – An Information Processing Approach,* Elsevier, 2004

**Reference Book:**

1. Ananthram Swami et. el, *Wireless Sensor Networks, Signal Processing and Communication Perspectives*, John Wiley, 2007.

# ANALYSIS OF COMPUTER NETWORKS

| Subject Code : 15PCN263 | Credits : 04 | |
|---|---|---|
| CIE : 50 Marks | SEE : 50 Marks | SEE : 03 Hrs. |
| Hours/Week : 4 Hrs. (Theory) | | Total Hours : 52 |

**Course Outcome:**

**After studying this course the student will be able to;**

- Use applied probability theory in measuring the performance of a system
- Understand statistics and data presentation, Practice performance evaluation techniques and performance measures or metrics, Summarize and analyze experiments outcomes, Compare systems using sample data Use Queuing theory to measure performances of systems,
- Analyze single queue systems, Analyze simple queuing networks and Model communication networks and I/O computer systems.

## MODULE - I

**Introduction:** Two examples of analysis: Efficient transport of packet voice calls, Achievable throughput in an input-queuing packet switch; the importance of quantitative modeling in the Engineering of Telecommunication Networks. Multiplexing: Network performance and source characterization; Stream sessions in a packet network: Delay guarantees; Elastic transfers in a packet network; Packet multiplexing over Wireless networks. 11 hours

## MODULE - II

**Stream Sessions:** Deterministic Network Analysis: Events and processes in packet multiplexer models: Universal concepts; Deterministic traffic models and Network Calculus; Scheduling; Application to a packet voice example; Connection setup: The RSVP approach; Scheduling (continued). 10 hours

## MODULE - III

Stream Sessions: Stochastic Analysis: Deterministic analysis can yield

loose bounds; Stochastic traffic models; Additional notation; Performance measures; Little's theorem, Brumelle's theorem, and applications.

10 hours

**MODULE - IV**

Multiplexer analysis with stationary and ergodic traffic; The effective bandwidth approach for admission control; Application to the packet voice example; Stochastic analysis with shaped traffic; Multihop networks; Long-Range-Dependent traffic. 10 hours

**MODULE - V**

**Adaptive Bandwidth Sharing for Elastic Traffic:** Elastic transfers in a Network; Network parameters and performance objectives; sharing a single link; Rate-Based Control; Window-Based Control: General Principles; TCP: The Internet's Adaptive Window Protocol; Bandwidth sharing in a Network. 10 hours

**TEXT BOOKS:**

1. Anurag Kumar, D. Manjunath, Joy Kuri: Communication Networking An Analytical Approach, Elsevier, 2004.

**REFERENCE BOOKS:**

1. M. Schwartz: Broadband Integrated Networks, Prentice Hall PTR, 1996.
2. J. Walrand, P. Varaiya: High Performance Communication Networks, 2nd Edition, Morgan Kaufmann, 1999