**ALAGAPPA UNIVERSITY, KARAIKUDI – 630003**

(Accredited with ‘A’ Grade by NAAC)

**Master of Philosophy in Computer Science**

**M.Phil. (Computer Science)**

**(Affiliated colleges)**

**Regulations (2015-2016)**

1. Candidates for admission to the Master of Philosophy in Computer Science M.Phil.(Computer Science) programme shall be required to have passed in any one of the following examinations of any recognized University with a minimum of 60% marks in (minimum 55% marks for SC/ST candidates):
2. M.Sc. Degree in Computer Science/Information Technology or M.C.A. or any qualification equivalent thereto.
3. The M.Phil.(Computer Science) programme shall extend over a period of one year consisting of two semesters. Each semester consists of minimum of 75 working days at the rate of 6 hours per day.
4. The courses of study and the scheme of examinations are shown in Appendix A and B respectively.
5. The End-Semester Examinations will be conducted in November and April of every academic year by the University in different courses according to the scheme given in Appendix B. A candidate will be permitted to appear for the Semester examination in a particular course at the end of each semester provided he/she secures not less than 80% of attendance in each course in that semester.
6. The revised curriculum is offered from the academic year 2015-2016.
7. Each student should take 36 credits to complete M.Phil. (Computer Science) programme.
8. Each theory course carries 6 credits with 75 marks in the End-Semester Examination and 25 marks in the Internal Assessment.
9. The End-Semester Examinations shall be of three hours duration.
10. Dissertation carries 12 credits. Dissertation carries 200 marks in the End-Semester examination (150 marks for Project Evaluation by both Internal Examiner and External Examiner separately awarded and the average will be taken, 50 marks for viva-voce awarded by Internal Examiner only)
11. To pass in each course, a candidate is required to secure 40% marks in the Semester examination and 40% marks in the Internal assessment and 50% marks in the aggregate (marks in Semester Examination + marks in Internal Assessment).
12. A student shall be permitted to continue the programme from I to II semesters irrespective of failure(s) in the courses of the earlier semester. The candidate will qualify for the M.Phil. (Computer Science) degree only if he/she passes all the arrears courses with in a period of THREE years.
13. Results will be declared after the completion of the each End-Semester examination and the marks/grades obtained by the candidates will be forwarded to them through the Head of the Department.
14. A Candidate who has passed all the examinations in the first attempt within one year of admission shall be declared to have passed in First Class with Distinction provided he/she secures more than 75% marks in the aggregate.
15. A candidate who has passed all the examinations within one year of admission shall be declared to have passed in First Class provided he/she secures not less than 60% in the aggregate.
16. All other candidates who have passed all the examinations in the prescribed courses shall be declared to have passed in Second Class.
17. All the candidates who have passed the examinations in all the prescribed courses shall be eligible for the award of the Degree of Master of Philosophy in Computer Science that is M.Phil. (Computer Science).
18. The common CBCS regulations prescribed for the Departments by the Alagappa University will be followed in all respect.

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**APPENDIX A**

**Courses of Study**

**M.Phil. (Computer Science)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **Title of the Course** | **Hours per week** | **Credit** |
| **I Semester** | | | |
| 5PCS1C1 | Research Methodology | 6 | 6 |
| 5PCS1C2 | Advanced Trends in Database Systems | 6 | 6 |
| 5PCS1C3 | General Skills in computer Science | 6 | 6 |
| **Total** | | **18** | **18** |
| **II Semester** | | | |
|  | Elective – I | 6 | 6 |
| 5PCS2DV | Dissertation & Viva Voce |  | 12 |
|  | **Total** | **6** | **18** |
| **Total** | | | **36** |

**ELECTIVE COURSES**

|  |  |
| --- | --- |
| **Course Code** | **Title of the Course** |
| 5PCS2C1 | Information and Network Security |
| 5PCS2C2 | Advanced Operating Systems |
| 5PCS2C3 | Data Mining and Warehousing |
| 5PCS2C4 | Service Oriented Architecture |
| 5PCS2C5 | Mobile Computing |
| 5PCS2C6 | Ad Hoc Network |
| 5PCS2C7 | Digital Image Processing and Analysis |
| 5PCS2C8 | Cloud Computing |
| 5PCS2C9 | Web Data Mining |

**APPENDIX B**

**Scheme of Examinations**

**M.Phil. (Computer Science)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Title of the Course** | **IA Marks (Max)** | **ES Marks (Max)** | **Total marks (Max)** |
| **I Semester** | | | |
| Research Methodology | 25 | 75 | 100 |
| Advanced Trends in Database Systems | 25 | 75 | 100 |
| General Skills in computer Science | 100 | -- | 100 |
| **II Semester** | | | |
| Elective I | 25 | 75 | 100 |
| Dissertation & Viva Voce | 50 | 150 | 200 |
| **Total** |  |  | **600** |

**IA** – Internal Assessment; **ES** – End-Semester

**SEMESTER – I**

**5PCS1C1 – RESEARCH METHODOLOGY**

**Unit I**

RESEARCH METHODOLOGY: Introduction – Objective – Motivation – Types of Research – Research Methods versus Methodology – Research and Scientific Method – Research Process – Data Collection – Primary data – Secondary Data – Data Presentation – Mathematical Tool for Analysis – Ethics in Research – Importance – Integrity in Research – Scientific Misconduct and Consequences.

**Unit II**

RESEARCH PROBLEM FORMULATION: Selecting the Problem – Designing the Problem: Necessity – Techniques – Research Design: Meaning – Need – Features of Design – Different Research Designs – Sampling Design: Steps – Criteria of Selecting a Sampling Procedure – Characteristics – Different Types of Sample Designs – Review of basic Statistical Measure – Measures of Central Tendency – Measures of Variation – Measure of Skewness.

**Unit III**

PROBABILITY AND ANALYSIS OF EXPERIMENTS: Introduction – Approaches to Probability– Probability distributions: Binomial – Poisson – Uniform – Exponential and Normal – Analysis of Variance (ANOVA) – Non parametric Tests: One Sample Test – Two Sample Test – Basic Multivariate Analysis: Correlation Analysis.

**Unit IV**

ALGORITHIMIC RESEARCH: Introduction – Algorithmic Research Problems – Types of Algorithmic Research Problems – Types of Solution Procedure / Algorithm – Steps of Development of Algorithm – Steps of Algorithmic Research – Design of Experiments and Comparision of Algorithms – Meta Heuristics for Combinatorial Problems.

**Unit V**

THESIS WRITING: Writing at the Tertiary Level – Planning the Thesis – Computer Tools for Writing and Publishing – The General Format – Page and Chapter Format – Footnotes – Tables and Figures – References – Appendices.

**References:**

1. “Research Methodology”, R.Pannerselvam, PHI, New Delhi, 2011.
2. “Research Methodology – Methods and Techniques”, Kothari C.R, New Age International, New Delhi, 2011.
3. “Research Methodology for Engineers”, R.Ganesan, MJP Publishers, 2011.
4. “Thesis and Assignment Writing”, Anderson, Berny H. Dujrston, H.Pode, Wily Eastern Ltd., New Delhi.

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**5PCS1C2 – ADVANCED DATABASE SYSTEMS**

**Unit I**

Introduction to Database Systems: Introduction – Basic concepts and Definition – Data Dictionary– Database System – Database Administrator – File Oriented system Vs Database Systems – Database Languages – Database System Architecture: Schema – Sub Schema – Three Level Architecture – Data Independence – DBMS: Structure – Components – Functions – Data Models– Types of Database Systems.

**Unit II**

Object Oriented Databases: Introduction – Object Oriented Data Model (OODM): Characteristics – OODM Vs ER Model – Object Oriented Database (OODB): Concepts – Object – Classes – Relationship among Objects – OODBMS: Features – Advantages – Disadvantages – Object Data Management Group (OMDG): Object Model – Object Definition Language – Object Query Language – ORDBMS: History – Features – OODBMS Vs ORDBMS.

**Unit III**

Parallel Database Systems: Introduction – Advantages – Disadvantages – Architecture – Key Elements of Parallel Database Processing – Query Parallelism – Distributed Database Systems: Introduction – Parallel Vs Distributed Databases – Properties – Types – Functions – Advantages – Disadvantages – Architecture – DDBS Design – Distributed Query Processing – Concurrency Control – Recovery control.

**Unit IV**

Decision Support system: Introduction – History – Characteristics – Benefits – Components – Operational Data Vs DSS Data – Temporal Databases: Introduction – Problem – Intervals – Packing and Unpacking Relations – Generalizing the Relational Operators – Database Design – Integrity Constraints – Logic Based Database: Introduction – Propositional Calculus – Predicate Calculus – Deductive Database systems – Recursive Query Processing.

**Unit V**

Emerging Database Technologies: Internet Databases: Internet Technology – WWW – Web Technology – Web Databases – Advantages and Disadvantages – Digital Libraries: Components – Need – Access – Database for Digital Libraries – Benefits – Multimedia Database: Sources – Queries – Application – Mobile Databases: Architecture – Characteristics – Mobile DBMS – Spatial Databases: Characteristics – Data Model – Queries.

**References:**

1. “Database Systems – Concepts, Designs and Applications: S.K.Singh, Pearson Education, New Delhi, 2008.
2. “An Introduction to Database Systems”, C.J.Date, A.Kannan, S.Swamynathan, Pearson Edition, Eighth Edition, New Delhi, 2007.
3. “Database system Concepts”, Abraham silberschatz, Henry F.Korth, S.sudharsan, Sixth Edition, Tata MC Graw Hill.

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**5PCS1C3 – GENERAL SKILLS IN COMPUTER SCIENCE**

**Unit I**

**Introduction to Software Concepts:** Need of Open Sources – Advantages of Open Sources – Commercial Software – Freeware – Free Software – Open Source Licenses – Category of OSS – OSS Tools – Applications. Operating System**:** The Linux operating system and its use both for desktops and as server software

**Unit II**

**Social Networks:** Concepts – Random network models – Network centrality – Small world network models – opinion formation – coordination – cooperation – Online Social Networks – Android

**Unit III**

**Research Tools:NS2**: NS2 Preliminaries – Simulations of TCP/IP – Routing and Network dynamics – Random Early Discard – LAN – Mobile Networks – How to work with trace files?

**MATLAB:** First steps in Matlab – Typing into Matlab – Matrices – Basic Graphics – Basic Data Analysis – M-Files – Data Files.

**Unit IV**

**Communication Skills:** Understanding Communication – greeting and introducing – making requests – asking for and giving permission – offering help – giving instruction and directions – art of small talk – participating in conversation – making a short formal speech – Describing the people, place, events and things.

Telephone Skills: understanding and handling calls, leaving message and making request.

**Unit V**

**Presentation Skills:** Written Communication: Report writing, note making – career skills – curriculum vitae and cover letter. Facing an interview – Group Discussion – Preparation of Power point/LCD presentations.

**Reference Books:**

1. <http://www.entirelyopensource.com/>
2. <https://www.coursera.org/course/sna>
3. NS Simulator for Beginners Lecture Notes 2003-2004, Sophia – Antipolis (NS2 Manual)
4. Basics of MATLAB and Beyond, Andrew Knight, Chapman &b Hall/CRC
5. Harry Chambers, Communication Skills for Scientific and Technical professional, Perseus, 2011.
6. Improve your communication skills, Kogan Page – 2000.
7. Curriculum Development, Theory & Practice, Harcourt Brace and World Inc., 1962.

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**ELECTIVE COURSES**

**5PCS2C1 – INFORMATION AND NETWORK SECURITY**

**Unit I**

Information Security and Cryptography – Security Goals, Services and Mechanisms – Classical Encryption Methods – Transposition Ciphers – Substitution Ciphers – Caesar Ciphers – Mono alphabetic Substitution – Homophonic Substitution – Polygram Substitution – Playfair Ciphers – Hill Ciphers – Poly alphabetic Substitutions – Vigenere Ciphers – Compound Vigenere – Auto-key Cipher – Running-key Cipher – Vernam Cipher – One-time Pad – Cryptographic codes – Machine Ciphers – Jefferson Cylinder – Rotor-based Machines

**Unit II**

Symmetric Key Cryptography – Symmetric Cipher Model – Types of Attacks – Block Ciphers Vs Stream Ciphers – Synchronous Stream Ciphers – Asynchronous Stream Ciphers – Evaluating Block Ciphers – Modes of Operations – Cascades of Ciphers and Multiple Encryption – DES – AES – Public Key Cryptography – Introduction – Basic Principles – The Chinese Remainder Theorem – RSA – Integer Factorization Problem – Knapsack Public Key Encryption – Probabilistic Public Key Encryption – Elliptic Curve Cryptography – Quantum

**Unit III**

Information Hiding – Steganography – Evolution and System – Modern Techniques – Audio – Video – Textual Steganography – Real-time Steganography – Steganalysis – Applications – Digital Watermarking – Data Integrity – Introduction – Preventing Unauthorized Manipulation – Hash Functions – Essential Properties – Types – The Birthday Attack – Estimate of Probability of Finding a Collision – Hash Function Design Issues – Cryptanalysis and the Security of Hash Functions – Attacks on Hash Functions – Standard Hashing Algorithms

**Unit IV**

Authentication – Objectives of Identification Protocols – Entity Authentication Techniques –Applications of Identification Protocols – Properties of Identification Protocols – Authentication Mechanisms – Challenge – Response Identification – Digital Signature – Digital Certificates – X.509 Protocol – RFC 2459 – RADIUS – CAPTCHA – Introduction to Biometrics – Definition – Features – Applications – Technological Issuesin Biometric Systems – Face Recognition – Fingerprint Recognition – Iris Recognition – Voice – DNA as aBiometric Identifier – Multimodal Biometric Systems

**Unit V**

Virus and Malware – Virus and Worms – Virus Structure and Operation – Defenses Against Viruses – Virus Writers and Antivirus Development – Generic Decryption Technology – Adware and Spyware – Mitigating Malware Risks – Web and Network Security – Introduction to SSL – SSL Operations and Layers – The SSL Record Protocol – The Alert Protocol – The Change Cipher Spec Protocol – SSL Handshake Protocol Specification – Errors – Introduction to Network Security– IPSec Security Architecture – Authentication Header – Encapsulating Security Payload – Security Associations – Key Management – Introduction to Firewalls – Design Goals – Types of Firewalls – Firewall Configurations

**References:**

1. Dhiren R. Patel, “Information Security”, Prentice Hall India, 2008
2. Behrouz A. Forouzan, “Cryptography and Network Security”, Tata McGraw Hill, 2007
3. William Stalling, “Cryptography and Network Security”, Prentice Hall, 2010

**5PCS2C2 – ADVANCED OPERATING SYSTEMS**

**Unit I**

Distributed Systems – Architecture types – issues – communication networks – communication primitives. Theoretical Foundations – inherent limitations – lamp ports logical clocks – vector clocks – casual ordering of messages – global state – cuts of a distributed computation – termination detection. Distributed Mutual Exclusion – introduction – the classification of mutual exclusion and associated algorithms – a comparative performance analysis.

**Unit II**

Distributed Deadlock Detection – Introduction – deadlock handling strategies issues in deadlock detection and resolution – control organizations for distributed deadlock detection – centralized and distributed deadlock detection algorithms – hierarchical deadlock detection algorithms. Agreement protocols – introduction – the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction – architecture – mechanism for building distributed file systems – design issues – log structured file systems.

**Unit III**

Distributed shared memory – Architecture – algorithms for implementing DSM – memory coherence and protocols – design issues. Distributed Scheduling – introduction – issues in load distributing – load distributing algorithm – components – stability – performance comparison – selecting a suitable load sharing algorithm – requirements for load distributing – task migration and associated issues. Failure Recovery and Fault tolerance: introduction – basic concepts – classification of failures – backward and forward error recovery, backward error recovery – recovery in concurrent systems – consistent set of check points – synchronous and asynchronous check pointing and recovery – check pointing for distributed database systems – recovery in replicated distributed databases.

**Unit IV**

Protection and security – preliminaries, the access matrix model and its implementations – safety in matrix model – advanced models of protection. Data security – cryptography: Model of cryptography, conventional cryptography – modern cryptography, private key cryptography, data encryption standard – publickey cryptography – multiple encryption – authentication in distributed systems.

**Unit V**

Multiprocessor operating systems – basic multiprocessor system architectures – inter connection networks for multiprocessor systems – caching – hypercube architecture. Multiprocessor Operating System – structures design issues – threads – process synchronization and scheduling. Database Operating systems – requirements Concurrency control: theoretical aspects – introduction, database systems – a concurrency control model of database systems – the problem of concurrency control – serializability theory – distributed database systems, concurrency control algorithms – basic synchronization primitives – lock based algorithms – timestamp based algorithms, optimistic algorithms – concurrency control algorithms, data replication.

**References:**

1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001.
2. Andrew S.Tanenbaum, "Modern operating system", PHI, 2003.
3. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 2003.
4. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2003

**5PCS2C3 – DATA WAREHOUSING AND MINING**

**Unit I**

Data warehousing Components – Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup and Transformation Tools – Metadata.

**Unit II**

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools– OLAP Tools and the Internet.

**Unit III**

Data mining – Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

**Unit IV**

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction – Basic Concepts – Decision Tree Induction – Bayesian Classification– Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

**Unit V**

Cluster Analysis – Types of Data – Categorization of Major Clustering Methods – K-means Partitioning Methods – Hierarchical Methods – Density-Based Methods – Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

**References:**

1. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw– Hill Edition, Tenth Reprint 2007.
2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Second Edition, Elsevier, 2007.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “ Introduction To Data Mining”, Person Education, 2007.
4. K.P. Soman, Shyam Diwakar and V. Ajay “, Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
6. Daniel T.Larose, “Data Mining Methods and Models”, Wile-Interscience, 2006.

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**5PCS2C4 – SERVICE ORIENTED ARCHITECTURE**

**Unit I**

SOA Fundamentals**:** Defining SOA – Business Value of SOA – Evolution of SOA – SOA – characteristics – concept of a service in SOA – misperceptions about SOA – Basic SOA architecture – infrastructure services – Enterprise Service Bus (ESB) – SOA

Enterprise Software models – IBM on Demand operating environment

**Unit II**

SOA Planning and Analysis**:** Stages of the SOA lifecycle – SOA Delivery Strategies – service – oriented analysis – Capture and assess business and IT issues and drivers – determining non-functional requirements (e.g., technical constraints, business constraints – runtime qualities – non-runtime qualities)

**Unit III**

Business centric SOA and its benefits – Service modeling – Basic modeling building blocks – service models for legacy application integration and enterprise integration – Enterprise solution assets (ESA)

**Unit IV**

SOA Design and implementation**:** Service-oriented design process – design activities – determine services and tasks based on business process model – choosing appropriate standards – articulate architecture – mapping business processes to technology – designing service integration environment (e.g., ESB, registry) – Tools available for appropriate designing – implementing SOA– security implementation – implementation of integration patterns – services enablement –quality assurance

**Unit V**

Managing SOA Environment**:** Distributing service management and monitoring concepts – operational management challenges – Service-level agreement considerations – SOA governance (SLA, roles and responsibilities, policies, critical success factors – and metrices) – QoS compliance in SOA governance – role of ESB in SOA governance – impact of changes to services in the SOA lifecycle

**References:**

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Prentice Hall Publication, 2005.
2. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, Rawn Shah, “Service-Oriented Architecture Compass: Business Value, Planning and Enterprise Roadmap”, IBM Press Publication, 2005.
3. *Sandy Carter*, “The New Language of Business: SOA & Web 2.0”, IBM Press, 2007.
4. Thomas Erl*,* “Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services”, Prentice Hall Publication, 2004
5. Dave Chappell*,* “Enterprise Service Bus”, O'Reilly Publications, 2004
6. Sanjiva Weerawarana*, Francisco Curbera, Frank Leymann, Tony Storey, Donald F.Ferguson*, “Web Services Platform Architecture: SOAP, WSDL, WS-Policy, WS- Addressing, WS-BPEL, WS-Reliable Messaging, and More”, Prentice Hall Publication, 2005
7. Eric Newcomer, Greg Lomow, “Understanding SOA with Web Services”, Addison Wesley Publication, 2004

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**5PCS2C5 – MOBILE COMPUTING**

**Unit I**

Medium Access Control – Motivation for Specialized MAC – SDMA – FDMA – TDMA – CDMA– Comparison of Access Mechanisms – Tele communications – GSM – DECT – TETRA – UMTS – IMT – 200 – Satellite Systems Basics – Routing – Localization – Handover – Broadcast Systems Overview – Cyclic Repetition of Data – Digital Audio Broadcasting – Digital Video Broadcasting.

**Unit II**

Wireless LAN Infrared Vs Radio Transmission – Infrastructure Networks – Ad hoc Networks – IEEE 802.11 – HIPERLAN – Bluetooth – Wireless ATM Working Group – Services – Reference Model – Functions – Radio Access Layer – Handover – Location Management – Addressing Mobile Quality of Service – Access Point Control Protocol.

**Unit III**

Mobile IP Goals – Assumptions and Requirement – Entities – IP Packet Delivery – Agent Advertisement and Discovery – Registration – Tunneling and Encapsulation – Optimization – Reverse Tunneling – IPv6 – DHCP – Ad hoc Networks.

**Unit IV**

Traditional TCP – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit/ Fast Recovery – Transmission/ Timeout Freezing – Selective Retransmission – Transaction Oriented TCP.

**Unit V**

Architecture – Datagram Protocol – Transport Layer Security – Transaction Protocol – Session Protocol – Application Environment – Wireless Telephony Application.

**References:**

1. J.Schiller, Mobile Communication, Addison Wesley, 2000.
2. William Stallings, Wireless Communication and Networks, Pearson Education, 2003.
3. Singhal, WAP: Wireless Application Protocol, Pearson Education, 2003.
4. Lother Merk, Martin S. Nicklaus and Thomas Stober, Principles of Mobile Computing, 2nd Edition, Springer, 2003.
5. William C. Y. Lee, Mobile Communication Design Fundamentals, John Wiley, 1993.

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**5PCS2C6 – ADHOC NETWORK**

**Unit I**

Introduction – Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms – Characteristics of the Wireless Channel – IEEE 802.11a– b Standard – Origin of Ad hoc Packet Radio Networks – Technical Challenges – Architecture of PRNETs – Components of Packet Radios – Adhoc Wireless Networks – What is an Ad Hoc Network? Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Adhoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet.

**Unit II**

Introduction – Issues in Designing a Routing Protocol for Adhoc Wireless Networks – Classifications of Routing Protocols – Table – Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source – Initiated On–Demand Approaches – Adhoc On–Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) – Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) – Location – Aided Routing (LAR) – Power – Aware Routing (PAR) – Zone Routing Protocol (ZRP).

**Unit III**

Introduction – Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols –Classifications of Multicast Routing Protocols – Tree – Based Multicast Routing Protocols – Mesh– Based Multicast Routing Protocols – Summary of Tree and Mesh based Protocols – Energy– Efficient Multicasting – Multicasting with Quality of Service Guarantees – Application – Dependent Multicast Routing – Comparisons of Multicast Routing Protocols.

**Unit IV**

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

**Unit V**

Introduction – Issues and Challenges in Providing QoS in Adhoc Wireless Networks – Classifications of QoS Solutions – MAC Layer Solutions – Network Layer Solutions – QoS Frameworks for Ad hoc Wireless Networks Energy Management in Adhoc Wireless Networks – Introduction – Need for Energy Management in Adhoc Wireless Networks – Classification of Energy Management Schemes – Battery Management Schemes – Transmission Power Management Schemes – System Power Management Schemes.

**References:**

1. C. Siva Ram Murthy and B. S. Manoj, Adhoc Wireless Networks Architectures and Protocols, Prentice Hall, PTR, 2004.
2. C.K.Toh, Ad Hoc Mobile Wireless Networks Protocols and Systems, Prentice Hall, 2001.
3. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2000.

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**5PCS2C7 – DIGITAL IMAGE PROCESSING AND ANALYSIS**

**Unit I**

Digital Image Processing: Origins of Digital Image Processing, Steps in Digital Image Processing, Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships between Pixels, Mathematical Tools used in Digital Image Processing.

**Unit II**

Image Transformation & Filters: Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filter, Sharpening Spatial Filters, Combining Spatial Enhancement methods, Fuzzy techniques for Intensity Transformation and Spatial Filtering. Filtering in the Frequency Domain: Preliminary Concepts, Sampling and the Fourier Transforms of Sampled Functions, The Discrete Fourier Transform (DFT), Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Sharpening using Frequency Domain Filters, Selective Filtering.

**Unit III**

Image Restoration, Reconstruction and Image Segmentation: Image Degradation/Restoration process, Noise Models, Restoration in the presence of Noise only – Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position – Invariant Degradations, Estimating the Degradation Functions, Inverse Filtering, Wiener Square Error Filtering, Constrained Least Square Filtering, Geometric Mean Filter, Image Reconstruction from Projections. Image Segmentation: Point, Line and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation.

**Unit IV**

Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Full Color Image Processing, Color Transformation, Smoothing and Sharpening, Image Segmentation Based on Color, Noise in Color Images. Wavelets and Multiresolution Processing: Multiresolution Expansion, Wavelet Transforms in One Dimension, The Fast Wavelet Transforms, Wavelet Transforms in Two Dimensions, Wavelet Packets. Image Compression: Fundamentals, Basic Compression Methods, Digital Image Watermarking.

**Unit V**

Morphological Image Processing: Erosion and Dilation, Opening and Closing, The Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology. Object Recognition: Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods, Structural Methods.

**References:**

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, 3rd Edition 2008, Pearson Education.
2. A.Jain,”Fundamentals of Digital Image Processing”, Prentice Hall of India, 2001.
3. B.Chandra and D.Dutta Majumder , “Digital Image Processing and Analysis ” Prentice-Hall of India private limited, New Delhi, 2006.

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**5PCS2C8 – CLOUD COMPUTING**

**Unit I**

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing.

**Unit II**

Introduction to Cloud Technologies, Study of Hypervisors Compare SOAP and REST Webservices, AJAX and mashups-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization Multitenant software: Multi-entity support, Multi-schema approach, Multitenance using cloud data stores, Data access control for enterprise applications

**Unit III**

Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Introduction to cloud development, Example/Application of Mapreduce, Features and comparisons among GFS,HDFS etc, Map-Reduce model

**Unit IV**

Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud Cloud computing security architecture: Architectural Considerations – General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control Identity management, Access control, Autonomic Security Cloud computing security challenges: Virtualization security management virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.

**Unit V**

Issues in cloud computing, Implementing real time application over cloud platform Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud’. Cloud computing platforms, Installing cloud platforms and performance evaluation Features and functions of cloud platforms: Xen Cloud Platform, Eucalyptus, OpenNebula, Nimbus, TPlatform, Apache Virtual Computing Lab (VCL), Enomaly Elastic Computing Platform

**References:**

1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition), 2009.
2. Enterprise Cloud Computing by Gautam Shroff, Cambridge, 2010.
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley – India, 2010.
4. Google Apps by Scott Granneman,Pearson, 2006.
5. Cloud Security & Privacy by Tim Malhar, S.Kumaraswamy, S.Latif (SPD, O’REILLY), 2009
6. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill, 2009
7. Cloud Computing Bible by Barrie Sosinsky, Wiley India, 2011.
8. Stefano Ferretti et.al.,‖QoS–aware Clouds”, IEEE 3rd International Conference on Cloud Computing, 2010

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**5PCS2C9 – WEB DATA MINING**

**Unit I**

Introduction to internet and WWW, Data Mining Foundations, Association Rules and Sequential Patterns, Basic Concepts of Association Rules, Apriori Algorithm, Frequent Itemset Generation, Association Rule Generation, Data Formats for Association Rule Mining, Mining with multiple minimum supports, Extended Model, Mining Algorithm, Rule Generation, Mining Class Association Rules, Basic Concepts of Sequential Patterns, Mining Sequential Patterns on GSP, Mining Sequential Patterns on Prefix Span, Generating Rules from Sequential Patterns.

**Unit II**

Supervised Learning, Basic Concepts, Decision Tree Induction, Learning Algorithm, Impurity Function, Handling of Continuous Attributes, Classifier Evaluation, Rule Induction, Sequential Covering, Rule Learning, Classification Based on Associations, Naive Bayesian Classification, Naive Bayesian Text Classification – Probabilistic Framework, Naive Bayesian Model, Unsupervised Learning, Basic Concepts, K-means Clustering, K-means Algorithm, Representation of Clusters, Hierarchical Clustering, Single link method, Complete link Method, Average link method, Strength and Weakness.

**Unit III**

Basic Concepts of Information Retrieval, IR Methods, Boolean Model, Vector Space Model and Statistical Language Model, Relevance Feedback, Evaluation Measures, Text and Web Page Preprocessing, Stopword Removal, Stemming, Web Page Preprocessing, Duplicate Detection, Inverted Index and Its Compression, Inverted Index, Search using Inverted Index, Index Construction, Index Compression, Latent Semantic Indexing, Singular Value Decomposition, Query and Retrieval, Web Search, Meta Search, Web Spamming.

**Unit IV**

Link Analysis, Social Network Analysis, Co-Citation and Bibliographic Coupling, Page Rank Algorithm, HITS Algorithm, Community Discovery, Problem Definition, Bipartite Core Communities, Maximum Flow Communities, Email Communities, Web Crawling, A Basic Crawler Algorithm – Breadth First Crawlers, Preferential Crawlers, Implementation Issues – Fetching, Parsing, Stopword Removal, Link Extraction, Spider Traps, Page Repository, Universal Crawlers, Focused Crawlers, Topical Crawlers, Crawler Ethics and Conflicts.

**Unit V**

Opinion Mining, Sentiment Classification, Classification based on Sentiment Phrases, Classification Using Text Classification Methods, Feature based Opinion Mining and Summarization, Problem Definition, Object feature extraction, Comparative Sentence and Relation Mining, Opinion Search and Opinion Spam. Web Usage Mining, Data Collection and Preprocessing, Sources and Types of Data, Key Elements of Web usage Data Preprocessing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web usage Patterns, Session and Visitor Analysis, Cluster Analysis and Visitor Segmentation, Association and Correlation Analysis, Analysis of Sequential and Navigation Patterns.

**References:**

1. Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer Publications, 2011
2. Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Second Edition, Elsevier Publications.2010
3. Anthony Scime, Web Mining : Applications and Techniques, 2005
4. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
5. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.

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