

Shivaji University, Kolhapur
Ph.D. Course work (Computer Science & Engineering Faculty)
Paper-II : Advances in Computer Sci. & Engineering

Teaching: 4 hr/week

Theory Marks: 100

Unit-1: Data Mining Technologies

(15 hrs)

Data Mining Tasks, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining, Data Preprocessing: Why Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Classification- Decision Trees, Bayesian Classification, Rule-Based Classification, Neural Network-Based Algorithms, Support Vector Machines, Classification by Association Rule Analysis, Nearest Neighbor Classifier, Clustering- Classification of clustering algorithms, Hierarchical Algorithms, Agglomerative Algorithms, Divisive Clustering, K -Means Clustering, Clustering Large Databases, BIRCH, DBSCAN, CURE Algorithm. Association Rules- Apriori Algorithm, Applications and Trends in Data Mining, Data Mining Applications, Social Impacts of Data Mining, Trends in Data Mining.

Reference

1. J. Han and M. Kamber, "Data Mining- Concepts and Techniques", 2nd Edition, Morgan Kaufmann, 2006.
2. Margaret H. Dunham," Data Mining Introductory and Advanced Topics", Prentice Hall
3. P. Tan, M. Steinbach and V. Kumar, "Introduction to Data Mining", Addison Wesley, 2006.

Unit-2: Networks and Security

(15 hrs)

Overview of OSI layer Model and TCP/IP protocol model. IPv4 Addresses: Classful Addressing, Class less Addressing, Cellular and Ad Hoc wireless network, Applications of Ad Hoc Wireless Network, issues in ad hoc wireless networks, mac protocols for ad hoc wireless networks: Introduction, Issues in Designing a MAC Protocol for Ad Hoc Wireless Network, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention-Based Protocol. Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Symmetric and Asymmetric Key Algorithms, Key Management in Ad Hoc Wireless Networks, Secure Routing in Ad Hoc Wireless Networks, IP Security-IP Security Architecture, Authentication Header and Encapsulating Security Payload.

References

1. Holger Kars, "Protocols and architectures for WSN", Wiley publication.
2. M Jochen Schiller, "Mobile communication", Person Publication.
3. Mathew Gast, "802.11 wireless Networks the definitive guide", O'Reilly.
4. William Stallings, "Cryptography and Network Security", Fourth Edition, Pearson Education 2007.
5. Behrouz A. Forouzan, "Cryptography & Network Security", TMH 2007.
6. Robert Bragg, Mark Rhodes, "Network Security: The complete reference", TMH

Unit-3: Advanced Algorithms and Distributed Systems

(15 hrs)

Performance analysis and randomized algorithms, Divide and Conquer method, Binary search, Greedy method and Dynamic Programming General methods, Minimum cost spanning trees, NP-hard problems, PARAM Algorithms -computational model, Fundamental techniques, Mesh Algorithms- Computational model, Packet routing fundamental algorithms, Hypercube Algorithms-Computational model, PPR routing fundamental algorithms. characterization of distributed systems, Examples of distributed systems, Trends in distributed systems, system models, Distributed File Systems, Distributed Shared Memory.

References

1. "Fundamentals Of Computer Algorithms", Ellis Horowitz, Sartaj Sahni and Sanguthewar Rajasekaran (Galgotia Publications).
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms," Third Edition PHI 2010
3. G Coulouris, J Dollimore and T Kindberg, "Distributed Systems Concepts and Design", fifth Edition, Pearson Education.
4. Kai Hwang, Faye A.Brigs, "Computer Architecture and Parallel Processing", Mc Graw Hill

Unit 4: Blockchain & Applications

(15hrs)

The history of blockchain and Bitcoin, Blockchain architecture, Generic elements of a blockchain, How blockchain works, Benefits, features, and limitations of blockchain, Two General Problem. Byzantine General problem and Fault Tolerance, Zero Knowledge Proof, Advantage over conventional distributed database, Merkle Patricia Tree, Life cycle of Blockchain application, Soft & Hard Fork, Private and Public blockchain, Distributed Consensus: The consensus algorithms in Blockchain, Proof of Work, Proof of Stake, Proof of Burn. Mining strategy, Attacks & Vulnerability, Cryptocurrency Stakeholders, Domain Name service & future of Blockchain.

Reference

4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press (July 19, 2016).
5. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan,” Blockchain Technology: Cryptocurrency and Applications”, ‘Oxford University Press, 2019.
6. Josh Thompson, “Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming”, Create Space Independent Publishing Platform

The list of reference books is indicative.

Shivaji University, Kolhapur
Ph.D. Course work (Computer Science & Engineering Faculty) Syllabi for
Paper-III

Any ONE subject from the given list can be opted

- 1. CLOUD COMPUTING**
- 2. USER INTERFACE DESIGN**
- 3. REAL - TIME AND EMBEDDED SYSTEMS**
- 4. CONVERGENCE TECHNOLOGIES**

Teaching: Theory :3 hr/week
Practical : 1hr/week

Theory Marks:80
Term work :20

Paper- III.1 : CLOUD COMPUTING

UNIT I : UNDERSTANDING CLOUD COMPUTING **10hr**

Cloud Computing – Recent trends in Computing - History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services,

UNIT II : DEVELOPING CLOUD SERVICES **18 hr**

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

UNIT III : CLOUD COMPUTING FOR EVERYONE **18 hr**

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation

UNIT IV: USING CLOUD SERVICES **14 hr**

Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing -Collaborating on Databases – Storing and Sharing Files

REFERENCES

1. Michael Miller, *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*, Que Publishing, August 2008.
2. Haley Beard, *Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs*, Emereo Pty Limited, July 2008.

Paper- III.2 : USER INTERFACE DESIGN

UNIT I : INTRODUCTION

12 hr

Human-Computer Interface – Characteristics Of Graphics Interface –Direct Manipulation Graphical System – Web User Interface –Popularity –Characteristic & Principles.

UNIT II: HUMAN COMPUTER INTERACTION

12 hr

User Interface Design Process – Obstacles –Usability –Human Characteristics In Design – Human Interaction Speed –Business Functions –Requirement Analysis – Direct –Indirect Methods – Basic Business Functions – Design Standards – General Design Principles – Conceptual Model Design – Conceptual Model Mock-Ups

UNIT III : WINDOWS

18 hr

Characteristics– Components– Presentation Styles– Types– Managements–Organizations– Operations– Web Systems– System Timings - Device– Based Controls Characteristics– Screen – Based Controls — Human Consideration In Screen Design – Structures Of Menus – Functions Of Menus– Contents Of Menu– Formatting – Phrasing The Menu – Selecting Menu Choice– Navigating Menus– Graphical Menus. Operate Control – Text Boxes– Selection Control– Combination Control– Custom Control–Presentation Control.

UNIT IV : MULTIMEDIA and EVALUATION

18 hr

Text For Web Pages – Effective Feedback– Guidance & Assistance–Internationalization– Accessibility– Icons– Image– Multimedia – Coloring. Conceptual Model Evaluation – Design Standards Evaluation – Detailed User Interface Design Evaluation

REFERENCES:

1. Wilbent. O. Galitz ,“The Essential Guide To User Interface Design”, John Wiley& Sons, 2001.
2. **Deborah Mayhew, The Usability Engineering Lifecycle**, Morgan Kaufmann, 1999Ben Shneiderman, “Design The User Interface”, Pearson Education, 1998.
3. Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd., 2002. Sharp, Rogers, Preece, ‘Interaction Design’, Wiley India Edition, 2007

Paper- III.3 :REAL-TIME AND EMBEDDED SYSTEMS

UNIT I : Embedded Architecture

12 hr

Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Embedded system design process- Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration, Formalism for System Design- Structural Description, Behavioral Description

UNIT II : Embedded Processor And Computing Platform

12 hr

ARM processor- processor and memory organization, Data operations, Flow of Control, SHARC processor- Memory organization, Data operations, Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging.

UNIT III : Networks

18 hr

Distributed Embedded Architecture- Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, ethernet, Myrinet, Internet, Network-Based design- Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling

UNIT IV : Real-Time Characteristics

18 hr

Clock driven Approach, weighted round robin Approach, Priority driven Approach, Dynamic Versus Static systems, effective release times and deadlines, Optimality of the Earliest deadline first (EDF) algorithm, challenges in validating timing constraints in priority driven systems, Off-line Versus Online scheduling, Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design, Quality Assurance.

Reference Books :

1. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001.
2. Jane.W.S. Liu Real-Time systems, Pearson Education Asia, 2000
3. C. M. Krishna and K. G. Shin , Real-Time Systems, ,McGraw-Hill, 1997 Frank Vahid and Tony Givargi, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & Sons, 2000.

Paper- III.4 : CONVERGENCE TECHNOLOGIES

UNIT I : Convergence Standards and Protocols

12 hr

Why Convergence, Identifying benefits of Converged network, Voice Packetization, Voice Compression (G.711,G.726,G.729 Etc), Switching basics, Circuit Switching Vs Packet Switching, Identify capabilities of T carrier systems, ISDN (Concept, services, architecture, protocol overview etc.), Overview Of Frame Relay Networks, B-ISDN

UNIT II : ATM Technology

18 hr

ATM VPI and VCI Creation of virtual channels, Definition of Switched Virtual Circuit and Permanent Virtual Circuit, Step-by-step PVC example of how an ATM network processes cells, Step-by-step SVC example of how an ATM network processes cells, Connection Admission Control (CAC), Cell Loss Priority (CLP), SVC signaling - Q.2931, Adaptation layers from a Voice over ATM perspective, AAL1, AAL2, AAL5.

UNIT III : Access Signaling Types

12 hr

Interconnection of voice gateways & IP, ATM, and Frame Relay networks. Learn which protocol is best for key systems, ISDN Q.931 signaling protocol, How PRI and BRI use Q.931 signaling, Q.931 call setup process, Comparison of signaling protocols based on ISDN's Q.931, MEGACO, ATM Q.2931, H.323, SS7.

UNIT IV : VOIP Convergence

18 hr

IP telephony basics, VOIP and its features and benefits, Overview of VOIP technology (including access gateways), Quality Of service and VOIP. Characteristics of the H.323 protocol, Identify the key benefits of Session Initiation Protocol, SIP components and messages, Media Gateway Control Protocol (MGCP), Overview of NetMeeting.

References:

1. Multimedia Communications Directions and Innovations By Jerry Gibson Academic Press
2. Multimedia Communication Systems techniques Standards and Networks By K.R.Rao Zoran Bojkovic and Dragorad Milovanovic Pearson Education
3. VOIP by Ulyess Black
4. ATM Networks Concepts and Protocols by Sumeet Kasera and Pankaj Sethi Tata McGraw Hill
5. ISDN and Broadband ISDN with Frame relay and ATM 4/e by William Stallings Prentice Hall Publication.