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

Teaching: 4 hr/week   **Theory Marks:100**

Unit 1: System Software, Computer Graphics and Visualization   (15 hrs)

Advanced operating systems, Multiuser and multitasking operating systems, Introduction, types of Parsers, LL (k) and LALR (k) parsers, three address codes. Introduction to code generation, simple code generation algorithm, DAGs Introduction to Code Optimization, basic blocks and flow graphs, common sub-expression elimination, loop optimization, loop invariant computations, dead code elimination, code movement.

Picture analysis, Modeling: 2D, 3D Geometric modeling and transformations, projections, curves and fractals. Illumination models and Rendering: Light, Ambient Light, Diffuse reflection, Shading algorithms, Color models, Ray tracing, Scientific Visualization: Methods of Scientific Exploration, Data Aspects and Transformations, Time-Tested Principles for Good Visual Plots, Tone Mapping, Visualizing Multidimensional Data, Scalar Data Visualization, Vector Data Visualization. Graphics User Interfaces, image manipulation and storage.

Reference

1. Alfred V. Aho, Ravi Shethi, Jeffrey D Ullman,"Compilers- principle, techniques and tools", Pearson Education, 2006

2. V Raghvan,"Principles of Compiler Design",Tata McGraw Hill,,2010

3. Peter Shirley, Ashikhmin Gleicher et. al.,"Fundamentals of Computer Graphics", A. K. Peters Ltd., 2005

4. Hearn and Baker,"Computer Graphics", PHI

5. Van Dan Feiner, Hughes, Foley, "Computer Graphics: Principles and Practice", PHI

Unit-2: Computer Networks   (15 hrs)

Wired network protocols, reference layers, wireless networks. WSN: Design issues, System Architecture, Sensor Network OS Tiny OS, Distributed data processing, Synchronization and localization, Communication and routing, Security issues , services and applications, Mobile Ad-hoc Networks: Location Management Schemes, Routing, GSM and satellite Communication:

Architecture, hand-off and power management. Wireless Network Standards & Protocols: 802.11.X, 802.16.x, 802.15.X, Challenges for MAC, DCF and PCF, WEP& EAP QoS in wireless Network: Parameters Throughput or bandwidth, Delay or latency Delay variation (delay jitter), Loss or error rate Network threats and attacks, Security Services, Number Theory Concepts, Cryptographic algorithms, Network Security Protocols, System Security, Security research in wired, wireless and ubiquitous networks, Security Standards and RFCs.

References

1. Holger Kars," Protocols and architectures for WSN" , Wiely 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, Parallel and Distributed Systems   (15 hrs)

Problem solving, Probabilistic analysis and randomized algorithms, Perfect Hashing, The Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs, NP-hard problems, Approximation algorithms, Online algorithms and competitive analysis. Linear-Programming Algorithms: Structure of Optima, Interior Point. Computational geometry:convex hull. Random Walks and Markov chains.

Terminology of Parallel and Distributed Computing, Parallel and Distributed Architectures, Parallel Performance, Shared Memory and Threads, Distributed Systems, Distributed Coordination, Distributed File Systems, Distributed Shared Memory, Cloud Computing, Computational Grids and Applications.

References

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein**,** "Introduction to Algorithms," Third Edition PHI 2010.

2. G Coulouris, J Dollimore and T Kindberg, "Distributed Systems Concepts and Design", Third Edition, Pearson Education.

3. Kai Hwang, Faye A.Brigs, "Computer Architecture and Parallel Processing", Mc Graw Hill

Unit-4: Data warehousing and Mining (15 hrs)

Data Mining Tasks, Data Warehouse (Multidimensional Data Model, Data Warehouse Architecture, Implementation), Data Warehousing to Data Mining, Data Preprocessing: Why Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Descriptive Statistical Measures, Classification: Decision Trees, Model Over fitting, Bayesian Classification, Rule-based classification, Nearest Neighbor Classifier, Classification by Back-propagation, Support vector machines, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy, Cluster Analysis: K-means, Agglomerative Hierarchical Clustering, DBSCAN, Association Rules: Apriori algorithm, FP-growth algorithm, Advanced techniques, Data Mining software and applications: Text mining (extracting attributes/keywords, structural approaches - parsing, soft parsing, Bayesian approach to classifying text), Web mining (classifying web pages, extracting knowledge from the web), Data Mining software and Applications.

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.

The list of reference books is indicative.

Shivaji University, Kolhapur
Ph.D. Course work (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	**Theory Marks:80**
Practical : 1hr/week	**Term work :20**

Paper- III.1 : CLOUD COMPUTING

UNIT I : UNDERSTANDING CLOUD COMPUTING   10hr

Cloud 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.931signaling, 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.