

I SEMESTER

MAT-511 COMPUTATIONAL METHODS AND STOCHASTIC PROCESSES

[3 1 0 4]

Probability and distribution, Stochastic processes and Queuing theory, Optimization Techniques. Numerical solutions to BVP's by finite difference and finite element methods. Solution of parabolic, elliptic, hyperbolic PDEs: Linear Algebra, Eigen values, Eigen vectors, Matrix computation and SVD.

References:

1. A Papoulis and S.U.Pillai, "Probability, Random Variables and Stochastic Processes", McGraw Hill.
2. P.Z.Peebles Jr., "Probability, Random Variables and Random Signal Principles", McGraw Hill.
3. S.C Chapra and RP Canale, "Numerical Methods for Engineers", Tata McGraw Hill.

CSE-501 ADVANCED CONCEPTS IN DATA BASE MANAGEMENT SYSTEMS

[3 1 0 4]

Overview of Relational Model, Query Processing - Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions. Query Optimization - Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation of Plans, Materialized Views, Physical DB Design and Tuning. Object and Object Relational Databases - Complex Data Types, Implementing Object and Object-Relational Features, SQL3, Parallel Databases - Database System Architectures, I/O Parallelism, Data Partitioning, Interquery, Intraquery, Intraoperation and Interoperation Parallelisms. Distributed Databases - Distributed data storage, Transactions, Commit Protocols, Concurrency Control, Availability, Query Processing. Data Warehouse and OLAP Technology, Semi Structured Data and XML - Structure of XML data, XML document schema, Querying and Transformation, Storage of XML data. Other Emerging Database Technologies and Applications

References:

1. Silberschatz, Korth and Sudarshan, "Database System Concepts", McGraw Hill, Sixth Edition, 2011.
2. Ramez Elmasri and S B Navathe, "Fundamentals of Database Systems", Pearson Education, Fifth Edition , 2007.
3. Thomas Connolly, Carolyn Begg, "Database Systems – A Practical Approach to Design, Implementation and Management", Pearson Education, 3rd Edition, 2003.
4. Ramakrishnan and Gehrke, "Database Management Systems", McGraw Hill, Third Edition, 2003.
5. Relevant research papers from the journals

CSE-503 ADVANCED COMPUTER NETWORKS

[3 1 0 4]

Brief Overview of TCP/IP suite of protocols- IP, ARP, ICMP, UDP, TCP, SMTP, FTP, HTTP. IPv6 and ICMPv6- basic protocol, extensions and options, support for QoS, security, etc., neighbor discovery, auto-configuration, routing, Changes to other protocols. Application Programming Interface for IPv6, Message Format, Error Messages, Informational Messages

Neighbor Discovery, Address Resolution, Router Discovery, Redirection, Group Membership, ICMPv6 Autoconfiguration, MAC protocols for high-speed LANS, MANs, and wireless LANS-DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet Fast access technologies: ADSL, Cable Modem, etc. Optical Networks: WDM, Wavelength routing, LightPaths/Lighttrails, Wavelength conversion and rerouting, Network Survivability and Provisioning, IP over DWDM, Next generation Optical Networks: Optical Circuit Switching, Optical Burst Switching, Optical Packet Switching, Multi-Protocol Label Switching (MPLS): MPLS Architecture and related protocols, Traffic Engineering (TE) and TE with MPLS, Transport protocols and congestion control, Quality of Service (QoS) with MPLS technology, Network recovery and restoration with MPLS technology, Voice over IP(VOIP):VOIP protocols: overview of H323 and SIP(session initiation protocol).Overview of VOIP call flows, IVR calls ,Advanced Routing and switching: Review of networking devices, routing and switching, VLAN, VTP, STP, Distance Vector Routing: RIP, algorithm, routing table format, routing update format, Link State Routing: OSPF, algorithm, routing table format, routing update format

References:

1. W. R. Stevens. "CP/IP Illustrated, Volume 1: The protocols," Addison Wesley, 1994.
2. Behrouz A.Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill, 4th Edition, 2010.
3. G. R. Wright and W. R. Stevens."TCP/IP Illustrated", Volume 2: The Implementation, Addison Wesley, 1995.
4. W. R. Stevens, "TCP/IP Illustrated, Volume 3: TCP for Transactions, HTTP, NNTP, and the Unix Domain Protocols", Addison Wesley, 1996.
5. Peter Loshin, "IPv6 Clearly Explained", Morgan Kauffman, 1999.
6. M. Gonsalves and K. Niles. "IPv6 Networks", McGraw Hill, 1998.
7. Bruce S. Davie, Adrian Farrel, "MPLS: Next Steps", Morgan Kaufmann, 2008
8. RFCs and Internet Drafts, available from Internet Engineering Task Force.
9. Articles in various journals and conference proceedings.
10. Krishna M.Sivalingham, Suresh Subramaniam, "Emerging Optical Network Technologies",Springer, 2004
11. Relevant research papers from the journals

CSE-505 OBJECT ORIENTED SYSTEM DEVELOPMENT

[3 1 0 4]

Introduction to information systems, Object Basics: encapsulation, Association and Aggregation, Inheritance, Dynamic and static type systems, Polymorphism, Dynamic Binding. Software development Methodologies, Requirements: Business perspective, Developer perspective. Introduction to OOAD with UML 2.0: structure diagrams, behavior diagrams, extension mechanisms Analyzing the problem: static and dynamic analysis, Designing the system architecture: priorities, system design, concurrency, security, Choosing technologies, typical front end configurations, back-end configurations. Designing subsystems: mapping the analysis class model into the design class model, handling persistence with a relational database, designing user interfaces, using patterns, frameworks and libraries, handling multiple activities. Reusable design patterns: patterns template, common design patterns. Specifying the interfaces of classes. Testing: automating tests, testing strategies, test driven development using JUnit.

References:

1. Mike O'Docherty, "Object-Oriented Analysis & Design- understanding System Development with UML 2.0", Wiley India Pvt. Ltd., 2010.
2. A. Dennis, B.H. Wixom and D. Tegarden, "Systems analysis and Design with UML version 2.0- an object oriented approach", Second edition, Wiley India Edition, 2006
3. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", McGraw Hill International Edition, 1999.

4. UML 2.0 Superstructure - Final Adopted Specification. Object Management Group, 2003
<http://www.omg.org/docs/ad/03-08-02.pdf>.
5. Relevant research papers from the journals

CSE-507 HIGH PERFORMANCE COMPUTER SYSTEMS

[3 1 0 4]

Introduction to Parallel Processing: Architectural classification schemes, Trends towards parallel processing, Parallelism in uniprocessor systems, Parallel Computer Structure, Applications of parallel processing. Principles of Pipelining: Principles of Linear and non-linear pipelining, classification of pipeline processors, general pipelines and reservation tables, Interleaved memory organization, SIMD computer organization, Masking and data routing mechanisms, SIMD interconnection networks, Multiprocessor Architecture: Functional structures, UMA and NUMA multiprocessors. Interconnection Networks: Time shared or common buses, Bus arbitration algorithm, Cross bar switch and multiport memories, Comparison of multiprocessor interconnection structure, multistage networks for multiprocessors. Algorithm Analysis, Algorithm design techniques, Parallel processing terminology and sieve of Eratosthenes, Speed up, scaled speed up and parallelizability, Elementary parallel algorithms, Matrix multiplication, Sorting, Combinatorial Search.

References:

1. Kai Hwang and Faye A. Briggs, "Computer Architecture and Parallel Processing," 1st Ed., McGraw Hill Inc., 1990.
2. J. L. Hennessy and D. A. Patterson, "Computer Architecture, A Quantitative approach," Morgan Kaufmann, 3rd edition, 2005.
3. Kai Hwang, "Advanced Computer Architecture – Parallelism, Scalability, Programmability", McGraw Hill, 1993.
4. Michael J. Quinn, "Parallel Computing – Theory and Practice," McGraw Hill Int. Edn., 2nd Ed., 1994.
5. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C," 8th Edition, 2007.
6. Relevant research papers from the journals.

HSS-501 RESEARCH METHODOLOGIES AND TECHNICAL COMMUNICATION.

[1 0 3 2]

Mechanics of Research Methodology - Types of Research, Significance of research, Research framework, Case study method, Experimental method, Sources of data, Data collection using questionnaire, Interviewing and experimentation. Research formulation-Components, selection and formulation of a research problem, Objectives of formulation, and Criteria of a good research problem. Research hypothesis – Criterion for hypotheses construction, Nature of hypotheses, need for having a working hypothesis, Characteristics and Types of hypothesis, Procedure of hypotheses testing. Sampling Methods Introduction to various sampling methods and their applications. Data Analysis–Sources of data, Collection of data, Measurement and scaling technique, and Different techniques of Data analysis. Thesis Writing and Journal Publication-Writing thesis, Writing journal and conference papers, IEEE and Harvard styles of referencing, Effective presentation, Copyrights, and avoiding plagiarism.

References:

1. Dr.Ranjit Kumar, "Research Methodology: A Step-by-Step Guide for Beginners", SAGE,2005

2. Geoffrey R. Marczyk, David DeMatteo & David Festinger, “Essentials of Research Design and Methodology”, John Wiley & Sons, 2004.
3. John W.Creswel, “Research Design : Qualitative, Quantitative, and Mixed Methods Approaches”, SAGE 2004
4. Suresh C.Sinha and Anil K.Dhiman, “Research Methodology (2 Vols-Set)”, Vedam Books, 2006.
5. C.R.Kothari, “Research Methodology: Methods and Techniques”, New Age International Publisher, 2008.

CSE-511 COMPUTING LAB I

[0 0 6 2]

Experiments/mini project based on the syllabus specified in Advanced Concepts in Database Management Systems, Advanced Computer Networks, Object Oriented System Development.

II SEMESTER

CSE-502 FORMAL METHODS IN COMPUTER SCIENCE

[3 1 0 4]

Finite Automata and Regular Expressions: Finite state systems, Basic definitions, Non deterministic finite automata, finite automata with E-moves, Regular expressions, Two-way finite automata, finite automata with output, applications of finite automata Properties of Regular Sets: The pumping lemma for regular sets, closure properties of regular sets, Minimization of finite automata. Context –free Grammars: Context free grammars, Derivation trees, simplification of context free Grammars, Chomsky normal form, Greibach normal form. Pushdown Automata: Definitions, PDA, and context free languages. Properties of Context Free Languages: The pumping lemma for CFLs, Closure properties of CFLs. Turing Machines: The TM Model, Computable languages and functions, Techniques for Turing machine construction, Modification of Turing Machines. Undecidability: The Church –Turing Thesis, Universal Turing Machines, the halting problem Computational Complexity: Boolean Satisfiability, The Class NP NP-completeness: Polynomial-time reductions.

References:

1. Hopcroft J.E., R. Motwani and Ullman J.D –“Introduction to Automata Theory, Languages and Computations”, Pearson Education, 2nd edn., 2003.
2. Lewis H.R and Papadimitriou C.H – “Elements of the Theory of Computation”, Pearson Education, 2nd edn., 2003.
3. Relevant research papers from the journals

CSE-504 ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING

[3 1 0 4]

Artificial Intelligence: Introduction, Intelligent Agents, Solving problems by searching, Informed Search methods, Game Playing, Knowledge Representation: Semantic Nets, Scripts, Frames. Expert Systems(ES): Introduction, Phases in building Expert Systems, Expert system architecture, ES versus traditional systems, Rule based ES, Blackboard systems, Truth Maintenance Systems, Applications. Neural Networks: Introduction, Basic Neural

Computational Models, Learning: Supervised versus unsupervised, Mathematical modeling. Fuzzy Systems: Basic concepts of fuzzy logic, Fuzzy sets, Fuzzy If-Then Rules, Neuro-Fuzzy Systems. Introduction to GA and NLP.

References:

1. Stuart Russell, & Peter Norvig, “Artificial Intelligence- A Modern Approach”, Pearson Education Asia, 2002.
2. Li Min Fu, “Neural Networks in Computer Intelligence”, TMH, 2003.
3. John Yen, & Reza Langari, “Fuzzy Logic- Intelligence, Control, & Information”, Pearson Education Asia, 2003.
4. Yegnanarayana, “Artificial Neural Networks”, EEE publications, 2005.
5. Simon Haykin, “Neural Networks-A Comprehensive Foundation”, Pearson Education Asia, 2nd edition, 2001.
6. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning publication, 1st Edition, 2011.
7. Relevant research papers from the journals.

CSE-512 COMPUTING LAB-II

[0 0 6 2]

Experiments/mini project based on the syllabus specified in Elective I and Elective III.

CSE-514 SEMINAR (0 0 3 1]

Each student has to present a seminar individually, on any technical topic related to the subject, but not covered in the syllabus. The time duration for presentation is 45 minutes and 15 minutes is devoted for question and answer session. Slides have to be prepared for the presentation. A seminar report has to be submitted at least one week before the day of the presentation.

Reference Materials : IEEE transactions, Technical journals, Proceedings of National and International Conferences, Web sites.

PROGRAM ELECTIVES

CSE-521 DISTRIBUTED COMPUTING SYSTEMS

[3 1 0 4]

Introduction to Distributed Computing Systems, Evolution of Distributed Computing System, Distributed Computing System Models, Introduction to Distributed Operating System, Issues in Designing a Distributed Operating System, Introduction to Distributed Computing Environment (DCE). Distributed shared memory, Design and implementation issues, Consistency models. Distributed Processes, Threads, Virtualization, Clients, Servers, Code migration. Security Engineering, Protocols, Hardware protection, Dependability concepts: Faults and Failures, Redundancy, Reliability, Availability, Safety, Security, Timeliness, Fault-classification, Fault-detection and location, Byzantine failures, Fault injection Fault-tolerant techniques, performability metrics. Emission Security, Technical Surveillance and countermeasures, Passive Attacks, Active Attacks. Electronic and Information warfare: Introduction, Basics, Communication system, Surveillance and target acquisition, IFF system, Directed Energy Weapon, Information Warfare.

References:

1. Pradeep. K. Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice-Hall of India, 2007.
2. Andrew S. Tennenbaum, and Maarten Van Steen, “Distributed Systems”, Prentice-Hall of India, 2008.
3. George Coulouries, Jean Dollimore, Tim Kindberg “Distributed Systems Concepts and Design” III Edition, Pearson Education Asia, 2004.
4. Ross J Anderson and Ross Anderson, “Security Engineering: A guide to building dependable distributed systems”, Wiley, 2001.
5. Relevant research papers from the journals

CSE-540 ADVANCED DATA STRUCTURES AND ALGORITHMS

[3 1 0 4]

Amortized Analysis - Aggregate analysis, The accounting method, The potential method, Dynamic Tables B-Trees - Definition of B-Trees, Basic operations on B-Trees, Deleting a key from a B-Tree. Binomial Heaps - Binomial trees and Binomial heaps, Operations on Binomial heaps. Fibonacci Heaps - Structure of Fibonacci heaps, Mergeable heap operations, Decreasing a key and deleting a node. Data structures for Disjoint sets – Disjoint-set operations, Linked-list representation of disjoint sets, Disjoint set forests. Minimum Spanning trees - Growing a minimum spanning tree, the algorithms of Kruskal and Prim Single-source Shortest Paths - The Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra’s algorithm. All-Pairs Shortest Paths - Shortest Paths and matrix multiplication, The Floyd-Warshall algorithm, Maximum Flow - Flow Networks, The Ford-Fulkerson method, Maximum bipartite matching

References:

1. Cormen T.H., Leiserson C.E, Rivest R.L. and Stein C. “Introduction to Algorithms” Prentice-Hall India, Second Edition, 2001.
2. Baase Sara and Gelder A.V - Computer Algorithms – “Introduction to Design and Analysis”, Pearson Education, Third Edition, 2000.
3. Relevant research papers from the journals.

CSE-542 DATA MINING AND BUSINESS ANALYTICS

[3 1 0 4]

Introduction to Business Intelligence, Basics of Data Integration ,Introduction to Multi-Dimensional Data Modeling, Basics of Enterprise Reporting, Data Mining functionalities Major issues in Data Mining, Applications and Trends in Data Mining, Association Rules Mining, Algorithms for discovering frequent itemsets, Mining various kinds of association rules, classification and Prediction , Clustering Analysis, Interactive Visual Data Analysis Sensing and Analyzing Univariate Data, Sensing and Analyzing Time Series Data

References:

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Second Edition, Elsevier
2. Michael Berry and Gordon Linoff, *Data Mining Techniques*, Wiley Publishing, 2004.
3. Kimball and Ross, The Data Warehouse Toolkit, Second Edition, John Wiley & Sons, 2002.
4. T. Davenport, "Competing on Analytics," Harvard Business Review (Decision Making), January 2006.
5. Fundamentals of Business Analytics by R.N Prasad , Seema Acharya
6. Business Intelligence by David Loshin
7. Business intelligence for the enterprise by Mike Biere
8. Business intelligence roadmap by Larissa Terpeluk Moss, Shaku Atre
9. An introduction to Building the Data Warehouse – IBM
10. Business Intelligence For Dummies – Swain Scheps
11. Successful Business Intelligence: Secrets to making Killer BI Applications by Cindi Howson
12. Information dashboard design by Stephen Few

CSE-544 COMPUTER VISION

[3 1 0 4]

IMAGE FORMATION: Cameras, Geometric Camera Models, Geometric Camera Calibration, Radiometry - Measuring Light. EARLY VISION: Linear Filters, Edge Detection, Texture, Stereopsis, Affine Structure from Motion, Projective Structure from Motion. MID-LEVEL VISION: Segmentation By Clustering, Segmentation By Fitting a Model, Segmentation and Fitting Using Probabilistic Methods, Tracking with Linear Dynamic Models. HIGH-LEVEL VISION: Model-Based Vision. Smooth Surfaces and Their Outlines, Finding Templates Using Classifiers, Recognition by Relations between Templates, Geometric Templates from Spatial Relations.

References:

1. Forsyth and Ponce, "Computer Vision : A Modern Approach", Pearson Education , 2003.
2. Linda Shapiro, George Stcplman, "Computer Vision", Prentice Hall, Jan. 2001.
3. Relevant research papers from the journals.

CSE-546 SECURE E-COMMERCE

[3 1 0 4]

Introduction to eCommerce: Illustration, eCommerce framework, Media Convergence, Anatomy of eCommerce application, Types of e Commerce: Interorganizational, intra organizational, C2B eCommerce, Communication Security goals; Consumer Oriented e Commerce: Major components of eCommerce, E commerce privacy policy, Network security policy, Firewall security policy, Requirements of transaction security, E commerce encryption, Mercantile Process Models: Illustration with case study; Digital Money Security Payment Transaction, Electronic Security basics, Limitation of eCommerce Security measures; Electronic Payment System: Limitations of traditional payment systems, Types of electronic payment systems, Digital token based system, Smartcard, Credit card based payment systems, eCash/eCheques, Risk and e Payment system. Automatic Teller Machine[ATM], ATM encryption, ATM fraud and Consequences for bankers; Security services: Payment transaction Security, Anonymity, Transaction untraceability, Confidentiality of payment transaction, Secure e Transaction [SET], Consumer, Legal, Business issues, Illustration with case discussion; Essentials of Crypto: Encryption Building blocks, Random Key generation, Properties of good crypto algorithm and their selection, Digital Signature, Public Key certificates; Illustration of e Commerce: Electronic Data Interchange [EDI], Supply Chain Management[SCM] fundamentals-Models-Elements, Online sales force automation, Software agents-Characteristics, technology, Telescript Agent

Language; E commerce and online publishing: Strategies, Approaches, Illustration, Digital copyright protection methods, Charting the online marketing process, Illustration with an example; Consumer search and resource discovery: Paradigms, Information filtering and retrieval; Mobile commerce: Wireless communication, WAP programming model; Customer effective web design: Illustration and Illustration with case study.

References:

1. Ravi Kalakota and Andrew Whinston –“Frontiers Electronic Commerce”, 2nd Edition, Addison-Wesley, 1999.
2. P.T. Joseph, S.J, “E Commerce”, 2nd Edition, Prentice Hall, 2008.
3. Anup Gosh, “E-Commerce Security and Privacy”, 2001
4. Relevant research papers from the journals

CSE-548 MOBILE COMMUNICATION AND NETWORKS **[3 1 0 4]**

Introduction to Wireless Communication Systems, Evolution of Mobile Radio Communications, Examples of Wireless Communication Systems, Wireless Medium Access Alternatives- Fixed assignment Access for Voice Oriented Networks, Random Access for Data Oriented Networks Principles of Wireless Network Operation-Network Planning, Wireless Network Operation, Wireless Networking-Traffic Routing in Wireless Networks, Common Channel Signaling, ISDN, SS7, Wireless Systems and Standards- AMPS and ETACS, IS-54 and IS-136, GSM, CDMA, CT2, DECT, PACS, PDC, PHS, Mobile Data networks, Wireless LAN- IEEE 802.11, Wireless ATM and HIPERLAN, WPAN, Bluetooth, Mobile Ad hoc Networks-Characteristics, Classification, Technologies, Routing, Wireless Sensor Networks-Differences from MANETs, Applications, Architecture, Routing, Mobile IP Advertisement, agents, registration, tunneling, Applications Overview of WAP, WAP architecture, transaction model

References:

1. Kaveh Pahlavan and Prashant Krishnamurthy, “Principles of Wireless Networks”, Prentice Hall of India-2002.
2. Theodore S Rappaport, “Wireless Communications Principles and Practice”, Pearson Education Asia, 2002.
3. Kumkum Garg, “Mobile Computing: Theory and Practice”, Pearson Education India, 2010
4. Charles E. Perkins, “Mobile IP Design Principles and Practices”, Addison Wesley Wireless Communication Series, 1998.
5. Sandeep Singhal, Thomas Bridgman, Lalitha Suyranarayana, Daniel Manuey, Jim Chan, David Bevis, Stefan Hild, Jari Alvinen, “Wireless Application Protocol”, Pearson Education, 2000.
6. Relevant research papers from the journals.

CSE-550 ADVANCED COMPUTER GRAPHICS **[3 1 0 4]**

Basic Raster Graphics Algorithms: Scan conversion of lines, circles and ellipses; Filling, clipping, antialiasing. Graphics Hardware: Raster and Random scan display systems; Interactive input devices. Geometric transformations: 2-D transformations, composition of transformations, window to viewport transformations, 3D transformations. 3-D Viewing: Projections – parallel and perspective Curves and Surfaces: Hermite, Bezier and B-Spline curves; surface representations

Solid Modeling:Representation of solids; operations on solids Light: Achromatic light – halftone approximations; Coloured light – XYZ, RGB, CMY models Visible surface determination: Visible line and surface determination algorithms Illumination and shading: Illumination models, Polygon rendering techniques. Animation: Methods of controlling Animation; Rules of animation

References:

1. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes “Computer Graphics – Principles and Practice in C”, Addison Wesley Pub. Co., 2nd Edition, 1997.
2. Donald Donald Hearn, Pauline Baker M., “Computer Graphics with OpenGL”, 3rd Edition, Pearson Education, 2004.
3. V.M. Newman and R.F. Sproull, “Principles of Interactive Computer Graphics”, McGraw Hill International, 2004.
4. Relevant research papers from the journals.

CSE-552 SOFTWARE ARCHITECTURE

[3 1 0 4]

Architecture in the system development life cycle - Architecture dimensions - Physical versus logical architectures, Module viewtypes and styles - Component-and-connector view types and styles – Allocation viewtypes and styles - Architecture patterns and frameworks - Evaluating architecture and Architecture based development, Understanding Quality Attributes - Achieving Qualities - Air Traffic Control - A Case Study in Designing for High Availability - Creating the Architecture - Flight Simulation: A Case Study in an Architecture for Integrability - documenting Software Architectures - Reconstructing Software Architectures, Architecture Representation - Data Architectures, Middleware Technologies - Remote procedure calls - Object middleware including DCOM and CORBA - Message-oriented middleware, Frameworks; Aspect oriented programming, Enterprise Java Beans architectures - Microsoft .NET architectures - Software Product Lines - Reusing Architectural Assets - A Case Study of an Industry Standard Computing Infrastructure, Case studies keyword in context, the WorldWide Web a case study in interoperability, Instrumentation software, cruise control, mobile robotics, three vignettes in mixed style. Software Architecture in the future.

References:

1. Len Bass, Paul Clements, and Rick Kazman, Software Architecture in Practice, second Edition, Pearson Education, 2003.
2. William J. Brown, Raphael C. Malveau, Hays W. Skip, McCormick and Thomas J.Mowbray, AntiPatterns: Refactoring Software, Architectures, and Projects in Crisis, Wiley, 1998.
3. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Miachel Stal, Douglas Schmidt, Pattern Oriented Software Architecture: A System of Patterns, John Wiley and sons, 2006.
4. Clements, P., Bachmann, F., Bass, L., Garlan, D., Ivers, J., Little, R., Nord, R., and Stafford, J., Documenting Software Architectures: Views and Beyond, Addison Wesley, 2000.
5. Shaw Mary , Garlan David , Software architecture perspectives on an emerging discipline,PHI publications 1996
6. Vasudev Verna,Software Architecture:A case based approach,Pearson Education, 2009.
7. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design patterns: Elements of Reusable Object-Oriented Software, Pearson Education, 1995.
8. Relevant research papers from the journals

CSE-554 NETWORK SECURITY

[3 1 0 4]

Network Attacks, Types of Attacks, Model for Internetwork Security. Firewalls, Packet filters, Application gateways, Circuit level Gateways, Stateful packet inspection, Security advantages of SPI, Implementation methods. Advanced Firewall Functionality., System Security. Intruders. Malicious Softwares: IPsec IPv4 and Ipv6., SKIP, IKE phases, Phase 1 IKE: Session Keys, Message IDs, Phase 2/Quick Mode, Traffic selectors, IKE Phase 1 protocols, Phase-2 IKE: Setting up IPsec SAs, ISAKMP/IKE Encoding: Fixed Header, Payload of ISAKMP Messages, SSL/, SSL/TLS Basic protocol, Session resumption, Computing the keys, Client authentication, PKI as deployed by SSL, Version Numbers, Negotiating cipher suites, Negotiating compression method, Attacks fixed in v3, Exportability, Encoding. PGP (Pretty Good Privacy) Signature Types, Key rings, Anomalies and Object formats. Kerberos V4, Realms, Interrealm authentication, Key version numbers, Encryption for privacy and Integrity, Encryption for Integrity Only, Network Layer addresses in tickets, Message formats. Kerberos V5 ASN.1, Evading password Guessing attacks, Key Inside Authenticator, Double TGT Authentication, PKINIT-Public Key for Users, KDC Database, Kerberos V5 Messages

References:

1. William Stallings, "Network Security Essentials: Applications and Standards", Pearson Education, 4th edition 2010.
2. Keith E. Strassberg, Richard J. Gondek, Gary Rollie, "Firewalls - The Complete Reference", Tata McGraw-Hill Edition, 2003.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security Private Communication in Public World", PHI Ltd, 2nd Edition, 2002.
4. Atul Kahate, "Cryptography and Network Security" Tata McGraw Hill, 2007.
5. Relevant research papers from the journals

CSE-556 EMBEDDED SYSTEMS

[3 1 0 4]

Introduction to Embedded Systems, Overview of Microcontrollers-Architecture and software development of 8/16 bit microcontrollers, Memory organization and bus architecture, Device drivers and Interrupt Servicing Mechanism, Context and periods for context switching, Deadline and interrupt latency; Introduction to Real Time Systems, Typical Real-Time Applications, Commonly Used Approaches to Hard Real-Time Scheduling, Optimality and Non optimality of EDF and LST algorithms, Clock-Driven Scheduling Notations and assumptions, Static Timer Driven Scheduler, General Structure of Cyclic Schedules, Cyclic Executives, Improving Average Response time of Aperiodic Jobs, Scheduling Sporadic Jobs, Acceptance Test, EDF Scheduling of Accepted Jobs, Priority-Driven Scheduling of Periodic Tasks, Fixed Priority versus Dynamic Priority Algorithms, Maximum Schedulable Utilization, Optimality of RM and DM algorithms, Schedulability tests for Fixed Priority tasks, Busy intervals, General Schedulability Test, Sufficient Schedulability Conditions for RM and DM algorithms, Schedulable Utilization of RM Algorithm for Tasks with $D_i=P_i$, Practical Factors, Resources and Resource Access Control, NonPreemptive Critical Sections, Basic Priority Inheritance Protocol, Basic Priority Ceiling Protocol, Stack Based Priority Ceiling Protocol, Use of priority Ceiling Protocol in Dynamic

References:

1. Raj Kamal, "Embedded Systems Architecture, Programming and design" Tata McGraw-Hill Publishing Company Limited, 2008
2. Jonathan W. Valvano, "Embedded Microcomputer Systems", Thomson Learning Brooks/Cole, 2002
3. Jane W.S. Liu, "Real Time Systems", Pearson Edition, 2004
4. Wayne Wolf, "Computers as Components: Principles of Embedded Computing system design", Harcourt India Private Limited, 2001.
5. Relevant research papers from the journals.

CSE-558 DIGITAL IMAGE ANALYSIS

[3 1 0 4]

Fundamental Steps and Components of Digital Image Processing, Visual Perception, Sampling and Quantization, Relationships between Pixels, Enhancement in the Spatial Domain, Enhancement in the Frequency Domain: Fourier Transform, Frequency-Domain Filters. Image Compression, Image restoration, Morphological Image Processing: Preliminaries, Some basic Morphological algorithms, Extension to Gray-Scale Images Segmentation: Detection of Discontinuities, Edge Linking and Boundary, Thresholding, Region-Based, Morphological Watersheds segmentations, Recognition Pattern Classes, using Decision-Theoretic, Structural Methods. Boundary Detection: On Associating Edge Elements, Searching Near an Approximate Location, Adjusting A Priori Boundaries, Non-Linear Correlation in Edge Space, Divide-and-Conquer, Hough Method for Curve Detection, Use of the Gradient, Generalizing the Hough Transform, Edge Following as Graph Searching, Good Evaluation Functions, Finding All the Boundaries, Texture: Texture Primitives, Structural Models of Texel Placement, Grammatical Models, Shape, Tree, Array Grammars Image.

References:

1. Rafael C. Gonzalez, Richard E. Woods, "*Digital Image Processing*", Pearson education, Second edition, 2004.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Digital Image Processing and Computer Vision", India Edition, Cengage Learning, 2008.
3. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Second Edition, McGrawHill Publication, 2010.
4. Relevant research papers from the journals

CSE-560 LINUX INTERNALS

[3 1 0 4]

Introduction Linux Versus Other Unix-Like Kernels, Hardware Dependency, Linux Versions, Basic Operating System Concepts, An Overview of the Unix Filesystem, An Overview of Unix Kernels. Memory Addressing, Memory Addresses, Segmentation in Hardware, Segmentation in Linux, Paging in Hardware, Paging in Linux, Processes Processes, Lightweight Processes, and Threads, Process Descriptor, Process Switch, Creating Processes, Destroying Processes, Kernel Synchronization, How the Kernel Services Requests, Synchronization Primitives, Synchronizing Accesses to Kernel Data Structures, Examples of Race Condition Prevention. Timing Measurements, The Linux Timekeeping Architecture, System Calls Related to Timing Measurements. Process Scheduling, Scheduling Policy, The Scheduling Algorithm, Data Structures Used by the Scheduler, Functions Used by the Scheduler, Queue Balancing in Multiprocessor Systems, System Calls Related to Scheduling. Memory Management, Page Frame Management, Memory Area Management, Noncontiguous Memory Area Management. The Virtual Filesystem The Role of the Virtual Filesystem (VFS), VFS Data Structures, Filesystem Types, Filesystem Handling, Pathname Lookup, Implementations of VFS System Calls, File Locking. I/o Architecture and device drivers. Process Communication, Pipes, Page Cache, Storing blocks in the page cache, Reading and writing a file, Page frame reclaiming algorithm, reverse mapping, implementing the PFRA, swapping, FIFOs, System V IPC, POSIX Message Queues.

References:

1. Daniel P. Bovet, Marco Cesati , “Understanding the Linux Kernel”, O'Reilly Publishers, 3rd Edition. 1996
2. Maurice J. Bach , “Design of Operating Systems”. 1992
3. Richard Stevens, “Advanced Programming In Unix.” 2004
4. Relevant research papers from the journals.

CSE-562 WEB SERVICES

[3 1 0 4]

Introduction to XHTML and Javascript, XML Concepts: What is XML, XML Elements and Attributes, XML Document Structure, Elements and Attributes Structure, XML Namespaces, XML Data Validation, XML 1.1 new features. XML Documents: XML document structure and Syntax, XML Namespaces, Element name tips. XML Data Format and Validation: XML parsers for data validation, Document Type Definitions, W3C XML Schemas. XML Parsing Concepts: Parsing XML with Document Object Model (DOM), Parsing XML with Simple API for XML(SAX) XSLT concepts and XSL transformations ,XForm, XML and Data Binding : DSOs, Storing and Binding data in HTML, Navigation from record to record, Binding XML data , Using DATA islands, Extracting data from DSO, Binding XML data into HTML tables. XML and Jscript: Reading Xml and Extracting data from it, Creating a DOM Document Object , Getting a Document's Document Element, Searching for XML Elements by name, Extracting Data from XML attributes. Xquery and usage of Xquery functions. Building Blocks of Web Services: Design of Information system, Architecture of an Information system, Middleware: Understanding Middleware, RPC and related Middleware, TP Monitors, object Brokers, Message Oriented Middleware, Web Service concept, SOAP, WSDL, UDDI. Microsoft.NET and Web Services: Creating and deploying .NET Web Services, Accessing .NET Web Services, Building a .NET Web Services Client. Advanced Web Services: Accessing Relational Data via Web Services, Authentication and Security for Web Services. Semantic Web – A layered approach, Semantic Web Technologies.

References

1. XML—A Beginner's Guide by Steven Holzner, Tata Mcgraw Hill Edition 2009 (ISBN-13: 978-0-07-014699-0, ISBN-10:0-07-014699-3)
2. Web Services Concepts , Architectures and Applications by Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju by Springer (First Indian Reprint 2009, ISBN: 978-81-8489-170-6)
3. XML 1.1 (covering J2EE, Java, Databases, Web Services and .NET) Programming Bible by Brian Benz with John R.Durant, WILEY Publishing Inc., First edition 2003
4. XML: How to Program, by Deitel, Deitel, Nieto, Lin and Sadhu, Prentice Hall. (new edition is still not out)
5. Web Services: A Technical Introduction: Deitel, Deitel, DuWaldt, and Trees, Prentice Hall. (gives a good perspective of web services)
6. Essential XML Quick Reference: A Programmer's Reference to XML, XPath, XSLT, XML Schema,
7. SOAP, and More by Aaron Skonnard, Martin Gudgin (Paperback)
8. The Official XMLSPY Handbook by Larry Kim (Paperback - February 2003)
9. Microsoft .NET for Programmers by Fergal Grimes (Paperback - January 2002)
10. ASP.NET: The Complete Reference by Matthew Macdonald, Robert Standefer.
11. A Semantic Web primer by Grigoris Antoniou and Frank van Harmelen, PHI 2nd Edition (ISBN: 978-81-203-4054-1)
12. Relevant research papers from the journals

CSE-564 SOFTWARE TESTING AND ANALYSIS

[3 1 0 4]

Software Test and Analysis in a nut shell, A Framework for Test and Analysis – Validation and verification, Basic Principles, Test and Analysis Activities Within a Software Process, Finite models, Dependence and data flow models, Test case selection and adequacy, Test specification and cases, adequacy criteria, comparing criteria, Structural testing, Data flow testing, Model-based testing, Testing object-oriented software, Fault based testing, Program analysis, automating analysis and test

References:

1. Mauro Pezze, Michal Young, “Software Testing and Analysis: Process, Principles and Techniques”, John Wiley & Sons, 2008.
2. Paul C Jorgensen, "Software Testing: A Craftsman's Approach", Second Edition Paul C Jorgensen, CRC Press, June 26, 2002.
3. Glenford J. Myers "The Art of Software Testing," 2nd ed., John Wiley & Sons, Inc., Hoboken, New Jersey, 2004.
4. Cem Kaner, James Bach, and Bret Pettichord,"Lessons Learned in Software Testing: a Context-Driven Approach," John Wiley & Sons, Inc., New York, 2002.
5. Aditya P Mathur, “Foundations of Software Testing”, Pearson Education, 2008.
6. Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2nd Edition, Pearson, 2007.
7. Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004.
8. The Craft of Software Testing - Brian Marrick, Pearson Education, 1995
9. Relevant research papers from the journals

OPEN ELECTIVE

CSE-536 MULTICORE PROGRAM OPTIMIZATION

[3 0 0 3]

Introduction to parallel computers; Instruction Level Parallelism (ILP); Multiprocessors and thread level parallelism; Shared Memory Multiprocessors; Cache coherence problems; Snoopy protocols: invalidate vs. update; Memory consistency models; Hyper threading technology architecture, multi-core architecture; Multi-threading on single core versus multi-core platforms; Amdahl's law; Power consumption; Synchronization; Introduction to Basic optimization; Hot Spot, Faster Algorithms, Data Dependency, Branching, Memory, Loops, Slow Operations; Introduction to Performance Tools (Intel Software Tools); Introduction to Multi-core Optimization; ILP vs TLP, Data vs Task Parallelism, Threading and Parallel programming constructs, Threading APIs, Multi Threading with OpenMP, Threading Goals and Issues; Multithreaded and Parallel Applications Case studies; Some applications in Integer Programming, Digital Signal Processing (Video Codec)

References:

1. Richard Gerber, Aart J. C. Bik, Kevin B. Smith, and Xinmin Tian, The Software Optimization Cookbook High Performance Recipes for IA-32 Platforms, 2nd Edition, Intel Press
2. Shameem Akhter, Jason Roberts. Multi-Core Programming: Increasing Performance through Software Multi-threading
3. J. L. Hennessy and D. A. Patterson. Computer Architecture: A Quantitative Approach, Morgan Kaufmann Publishers, 3rd Edition
4. D. E. Culler, J. P. Singh, with A. Gupta. Parallel Computer Architecture: A Hardware/Software Approach. Morgan Kaufmann Publishers, 2nd Edition
5. Relevant papers from Intel, IEEE and other journals
6. <https://computing.llnl.gov/tutorials/pthreads/>
7. www.llnl.gov/computing/tutorials/openMP/

CSE-538 INFORMATION STORAGE AND MANAGEMENT

[3 0 0 3]

Introduction to Information Storage and Management, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Information Lifecycle, Storage System Environment, Disk Drive Laws Governing Disk Performance, Logical Components, Application Requirements and Disk Performance, Data Protection, RAID, Implementation, RAID Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares, Intelligent Storage System, Components, Intelligent Storage Array, EMC CLARiiON and Symmetrix, Direct Attached Storage and Introduction to SCSI, Types of DAS, Benefits and Limitations, Introduction to Parallel SCSI, SCSI Command Model, Storage Area Networks, The SAN and Its Evolution, Components of SAN, FC Connectivity, Fibre Channel Ports, World Wide Names, Zoning, Fibre Channel Login Types, FC Topologies, EMC Connectrix, Network Attached Storage, Benefits of NAS, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, EMC Celerra, Content-Addressed Storage, Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples, EMC Centera, Storage Virtualization, Forms of Virtualization, Storage Virtualization Configurations, Storage Virtualization Challenges, Types of Storage Virtualization, Backup and Recovery, Backup Purpose, Backup Considerations, Backup Granularity, Recovery

Considerations, Backup Methods, Backup Process, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies, EMC NetWorker, Local Replication, Remote Replication.

References:

1. G. Somasundaram, Alok Shrivastava, “ Information Storage and Management Storing, Managing, and Protecting Digital Information”, EMC Education Services, Wiley India Edition, 2009.
2. Marc Farley, “Storage Networking Fundamentals”, CISCO Systems, First edition, 2004.
3. Gupta Meena, “Storage Area Network Fundamentals”, Pearson Ed.
4. Robert Spalding, “Storage Networks: The Complete Reference“, Tata Mcgraw Hill, 2003.
5. Marc Farley Osborne, “Building Storage Networks”, Tata McGraw Hill, Second edition, 2001.
6. Relevant research papers from the journals

III/IV SEMESTER

CSE-699 DISSERTATION/THESIS/PROJECT [- - - 40]

The duration of this major project is one year. Students are required to undertake innovative and research oriented projects, which not only reflect their knowledge gained in the previous two semesters but also additional knowledge gained from their own effort. They must show the phase wise development of their project submitting the appropriate documents at the end of each phase.