JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

COURSE STRUCTURE FOR DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.Tech-CSE- Computer Science and Engineering and Computer Science

w.e.f. 2017-18 Admitted Batch onwards

M.Tech I Semester

S.No	Subject Code	Subject	L	T	P	C
1.	17D08101	Advanced Data Structures and Algorithms	4	-	-	4
2.	17D25102	Fundamentals of Data Science	4	-	-	4
3.	17D25203	Software Patterns	4	-	-	4
4.	 17D25207 17D58101 17D58102 17D08109	Elective-I a. Software Project Management b. Information Security c. Distributed Databases d. Neural Networks	4	-	-	4
5.	 17D58103 17D08206 17D08104 17D58104	Elective-II a. Professional Aspects In Software Engineering b. Artificial Intelligence c. Internals of Operating Systems d. Multicore Architecture & Programming	4	-	-	4
6.	17D08110	Advance Data Structures & Algorithms Lab	-		4	2
7.	17D58105	R & Analytics Lab	-		4	2
8.	17D25214	Software Patterns Lab	-		4	2
		Total	**20**		**12**	**26**

M.Tech II Semester

S.No	Subject Code	Subject	L	T	P	C
1.	17D08203	Cloud Computing	4	-	-	4
2.	17D25208	Big Data Analytics	4	-	-	4
3.	17D08201	Mobile Application Development	4	-	-	4
4.	 17D25206 17D25201 17D08103 17D58201	Elective-III a. Internet of Things b. Advances in Software Testing c. Network Security & Cryptography d.NOSQL databases	4	-	-	4
5.	 17D08208 17D58202 17D25210 17D58203	Elective-IV a. Machine Learning b. Distributed Computing c. Software Configuration Management d. Natural Language Processing	4	-	-	4
6.	17D08212	Map Reduce Programming Lab	-	-	4	2
7.	17D58204	SPARK Programming Lab	-	-	4	2
8.	17D08210	Mobile Application Development Lab	-	-	4	2
		Total	**20**		**12**	**26**

M.Tech IIISemester

S.No	Subject Code	Subject	L	T	P	C
1.	17D20301 17D20302 17D20303	Elective-V (Open Elective) 1. Research Methodology 2.Human Values & Professional Ethics 3.Intellectual Property Rights	4	-	-	4
2.	17D58301	Elective-VI (MOOCs)	-	-	-	-
3.	17D58302	Comprehensive Viva-Voice	-	-	-	2
4.	17D58303	Seminar	-	-	-	2
5.	17D58304	Teaching Assignment	-	-	-	2
6.	17D58305	Project work Phase-I	-	-	-	4
		Total	**04**	**-**	**-**	**14**

M.TechIV Semester

S.No.	Subject Code	Subject	L	T	P	C
1.	17D58401	Project work Phase - II	-		-	12
		Total	**-**		**-**	**12**

Project Viva Voce Grades:

A: Satisfactory
B: Not Satisfactory

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D08101) ADVANCED DATA STRUCTURES AND ALGORITHMS

UNIT I : Overview of Data Structures - Arrays, Stacks, Queues, linked lists , Linked stacks and Linked queues, Applications

Algorithm Analysis - Efficiency of algorithms, Asymptotic Notations, Time complexity of an algorithm using O notation, Polynomial Vs Exponential Algorithms, Average, Best, and Worst Case Complexities, Analyzing Recursive Programs.

UNIT II: Trees and Graphs – Basics of trees and binary trees, Representation of trees and Binary trees, Binary tree Traversals, Threaded binary trees, Graphs, representation and traversals.

Binary Search Trees, AVL Trees and B Trees - Binary Search Trees: Definition, Operations and applications. AVL Trees: Definition, Operations and applications. B Trees: Definition, Operations and applications.

UNIT III: Red – Black Trees, Splay Trees and Hash Tables - Red–Black Trees, Splay Trees and their applications, Hash Tables, Hash Functions and various applications, File Organizations.

UNIT IV: Divide – and – Conquer & Greedy Method - General Method, Binary Search, Finding Maximum and Minimum, Quick Sort, Merge sort, Strassen's Matrix Multiplication, Greedy Method- General Method, Minimum Cost Spanning Trees, Single Source Shortest Path.

Back Tracking and Branch – and – Bound - General Method, 8 – Queen's Problem, Graph Coloring. Branch – and – Bound: The Method, LC Search, Control Abstraction, Bounding, 0 / 1 Knapsack Problem.

UNIT V: Dynamic Programming - General Method, All Pairs Shortest Path, Single Source Shortest Path, 0 /1 Knapsack problem, Reliability Design, Traveling Sales Person's Problem.

Text Books:

1. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press.

References:

1. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education, 2010.
2. Classic Data Structures by D. Samanta, 2005, PHI
3. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG
6. Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3rd Edition, Galgotia.
7. Data Structures and Algorithms in C++ by Drozdek 2nd Edition, Thomson.

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D25102) FUNDAMENTALS OF DATA SCIENCE

UNIT - I

Introduction, What Is Statistical Learning?, Why Estimate f?, How Do We Estimate f?, The Trade-Off Between Prediction Accuracy and Model Interpretability, Supervised Versus Unsupervised Learning, Regression Versus Classification Problems, Assessing Model Accuracy, Measuring the Quality of Fit, The Bias-Variance Trade-of, The Classification Setting, Introduction to R, Basic Commands, Graphics, Indexing Data, Loading Data, Additional Graphical and Numerical Summaries.

UNIT – II

Linear Regression, Simple Linear Regression, Multiple Linear Regression, Other Considerations in the Regression Model, Comparison of Linear Regression with K-Nearest Neighbours, Linear Regression.

UNIT-III

Classification, Logistic Regression, Linear Discriminant Analysis, A Comparison of Classification Methods, Logistic Regression, LDA, QDA, and KNN.

UNIT- IV

Programming for basic computational methods such as Eigen values and Eigen vectors, sparse matrices, QR and SVD, Interpolation by divided differences.

Data Wrangling: Data Acquisition, Data Formats, Imputation, The split-apply-combine paradigm.

UNIT-V

Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity.

Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.

Text Books:

1. Gareth James Daniela Witten Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, February 11, 2013, web link: www.statlearning.com.
2. Mark Gardener, Beginning R The statistical Programming Language, Wiley, 2015.
3. Han , Kamber, and J Pei, Data Mining Concepts and Techniques, 3rd edition, Morgan Kaufman, 2012.

References:

1. Sinan Ozdemir, Principles of Data Science, Packt Publishing Ltd Dec 2016.
2. Joel Grus, Data Science from Scratch, Oreilly media, 2015.

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D25203) SOFTWARE PATTERNS

UNIT I

Envisioning Architecture - What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views and the Architecture Business Cycle.

Creating an Architecture - Quality Attributes, Achieving qualities, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT II

Introduction to Patterns - What is a Pattern? What makes a Pattern? Pattern Categories, Relationships between Patterns, Pattern Description, Patterns and Software Architecture.

Architectural Patterns

Layers, Pipes and Filters, Blackboard, Broker, Microkernel, MVC, PAC, Reflection.

UNIT III

What is Design Pattern, Organizing catalogs, Role in solving design problems, Selection and Usage, **Creational Patterns -** Abstract factory, builder, factory method, prototype, singleton,

UNIT IV

Structural Patterns - Adapter, bridge, composite, decorator, façade, flyweight, Proxy, Decorator, façade, flyweight, Proxy.

UNIT V

Behavioral Patterns - Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, and visitor.

Case Studies – Designing a Document Editor - Design issues of Lexi Editor in Deign Patterns, The World Wide Web - a case study in interoperability

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education,2003.
2. Pattern-Oriented Software Architecture", A System of Patterns, Frank Buschmann Regine Meunier, Hans Rohnert, Peter Sommerlad and Michael Stal, WlLEY.
3. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Pearson Education.

REFERENCE BOOKS:

1. AntiPatterns: Refactoring Software, Architectures, and Projects in Crisis, by William J. Brown, Raphael C. Malveau, Hays W. "Skip" McCormick , Thomas J. Mowbray (Author) 1st Edition,
2. Java testing patterns, John Thomas etc, wiley.
3. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR,2001
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D25207) SOFTWARE PROJECT MANAGEMENT

(Elective-I)

UNIT I : Project Evaluation And Project Planning

Importance of Software Project Management, Activities Methodologies, Categorization of Software Projects , Setting objectives , Management Principles, Management Control, Project portfolio Management, Cost-benefit evaluation technology, Risk evaluation, Strategic program Management, Stepwise Project Planning.

UNIT II : Project Life Cycle And Effort

Software process and Process Models, Choice of Process models, mental delivery, Rapid Application development, Agile methods, Extreme Programming, SCRUM, Managing interactive processes, Basics of Software estimation, Effort and Cost estimation techniques, COSMIC Full function points, COCOMO II A Parametric Productivity Model, Staffing Pattern.

UNIT III : Activity Planning And Risk Management

Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass & Backward Pass techniques, Critical path (CRM) method, Risk identification, Assessment, Monitoring, PERT technique, Monte Carlo simulation, Resource Allocation, Creation of critical patterns, Cost schedules.

UNIT IV : Project Management And Control

Framework for Management and control, Collection of data Project termination, Visualizing progress, Cost monitoring, Earned Value Analysis- Project tracking, Change control- Software Configuration Management, Managing contracts, Contract Management.

UNIT V : Staffing In Software Projects Managing people, Organizational behavior, Best methods of staff selection, Motivation, The Oldham-Hackman job characteristic model, Ethical and Programmed concerns, Working in teams, Decision making, Team structures, Virtual teams, Communications genres, Communication plans.

Text Books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References Books:

1. Robert K. Wysocki “Effective Software Project Management” – Wiley Publication,2011.
2. Walker Royce: “Software Project Management”- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, “Managing Global Software Projects” – McGraw Hill Education (India), Fourteenth Reprint 2013.

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D58101) INFORMATION SECURITY
(Elective-I)

Unit-I

Computer Security concepts, The OSI Security Architecture, Security attacks, Security services and Security mechanisms, A model for Network Security

Classical encryption techniques- symmetric cipher model, substitution ciphers, transposition ciphers, Steganography.

Modern Block Ciphers: Block ciphers principles, Data encryption standard (DES), Strength of DES, linear and differential cryptanalysis, block cipher modes of operations, AES, RC4.

Unit-II

Introduction to Number theory – Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence, Algebraic Structures, GF(2^n) Fields, Primes, Primality Testing, Factorization, Chinese remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

Public-key cryptography - Principles of public-key cryptography, RSA Algorithm, Diffie-Hellman Key Exchange, ELGamal cryptographic system, Elliptic Curve Arithmetic, Elliptic curve cryptography

Unit-III

Cryptographic Hash functions: Applications of Cryptographic Hash functions, Requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)

Message Authentication Codes: Message authentication Requirements, Message authentication functions, Requirements for Message authentication codes, security of MACs, HMAC, MACs based on Block Ciphers, Authenticated Encryption

Digital Signatures-RSA with SHA & DSS

Unit-IV

Key Management and distribution: Symmetric key distribution using Symmetric Encryption, Symmetric key distribution using Asymmetric, Distribution of Public keys, X.509 Certificates, Public key Infrastructure.

User Authentication: Remote user Authentication Principles, Remote user Authentication using Symmetric Encryption, Kerberos, Remote user Authentication using Asymmetric Encryption, Federated Identity Management, Electronic mail security: Pretty Good Privacy (PGP), S/MIME.

Unit-V

Security at the Transport Layer (SSL and TLS) : SSL Architecture, Four Protocols, SSL Message Formats, Transport Layer Security, HTTPS, SSH

Security at the Network layer (IPSec): Two modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange.

System Security: Description of the system, users, Trust and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, worms, viruses, Intrusion Detection System(IDS), Firewalls

Text books:

1. “Cryptography and Network Security”, Behrouz A. Frouzan and DebdeepMukhopadhyay, McGraw Hill Education, 2nd edition, 2013.

2.“Cryptography and Network Security: Principals and Practice”, William Stallings, Pearson Education , Fifth Edition, 2013.

References:

1. “Network Security and Cryptography”, Bernard Menezes ,Cengage Learning.
2. “Cryptography and Security”, C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, Wiley-India.
3. “Applied Cryptography, Bruce Schiener, 2nd edition, John Wiley & Sons.
4. “Cryptography and Network Security”, AtulKahate, TMH.
5. ‘Introduction to Cryptography”, Buchmann, Springer.
6. ‘Number Theory in the Spirit of Ramanujan”, Bruce C.Berndt, University Press
7. “Introduction to Analytic Number Theory”, Tom M.Apostol, University Press

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D58102) DISTRIBUTED DATABASES
(Elective-I)

UNIT-I: Introduction of DDBMS

Distributed data processing- Data delivery alternatives- challenges of DDBSs-Design issues-Distributed DBMS Architecture-Overview of relational DBMS-review of computer networks- Distributed databases design-Top down design process-Distribution design issues-Fragmentation- Allocation-data directory-database integration- bottom up design methodology-schema matching- schema integration- schema mapping- data cleaning.

UNIT-II: Data and Access control

View management-data security-semantic integrity control-overview of query processing-query processing problem-objectives of query processing-complexity of relational Algebra operations-characterization of query processors-layers of query processing-query decomposition and data localization-query decomposition-localization of distributed data.

UNIT-III: Optimization of queries and transaction management

Query optimization-centralized query optimization-join ordering in distributed queries-Distributed query optimization-multi database query processing-issues in multi database query processing- multi database query processing archicture-query rewriting using views-query optimization and execution-query translation and execution-introduction to transaction management- definition of a transaction-properties of transactions-types of transactions-archicture revisited.

UNIT-IV: Distributed concurrency control & Replication

Serializability theory-Taxonomy of concurrency control mechanisms-locking based concurrency control algorithms-timestamp based concurrency control algorithms-optimistic concurrency control algorithms-deadlock management-“Relaxed” concurrency control-Distributed DBMS Reliability- Reliability concepts and measures-failures in Distributed DBMS-local Reliability protocols- Distributed Reliability protocols-Dealing with site failure-network partitioning-architectural considerations-data replication-consistency of replicated databases-update management strategies-replication protocols-group communication-replication and failures-replication mediator service.

UNIT-V: Database systems-Various Models

Parallel database system architectures-parallel data placement-parallel query processing load balancing-database clusters-distributed object database management-fundamental object concepts and object models-object distributed design- architectural issues-object

management-distributed object storage-object query processing-transaction management-web data management-web graph management-web search-web querying-distributed XML Processing.

TEXT BOOKS:

1. M. Tamer Ozsu, Patrick Valduriez, Principles of Distributed Database Systems, Springer, 2011.

REFERENCE BOOKS:

1. Chhandra Ray, Distributed database systems, Pearson education, India, 2012.
2. Stefano Ceri, Giuseppu Pelagatti, Distributed databases: Principles and systems, Mc Graw Hill Education, 2008.

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D08109) NEURAL NETWORKS

(Elective-I)

UNIT – I

BASICS OF ARTIFICIAL NEURAL NETWORKS: Characteristics of Neural Networks, Historical Development of Neural Network Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws

UNIT II

ACTIVATION AND SYNAPTIC DYNAMICS: Activation Dynamics Models, Synaptic Dynamics Models, Learning Methods, Stability and Convergence, Recall in Neural Networks.

UNIT III

FUNCTIONAL UNITS OF ANN FOR PATTERN RECOGNITION TASKs: Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units: Pattern Recognition Tasks by Feed forward Neural Networks, Pattern Recognition Tasks by Feedback Neural Networks, Pattern Recognition Tasks by Competitive Learning Neural
Networks

UNIT IV

FEEDFORWARD NEURAL NETWORKS: Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of Pattern Mapping Networks

UNIT V

FEEDBACK NEURAL NETWORKS: Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks, Stochastic Networks and Simulated Annealing, Boltzmann Machine

Text Books:

1. “Artificial Neural Networks”, B. Yegnanarayana – PHI Publications

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D25107) PROFESSIONAL ASPECTS IN SOFTWARE ENGINEERING

(Elective-II)

UNIT-I:

Intellectual Property rights Confidential Information, Copyright, Infringement of Copyright, Acts permitted in Relation to Copyright Works, Licensing and Assignment of Copyright, Moral Rights, Designs, Trademarks, The tort of passing off, Domain Names, Patents.

UNIT-II:

Software Licenses, Copyright, Contract, Patent, Free Software and Open Source Software, MIT License, BSD, License, GNU General Public License, GNU Lesser General Public License, Q Public License, Proprietary License, Sun Community License.

UNIT-III:

Software Contracts:

Basics of Software Contracts, Extent of liability, Contract for the supply of custom-built software at a fixed price, other types of software service Contract, Liability for defective software.

UNIT-IV:

Software Crime Prevention

Computing and criminal Activity, Reforms of Criminal Law, Categories of Misuse, Computer Fraud, Obtaining Unauthorized Access to Computer, Unauthorized Alteration or Destruction of Information, Denying Access to an Authorized user, Unauthorized Removal of Information Stored in a Computer.

UNIT-V:

Data Protection Regulations, Data Protection and Privacy, The impact of the Internet, Factors Influencing the Regulation of Data Processing, Convergence of Data Protection Practice, Defamation and the protection of Reputation.

REFERENCES:

1. Andrew M. St. Laurent, “Open Source and Free Software Licensing”, O’Reilly, Publications.

2. Frank Bott, et. al, “Professional Issues in Software Engineering”, Taylor &

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D08206) ARTIFICIAL INTELLIGENCE

(Elective-II)

Unit – I

Foundations of AI: What is AI, History of AI, Strong and weak AI, The State of the Art.

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit – II

Solving Problems by Searching: Problem – Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

Unit – III

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

Unit – IV

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

Unit – V

Learning Probabilistic Models: Statistical Learning, Learning with Complete data, Learning with Hidden variables: The EM Algorithm.

Text Books :

1. "Artificial Intelligence A Modern Approach", Stuart J. Russell & Peter Norvig – Pearson.
2. "Artificial Intelligence", Elaine Rich, Kevin Knight & Shivashankar B Nair – McGraw Hill Education.

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D08104) INTERNALS OF OPERATING SYSTEMS

(Elective-II)

UNIT-I : BUFFER CACHE AND FILE SUB-SYSTEM

Introduction to kernel- Architecture of the UNIX operating system, System Concepts, Data structures.

Buffer Cache: Buffer header, Structure of buffer pool, Reading and writing disk blocks. Files INODES, Structure of a regular file, Directories, Super block, Inode assignment.

UNIT-II : SYSTEM CALLS AND PROCESS SUB-SYSTEM

System calls- OPEN, READ, CLOSE, WRITE, CREATE, CHMOD, CHOWN, Pipes, Mounting and Unmounting. Process Layout the system memory, context, process control, process creation, signals, process scheduling, time, clock.

UNIT-III : INTER PROCESS COMMUNICATIONS

Inter-process communications- Process tracing, System V IPC, Shared Memory, Semaphores. Network Communications- Socket Programming: Sockets, descriptors, connections, socket elements, Stream and datagram sockets.

UNIT-IV : WINDOWS SYSTEM COMPONENTS

Windows Operating System- versions, concepts and tools, Windows internals, System architecture, requirements and design goals, operating system model, architecture overview, key system components. System mechanisms- Trap dispatching, object manager, synchronization, system worker threads, windows global flags, local procedural calls, kernel event tracing.

UNIT-V : REGISTRY AND PROCESS MANAGEMENT

Windows management mechanisms- the registry, registry usage, registry data types, local structure, trouble shooting registry problems, registry internals, services, applications, accounts, service control manager, windows management instrumentation, processes, threads and jobs: Process internals, flow of create process, thread internals, examining thread creation, thread scheduling, job objects.

TEXT BOOKS:

1. Maurice J. Bach, The design of the UNIX operating system, Prentice hall of India,1991
2. Mark E. Russinovich and David A. Solomon, Microsoft Windows Internals, Microsoft Press, 2004.

REFERENCE BOOKS:

1. William Stallings, “Operating Systems: Internals and Design Principles”, 5th Edition, Prentice Hall, 2005.

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M.Tech I semester (CSE & CS)

L	T	P	C
4	0	0	4

(17D58103) MULTI-CORE ARCHITECTURES & PROGRAMMING
(Elective-II)

UNIT - I

Fundamentals of SuperScalar Processor Design, Introduction to Multicore Architecture – Chip Multiprocessing, homogeneous Vs heterogeneous design - SMP – Multicore Vs Multithreading. Shared memory architectures– synchronization – Memory organization – Cache Memory – Cache Coherency Protocols - Design of Levels of Caches.

UNIT - II

Multicore programming Model – Shared memory model, message passing model, transaction model – OpenMP and MPI Programming. PowerPC architecture – RISC design, PowerPC ISA, PowerPC Memory Management - Power 5 Multicore architecture design, Power 6 Architecture.

UNIT - III

Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element), Cell Software Development Kit, Programming for Multicore architecture.

UNIT - IV

PRAM Model – PRAM Algorithms – Parallel Reduction – Prefix Sums – List Ranking – Preorder Tree Traversal – Merging Two Sorted Lists – Graph Coloring – Reducing Number of Processors – NC Class. Classifying MIMD Algorithms – Hypercube SIMD Model – Shuffle Exchange SIMD Model – 2D Mesh SIMD Model – UMA Multiprocessor Model – Broadcase – Prefix Sums. Enumeration Sort – Lower Bound on Parallel Sorting – Odd-Even Transposition Sort –Bitonic Merge – Parallel Quick Sort – Complexity of Parallel Search – Searching on Multiprocessors.

UNIT - V

P-Depth Search – Breadth Death Search – Breadth First Search – Connected Components – All pair Shortest Path – Single Source Shortest Path – Minimum Cost Spanning Tree. Matrix Multiplication on 2-D Mesh, Hypercube and Shuffle Exchange SIMD Models – Algorithms for Multiprocessors – Algorithms for Multicomputers – Mapping Data to Processors.

REFERENCES

1. Hennessey and Pateterson, “Computer Architecture A Quantitative Approach”, Harcourt Asia, Morgan Kaufmann, 1999.
2. Joseph JaJa, “Introduction to Parallel Algorithms”, Addison-Wesley, 1992.
3. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability and Programmability” McGraw-Hill, 1993.
4. Richard Y. Kain, “Advanced Computer Architecture: A System Design Approach”, PHI, 1999.
5. Rohit Chandra, Ramesh Menon, Leo Dagum, and David Kohr, “Parallel Programming in OpenMP”, Morgan Kaufmann, 2000.
6. Michael J. Quinn, “Parallel Computing: Theory & Practice”, Tata McGraw Hill Edition, 2003.
7. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, “Introduction to
8. Parallel Computing”, 2nd Edition, Addison Wesley, 2003.

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M.Tech I semester (CSE & CS)

L	T	P	C
0	0	4	2

(17D08110) ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

1. Write C++ programs to implement the following using an array.

   a) Stack ADT b) Queue ADT

2. Write C++ programs to implement the following using a singly linked list.

   a) Stack ADT b) Queue ADT

3. Write C++ programs to implement the deque (double ended queue) ADT using a doubly linked list and an array.
4. Write a C++ program to perform the following operations:

   a) Insert an element into a binary search tree.

   b) Delete an element from a binary search tree.

   c) Search for a key element in a binary search tree.

5. Write C++ programs that use recursive functions to traverse the given

   binary tree in

   a) Preorder b) inorder and c) postorder.

6. Write C++ programs that use non-recursive functions to traverse the given

   binary tree in

   b) Preorder b) inorder and c) postorder.

7. Write C++ programs for the implementation of bfs and dfs for a given graph.

8. Write C++ programs for implementing the following sorting methods:

   a) Merge sort b) Heap sort

9. Write a C++ program to perform the following operations

    a) Insertion into a B-tree b) Deletion from a B-tree

10. Write a C++ program to perform the following operation

    a) Insertion into an AVL-tree

11. Write a C++ program to implement all the functions of a dictionary (ADT) using hashing.

12. Write a C++ program for implementing Knuth-Morris- Pratt pattern matching algorithm.

(Note: Use Class Templates in the above Programs**)**

References::

1. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education, 2010.
2. Classic Data Structures by D. Samanta, 2005, PHI
3. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG
6. Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3rd Edition, Galgotia.
7. Data Structures and Algorithms in C++ by Drozdek 2nd Edition, Thomson.
8. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press

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M.Tech I semester (CSE & CS)

L	T	P	C
0	0	4	2

(17D58104) R & ANALYTICS LAB

1. Installation of R

   Installing R in windows, R Console (R window to edit and execute R Commands), Commands and Syntax (R commands and R syntax), Packages and Libraries (Install and load a package in R), Help In R, Workspace in R.

2. Implement the data structures using R Programming

   Introduction to Data Types (Why Data Structures?, Types of Data Structures in R), Vectors, Matrices, Arrays, Lists, Factors, Data Frames, Importing and Exporting Data.
3. Implement the Graphical Analysis using R

   Creating a simple graph (Using plot() command), Modifying the points and lines of a graph (Using type, pch, font, cex, lty, lwd, col arguments in plot() command), Modifying Title and Subtitle of graph (Using main, sub, col.main, col.sub, cex.main, cex.sub, font.main, font.sub arguments in plot() command), Modifying Axes of a Graph (Using xlab, ylab, col.lab, cex.lab, font.lab, xlim, ylim, col.axis, cex.axis, font.axis arguments and axis() command), Adding Additional Elements to a Graph (Using points(), text(), abline(), curve() commands), Adding Legend on a Graph (Using legend() command), Special Graphs (Using pie(), barplot(), hist() commands), Multiple Plots (Using mfrow or mfcol arguments in par() command and layout command).
4. Implement the Descriptive Statistics using R.

   Measure of Central Tendency (Mean, Median and Mode), Measure of Positions (Quartiles, Deciles, Percentiles and Quantiles), Measure of Dispersion (Range, Median, Absolute deviation about median, Variance and Standard deviation), Measure of Distribution (Skewness and Kurtosis), Box and Whisker Plot (Box Plot and its parts, Using Box Plots to compare distribution).

5. **In memory Data Analytics**: Window and text functions in SQL; Advanced SQL functions
6. **MongoDB**: Installation of MongoDB, Features of MongoDB: CRUD operations; import and export functions, indexes, aggregate functions, dealing with Nulls, count, limit, skip and sort functions and cursors

7. **Experiments on Hive and Pig**

   Data Wrangling using R

   Open refine tool for handling messy data

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

M.Tech I semester (CSE & CS)

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(17D25214) SOFTWARE PATTERNS LAB

Student is expected to complete the following experiments as a part of laboratory work.

1. Identify the application where you can use single pattern and implement it.
2. Identify the application where you can use multiple patterns and implement it.
3. Using UML design one of the architectural patterns.
4. Using UML design one of the creational patterns.
5. Using UML design one of the structural patterns.
6. Using UML design one of the behavioral patterns.
7. User gives a print command from a word document. Design to represent this chain of responsibility design pattern.

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