Subject Code: -	CSE2101	Subject Name: -	Data Structures and Algorithms
Semester: -	III	Branch Name: -	CSE
Subject Type: -	Core		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2101: DATA STRUCTURES AND ALGORITHMS [3 1 0 4]

Course Contents

Introduction: algorithm specification; **Performance analysis:** time and space complexity, asymptotic notation; **C concepts:** pointers, functions, arrays, passing arrays to functions through pointers, dynamic memory allocation, bubble sort , insertion sort , selection sort, structures, arrays of structures, passing structures to functions; **List:** ADT, array and its types, implementation, operations, linked list and its types, implementation and operations; **Stack:** ADT, implementations using array and linked list, operations and its applications; **Queue:** ADT, implementations using array and linked list, operations and its applications; **Tree:** terminologies, different types, representation of binary tree using array and linked structure, binary search tree, different operations (recursive and non-recursive), heap, heap sort, priority queue, AVL trees, B-tree; **Graph:** Introduction, representation, operations and applications; Searching techniques and hashing.

References:

1. A. S. Tannenbaum, J. Augenstein, Data Structures using C, Pearson India, 2018.
2. 2. E. Horowitz, S. Sahni, Fundamentals of Data Structures in C, (2e), Universities Press, 2008.
3. A. Forouzan, R. F. Gilberg, A Structured Programming Approach Using C, (3e), Cengage Learning, 2006.

Subject Code: -	CSE2102	Subject Name: -	Relational Database Management Systems
Semester: -	III	Branch Name: -	CSE
Subject Type: -	Core		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2102 Relational Database Management Systems [3 1 0 4]

Course Contents

Introduction: DBMS Concepts, Database System Vs File System, Data Models, Schema & Instance, Schema architecture, Data independence, Data Base Languages and interfaces, Database system applications, Database users, Functions of DBA Data Modeling using the Entity Relationship; **Model:** ER model concepts, Entities, Attributes, Relationship & types, Relationship Constraints, Extended ER-Model Concept - Generalization, Specialization and Aggregation, Transforming ER diagram into the tables; **Relational Data models:** Domains, Tuples, Attributes, Relations, Characteristics of relations, Keys, Key attributes of relation, Relational database, Schemas, Integrity constraints. Referential integrity, Relational Algebra and Relational Calculus; **Relational algebra operators**: Unary, Binary, Set Operations. Tuple oriented and domain oriented relational calculus and its operations; **SQL:** Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Joins, Sub-Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers; **Data Base Design:** Introduction to Normalization, Functional dependency, Normal forms, Decomposition, Armstrong's Axioms, Canonical Cover, Lossless Join & Dependency preservation Problems with null valued and dangling tuples, multivalued dependencies; **Transaction Processing Concepts:** Transaction Properties & States, Schedules, Serial & Concurrent Schedule, Serializability of schedules, conflict & view serializable schedule, Recoverability, Recovery from transaction failures, log-based recovery, checkpoints, Deadlock handling; **Concurrency Control Techniques:** Concurrency control, Concept of Locks, Concurrency Control Protocols - Two Phase Locking Protocols, Time stamping protocols, validation-based protocol, multiple granularities, Multi version schemes, Recovery with concurrent transactions; **File Structures:** File Organization, Indexing, Primary, Clustered, Secondary Indexes, Hashing, Multilevel Indexing with B-Tree, B+ Tree.

References:

1. A. Silberschatz, H. F. Korth, S. Sudarshan, Database System Concepts, (6e), McGraw Hill, 2013.
2. R. Elmasri, S. B. Navathe, Fundamentals of Database Systems, (6e), Addison-Wesley, 2010.
3. R. Ramakrishnan, J. Gehrke, Database Management Systems, (3e), McGraw Hill, 2014.
4. I. Bayross, SQL, PL/SQL The Programming Language of Oracle, (4e), BPB Publications, 2010.
5. J. Date, An Introduction to Database Systems, (8e), Prentice Hall of India, 2006.

Subject Code: -	CSE2103	Subject Name: -	Computer Organization and Architecture
Semester: -	III	Branch Name: -	CSE
Subject Type: -	Core		
Date:-	30 Jan 2024		

Pre-requisites (if any):

CSE2103: Computer Organization and Architecture [3 1 0 4]

Course Contents

Basic Structure of Computers: Computer types, Functional units, Basic operational concepts, performance; **Machine Instructions and Programs:** Number representation and arithmetic operations, Memory locations and addresses, Instructions and instruction sequencing, Addressing modes, Assembly language programs; **Input-Output Organization:** I/O module schematic, Memory-mapped and I/O mapped device interface, Programmed I/O, Interrupt driven data transfer, Interrupt handling, Direct memory access; **Memory System:** Cache basics, Mapping techniques, Replacement algorithms, Hit rate and miss penalty; **Arithmetic:** Design of fast adders, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication; **Basic Processing Unit and Pipelining:** Single and multiple-bus organization of processor Datapath, Microprogrammed control unit, Hardwired control unit, Basic concepts of pipelining, Structural hazards, Data hazards, Control hazards; **Multi-Core Processors:** Flynn's classification, Superscalar, Vector processor, Multi-core, and GPU.

References:

1. J. L. Hennessy, D. A. Patterson, Computer Architecture: A Quantitative Approach, (6e), Morgan Kaufmann Publishers, 2019.
2. M. W. Stallings, Computer Organization and Architecture –Designing for Performance, (9e), Pearson, 2013
3. C. Hamacher, Z. Vranesic, S. Zaky, Computer Organization, (5e), Tata McGraw Hill, 2011.
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Subject Code: -	CSE2121	Subject Name: -	Object Oriented Programming using Java
Semester: -	III	Branch Name: -	CSE
Subject Type: -	Flexi Core		
Date:-	31 Jan 2024		

Pre-requisites (if any): Topics covered under the course Computer Programming

CSE2121: Object Oriented Programming using Java [3 1 0 4]

Course Contents

Introduction: Objects, Classes, Encapsulation, Polymorphism, Inheritance; **Java Basics:** Compilation and Execution of a Java program, Java Compiler and Interpreter, Data Types in Java, operators and control statements in java; **Class Definition and Object Creation:** Instance-Fields/Attributes, Methods, Access Modifiers, Constructors, Object vs Class Variables, Role of static and final keywords in Java, Type Conversion and Promotion; **Polymorphic Forms:** Method Overloading, Objects as Parameters and return types; **Input-Output :** Reading Input and Output in Java; **Object Class in Java :** String form of an Object via toString() method, Object equality method; **Arrays and Strings in Java:** 1-D Arrays, 2-D and Multi-dimensional arrays, Variable Size array, Dynamic Arrays using Array Lists, Strings in Java via String, StringBuilder and StringTokenizer classes; **Inheritance in Java:** Extending classes, abstract classes, final classes, use of super keyword, Method Overriding, Runtime Polymorphism, Inner Classes – static and non-static nested Classes, Local Classes; **Inheritance via Interfaces:** class vs interface, defining interfaces, implementing multiple inheritance, extend interface; **Exception Handling:** Exceptions, Defining and Creating Exceptions, multiple catch clauses, Use of Exceptions in Real Life Problems; Package in Java: Defining and Creating Packages, importing packages; **Garbage Collector:** Role, definition, explicit call; **Multithreading:** Thread class, Runnable interface, thread life cycle, synchronization, thread priority, creating and running threads.

References:

1. Java: The Complete Reference, Herbert Schildt, 12th Edition, McGraw Hill, 2022
2. Programming with Java, E Balagurusamy, 6th Edition, McGraw Hill, 2019
3. Paul Deitel, Harvey Deitel, Java How to Program, Early Objects 11th Edition, Pearson, 2018.

Subject Code: -	CSE2122	Subject Name:	Object Oriented Programming using Python
Semester: -	III	Branch Name: -	CSE
Subject Type: -	Flexi Core		
Date:-	30 Jan 2024		

Pre-requisites (if any):

CSE2122: Object Oriented Programming using Python [3 1 0 4]

Course Contents:

Introduction: Programming a computer, Programming languages; **Python basics:** Getting started with Python, Essentials of a Python program, Integers, Floating-point numbers, Strings; **Variables and scope:** Variables, Modifying values, Type conversion; **Selection control statements:** if statement, Boolean values, operators, and expressions; **Collections:** Lists, Tuples, Sets, Ranges, Dictionaries, Conversion, Sequences; **Loop control statements:** while, for statements, Nested loops, Iterables, iterators and generators, Comprehensions, The break and continue statements; **Functions:** Input parameters, Return values, Default parameters, *args and **kwargs, Decoratorss, Lambdas,Generator functions and yield; **Data Structure in Python:** Array, Linked List, Stack, Queue, Tree, Searching and Sorting; **Object-Oriented programming:** OOP's Concepts, Classes, and Objects: Defining and using a class, Instance attributes, Class attributes, Class decorators, inspecting an object, Constructor, Abstraction, Composition; **Inheritance:** Types of Inheritance. overriding magic methods; **I/O and Errors Handling:** Errors, exceptions, handling exceptions, Debugging programs, Logging, Testing; **Packaging:** Modules, Packages, Documentation; **File Handling:** Introduction, Access Methods, Read and write operation, Working with directories; **Python Libraries:** Pandas, Matplotlib, NUMPY.

References:

1. Data Structures and Algorithms in Python, An Indian Adaptation Paperback – 1 July 2021 by Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Wiley Publication
2. D. Phillips, Python 3 Object-Oriented Programming Build robust and maintainable software with
3. object-oriented design patterns in Python 3.8, (3e), Packt Publishing, January 2018
4. W. J. Chun, Core Python Applications Programming, (3e), Prentice Hall Publishers, 2012
5. J. Grus, Data Science from Scratch: First Principles with Python, (1e), O'Reilly Media, 2015
6. Python Data Science Essentials: A practitioner's guide covering essential data science principles, tools, and techniques, Third Edition By Alberto Boschetti, Luca Massaron.

Subject Code: -	CSE2131	Subject Name: -	Data Structures and Algorithms Lab
Semester: -	III	Branch Name: -	CSE
Subject Type: -	Lab		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2131 Data Structures and Algorithms Lab [0 0 2 1]

Course Contents

Implementation of array operations: insertion, deletion, linear search and binary search, matrix operation; **Implementation of singly, doubly, and circular linked lists:** inserting, deleting, and inverting a linked list, Polynomial addition, subtraction and sparse matrix implementation by linked list, Josephus problem; **Stacks and Queues:** adding, deleting elements. **Circular Queue:** Adding & deleting elements, conversion of infix to postfix and Evaluation of postfix expressions using stacks & queues, Implementation of stacks & queues using linked lists; **Recursive and Non-recursive traversal of Trees:** Threaded binary tree traversal, BST and AVL tree implementation; **Implementation of sorting and searching algorithms:** bubble sort, Insertion sort, selection sort, quick sort, heap sort, merge sort, radix sort, Hash table implementation.

References:

1. A. S. Tannenbaum, J. Augenstein, Data Structures using C, Pearson India, 2018.
2. E. Horowitz, S. Sahni, Fundamentals of Data Structures in C, (2e), Universities Press, 2008.
3. A. Forouzan, R. F. Gilberg, A Structured Programming Approach Using C, (3e), Cengage Learning, 2006.

Subject Code: -	CS2132	Subject Name: -	Relational Database Management System Lab
Semester: -	III	Branch Name: -	CSE
Subject Type: -	Lab		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2132 Relational Database Management System Lab [0 0 2 1]

Course Contents:

Database Foundations: Introduction, Databases and Data Modelling, Refining the Data Model, Oracle SQL Developer Data Modeler, Introduction to SQL; **Database Design:** Introduction, Entities and Attributes, Super/Sub Types and Business Rules, Relationship Fundamentals, UIDs and Normalization, Arcs, Hierarchies, and Recursive Modelling, Mapping, Creating Database Projects, Presenting Database Projects; **Database Programming with SQL**: Introduction, SELECT, WHERE ORDER BY, and Intro to Functions, Single Row Functions, JOINs, Group Functions, Subqueries, Ensuring Quality Queries Part I, DML, DDL, Constraints, Views, Sequences and Synonyms, Privileges and Regular Expressions, TCL, Final Project, and Exam Review.

References:

1. A. Silberschatz, H. F. Korth, S. Sudarshan, Database System Concepts, (6e), McGraw Hill, 2013.
2. I. Bayross, Teach yourself SQL & PL/SQL using Oracle 8i & 9i with SQLJ, BPB Publications, 2010.
3. R. Elmasri, S. B. Navathe, Fundamentals of Database Systems, (6e), Addison-Wesley, 2010.

Subject Code: -	CSE2201	Subject Name: -	Design and Analysis of Algorithms
Semester: -	IV	Branch Name: -	CSE
Subject Type: -	Core		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2201 Design and Analysis of Algorithms [3 1 0 4]

Course Contents:

Introduction: Algorithm Definition and Criteria of Algorithms, Iterative and Recursive algorithms; **Performance Analysis:** Priori and Posteriori Analysis, Asymptotic Notations, Space Complexity, Time Complexity, Performance measurement of iterative and recursive algorithms; **Solving Recurrence Relations:** Substitution Method, Iterative Method, Recursive Tree Method, Master Method; **Divide and Conquer:** Introduction, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort, Randomized Quick Sort, Integer Multiplication; **Graph Search Algorithm:** Graph representation, Breadth First Search and Depth First Search; **Greedy Strategy:** Introduction, Knapsack Problem, Job Sequencing with Deadlines, Huffman Coding, Union and Find Operation (Set and Disjoint Set), Minimum Cost Spanning Tree Algorithms (Prim's and Kruskal's), Optimal Merge Patterns, Single Source Shortest Path (Dijkstra's Algorithm); **Dynamic Programming:** Introduction, Single Source Shortest Path (Bellman and Ford Algorithm), All Pair Shortest Path (Floyd Wrashal's Algorithm), Optimal Binary Search Trees, 0/1 Knapsack Problem, Travelling Salesperson Problem, Longest Common Subsequence, Matrix Chain Multiplication, Edit distance; **Backtracking:** Introduction, N-Queens Problem, Graph Colouring and Hamiltonian Cycles; **Branch and Bound:** Introduction, FIFO and LC Branch and Bound, 0/1 Knapsack Problem, Travelling Salesman Problem; **String Matching:** Naïve String Matching, Rabin Karp Algorithm, Knuth-Morris-Pratt Algorithm; **Complexity Classes:** NP, NP-Complete and NP-Hard Problems, Cook's Theorem, Polynomial time reductions, Satisfiability, Reduction from Satisfiability to Vertex Cover.

References:

1. T. H. Cormen, C. E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, (3e), MIT press, 2009
2. E. Horowitz, S. Sahni, S. Rajasekaran, Fundamental of Computer Algorithms, (2e), Universities Press, 2007.

Subject Code: -	CSE2202	Subject Name: -	Operating Systems
Semester: -	IV	Branch Name: -	CSE
Subject Type: -	Core		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2202 Operating Systems [3 1 0 4]

Course Contents:

Introduction: Definition of operating systems, Single and multi-processor systems, Operating system services, System commands and system calls, Interrupt, System boot, Operating system structure, Types of OS, Multi-user, Multitasking, Embedded, Real-time, Network, Distributed; **Process and Thread**: Process concept, Operations on processes, Inter-process communication, UNIX pipes, Multithreading, Multithreaded models, Programs using PThread; **Process Scheduling**: Basic concepts, Scheduling criteria, Scheduling algorithms; **Synchronization**: Critical section problem, Dekker's algorithm, Peterson solution, Synchronization hardware, Semaphores, Classical problems of synchronization, Deadlock, Methods for handling deadlock- prevention, avoidance, detection, and recovery; **Memory Management**: Address binding, Logical vs Physical address space, Swapping, Contiguous memory allocation, Paging, Structure of Page Table, Segmentation, Demand Paging, Page Replacement Policies, Allocation of Frames, Thrashing; **File System Interface and Implementation**: File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File System Structure, File System Implementation, Allocation Methods, Free Space Management; **Disk Management**: Disk Scheduling Algorithms, Disk Management, Swap Space Management; **Case Studies**: Linux, Windows, iOS, Android.

References:

1. A. Silberschatz, P. B. Galvin, G. Gagne, *Operating System Concepts*, (9e), Wiley, 2014.
2. A.S. Tanenbaum, H. Bos, *Modern Operating Systems*, (4e), Pearson, 2015.
3. W. Stallings, *Operating Systems: Internals and Design Principles*, (9e), Pearson, 2018I.

Subject Code: -	CSE2221	Subject Name: -	Cryptography
Semester: -	IV	Branch Name: -	CSE
Subject Type: -	Flexi Core (FC)		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2221: Cryptography [3 1 0 4]

Course Contents:

Introduction: Basic objectives of cryptography, Secret-key and public-key cryptography, One-way trapdoor one-way functions, Cryptanalysis, Attack models, Classical cryptography; **Block ciphers:** Modes of operation, Public-key parameters: Modular arithmetic, GCD, primality testing, Chinese remainder theorem, modular square roots, finite fields; DES and its variants, AES, Linear and differential cryptanalysis; **Message digest:** Properties of hash functions, MD2, MD5 and SHA-1, Keyed hash functions, Attacks on hash functions. Pseudorandom Number Generation; **Intractable problems:** Integer factorization problem, RSA problem, Modular square root problem, Discrete logarithm problem, Diffie-Hellman problem, known algorithms for solving the intractable problems; **Public-key encryption:** RSA, EIGamal scheme, Elliptic and hyperelliptic, curve cryptography, Side channel attacks, Diffie-Hellman and MQV key exchange; **Digital signatures:** RSA, DSA and NR signature schemes, blind and undeniable signatures; **Entity authentication:** Passwords, Challenge-response algorithms, Zero-knowledge protocols; **Transport-Level Security:** Web Security Issues, Secure Sockets Layer (SSL), Transport Layer Security (TLS), Electronic Mail Security, Pretty Good Privacy (PGP); **IP Security:** IP Security Overview, IP Security Policy, Encapsulating Security, Payload, Combining Security Associations, Internet Key Exchange.

References:

1. B. A. Forouzan, D. Mukhopadhyay, "*Cryptography and Network Security*", McGraw Hill, 3rd Edition, 2008.
2. W. Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall, 5th edition, 2010.

Subject Code: -	CSE2222	Subject Name: -	High Performance Computing
Semester: -	IV	Branch Name: -	CSE
Subject Type: -	Flexi Core (FC)		
Date: -	31 Jan 2024		

Pre-requisites (if any): It is desirable to have knowledge of Linux and/or programming languages like C/C++/Python.

CSE2222: High Performance Computing [3 1 0 4]

Course Contents:

Introduction to Parallel Computing: Definition and applications of parallel computing, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism, Trends in Microprocessor and Architectures, Limitations of Memory, System Performance; **Types of HPC systems:** clusters, grids, clouds, HPC Applications, HPC Scalable and parallel architectures – Shared memory and distributed memory; **HPC ecosystem:** hardware, software, networks, and Interconnect technologies, InfiniBand, Ethernet, etc. **case study: HPC facility in INDIA. Parallel programming**: Principles of Parallel Algorithm Design, Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions; **Parallel Programming Models:** Message Passing Interface (MPI), Introduction to OpenMP, OpenMP – Threads vs Process, fork-join model, OpenMP – Race Conditions, False Sharing and Critical Section, OpenMP Data Environment; **Case Study:** Pi calculation and OpenMP; **CUDA programming**: Introduction to CUDA programming, CPU vs GPU, The Age of Parallel Processing, the Rise of GPU Computing, A Brief History of GPUs, Early GPU, GPU Architecture, CUDA Architecture, Using the CUDA Architecture, Applications of CUDA, Introduction to CUDA C-Write CUDA programming execution model, CUDA programming in Python – global memory coalescing and shared memory utilization, Multi-GPU CUDA Programming; **Analytical Models of Parallel Programs:** Analytical Models, Sources of overhead in Parallel Programs; **Performance Metrics for Parallel Systems:** speedup, efficiency, scalability, Profiling, and performance analysis tools, Minimum execution time and minimum cost, optimal execution time; **Dense Matrix Algorithms:** Matrix- Vector Multiplication, Matrix-Matrix Multiplication; **Distributed Memory Parallelization**: Introduction to Open MPI, the message passing programming model – Send (), Receive (), MPI applications, clusters, and benchmarks, Pi Calculation using MPI, MPI blocking/non-blocking communication; **Hands-on Projects:** Implementation of parallel algorithms using MPI, OpenMP.

Reference:

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition, Addison-Wesley,2003, ISBN: 0-201-64865-2.
2. Jason sanders, Edward Kandrot, “CUDA by Example”, Addison-Wesley, ISBN-13: 978-0- 13-138768-
3. Shane Cook, “CUDA Programming: A Developer's Guide to Parallel Computing with GPUs”, Morgan Kaufmann Publishers Inc. San Francisco, CA, USA 2013 ISBN: 9780124159884.
4. David Culler Jaswinder Pal Singh, ”Parallel Computer Architecture: A Hardware/Software Approach”, Morgan Kaufmann,1999, ISBN 978-1-55860-343-1

Subject Code: -	CSE2240	Subject Name: -	Automata and Compiler Design
Semester: -	Fourth	Branch Name: -	CSE
Subject Type: -	PE-1		
Date:-	Jan 31, 2024		

Pre-requisites (if any): Discrete Mathematics

CSE2240 : Automata and Compiler Design [3 0 0 3]

Course Contents:

Introduction: Three basic concepts – language, grammar and automata; Chomsky Hierarchy; **Finite Automata:** Deterministic Finite Automata (DFA) and Non-Deterministic Finite Automata (NFA), Mealy and Moore machines construction and equivalence; **Regular Sets and Regular Grammars:** Regular Expressions, Equivalence of regular expressions and regular languages, Regular Grammar and FA, Closure properties of Regular Languages, Pumping Lemma for Regular Languages; **Context Free Languages (CFL) and Grammars (CFG):** Ambiguity, Methods for Transforming Grammars, Chomsky Normal Form (CNF) and Greibach Normal Form (GNF); **Push Down Automata:** Nondeterministic Pushdown Automata (NPDA), Design of NPDA, Equivalence of PDA and CFLs, Closure properties and decision problems of CFLs; **Introduction to Turing machine:** Definition, Turing Machining as Language acceptors, Types of Turing machine, Recursively Enumerable and Recursive Languages and their closure properties, Concept of insolvability & reducibility, Halting Problem, Post correspondence Problem, Rice theorem, P and NP, Polynomial-Time reductions and NP-Completeness; **Introduction to Compiler Design:** Structure of a Compiler, Lexical Analysis, Recognition of Tokens.

References:

1. P. Linz, *Introduction to Formal Languages and Automata*, Johnes and Bartlett , 6th Edition, Indian Student Edition, 2016.
2. A. Aho, J. Ullman, M. S. Lam, R. Sethi, *Compilers : Principles, Techniques and Tools*, Pearson Education, 2nd Edition, 2007.
3. J. Martin, *Introduction to Languages and the Theory of Computation*, Tata McGraw Hill, 4th Edition, 2010.
4. M. Sipser, *Introduction to the Theory of Computation*, Cengage Learning, 3rd Edition, 2014.

Subject Code: -	CSE2241	Subject Name: -	Data Visualization Techniques
Semester: -	IV	Branch Name: -	
Subject Type: -	PE-1		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2241 : Data Visualization Techniques [3 0 0 3]

Course Contents

Introduction: Introduction of visual perception, visual representation of data, Gestalt principles, information overloads; **Visual representations**: Creating visual representations, visualization reference model, visual mapping, visual analytics; **Design of visualization applications**: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents; **Visualization:** Visualization of groups, trees, graphs, clusters, networks, software; **Metaphorical visualization:** Visualization of volumetric data, vector fields, processes and simulations; **Visualization of maps**: geographic information, GIS systems, collaborative visualizations, evaluating visualizations.

References:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd, 1st Edition, 2010
2. Kieran Healy, Data Visualization: A Practical Introduction, 1st Edition, 2018

Subject Code: -	CSE2231	Subject Name: -	Design and Analysis of Algorithms Lab
Semester: -	IV	Branch Name: -	CSE
Subject Type: -	Lab		
Date:-	31Jan 2024		

Pre-requisites (if any):

CSE2231 Design and Analysis of Algorithms Lab **[0 0 2 1]**

Course Contents:

Sorting & Searching Algorithm: insertion sort, selection sort, binary search; **Basic data structures:** stacks and queues, graphs and trees, binary trees; **Algorithmic paradigms:** Recursion, divide-and-conquer, Merge sort, Quick sort; **Greedy:** Knapsack, Huffman encoding, dynamic programming, lower bounds and optimal algorithms; **Heaps:** Heaps, priority queues, min-max heaps, heap sort; **Dynamic search structures:** Binary search trees, height balancing, B-trees; **Algorithms on arrays:** Linear-time median finding, sorting in linear time (counting sort, radix sort, bucket sort), String matching (Rabin-Karp and Knuth-Morris-Pratt algorithms); **Graph algorithms Traversal:** (BFS, DFS, topological sort), Minimum spanning trees (Prim and Kruskal algorithms), shortest paths (Dijkstra's and Floyd-Warshal algorithms); **Mini-Projects & Case Studies**.

References:

1. T. H. Cormen, C. E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, (3e), MIT press, 2009
2. E. Horowitz, S. Sahni, S. Rajasekaran, Fundamental of Computer Algorithms, (2e), Universities Press, 2007.

Subject Code: -	CSE2232	Subject Name: -	Operating Systems Lab
Semester: -	IV	Branch Name: -	CSE
Subject Type: -	Lab		
Date:-	31 Jan 2024		

Pre-requisites (if any):

CSE2232 Operating Systems Lab [0 0 2 1]

Course Contents:

Red Hat: Install Red Hat Enterprise Linux using scalable methods, Access security files, file systems, and networks; **Shell Programming:** execute shell scripting and automation techniques; **System Calls:** File and process, I/O Redirection, IPC using Pipe and Signals; **PThread API:** Multithreaded programs; **Synchronization**: Programs using PThreads and Semaphores; **CPU Scheduling**: FCFS, SJF, Priority, RR; **Deadlock:** Bankers Algorithm; **Memory Management**: LRU, FIFO, OPT; **Creating a Virtual Machine:** Virtual Machine Files and Snapshots, Virtual Machine Cloning and Exporting.

References:

1. W. R. Stevens, S. A. Rago, Advanced Programming in the UNIX Environment, (3e), Addison Wesley, 2013.
2. S. Das, Unix Concepts and Applications, (4e), McGraw Hill, 2006.
3. K. A. Robbins, S. Robbins, Unix Systems Programming: Communication, Concurrency, and Threads, (2e), Prentice Hall, 2004
4. https://www.redhat.com/en/services/training/rh124-red-hat-system-administration-i