

Syllabus

K21MR

for the devil, by the serpent

CSE205: Data Structures and Algorithms

Unit 1

Introduction

Basic Concepts, Complexity Analysis: time space and trade off, Omega Notation, Theta Notation, Big O Notation, Basic Data Structures.

Arrays

Linear arrays: memory representation, Array operations: Traversal, Insertion, Deletion, Sorting, Searching, Merging and their complexity analysis.

Sorting and Searching

Bubble Sort, Insertion Sort, Selection Sort

Unit 2

Linked Lists

Introduction, Memory representation, Allocation, Traversal, Insertion, Deletion, Header linked lists: Grounded and Circular, Two-way lists: operations on Two-way Linked Lists.

Unit 3

Stacks

Introduction: List and Array representations, Operations on Stack (traversal, push and pop), Arithmetic expressions: Polish notation, evaluation and transformation of expressions.

Queue

Array and List representation, operations (traversal, insertion and deletion), Priority Queues, Deques

Unit 4

Trees

Binary Trees: Introduction (complete and extended binary trees), memory representation (linked, sequential), Binary Search Tree: introduction, searching, insertion and deletion, In-order traversal, Pre-order traversal, Post-order traversal using recursion

Recursion

Introduction, Recursive implementation of Towers of Hanoi, Merge sort, Quick sort

Unit 5

AVL trees and Heaps

AVL trees Introduction, AVL trees Insertion, AVL trees Deletion, Heaps: Insertion, Heaps: Deletion, HeapSort, Huffman algorithm

Unit 6

Graphs

Warshall's algorithm, Graph Traversal: BFS, DFS, Shortest path algorithm Floyd Warshall Algorithm(modified warshall algorithm)

Hashing

Hashing introduction: hash functions, hash table, Open hashing (separate chaining), Closed hashing (open addressing): Linear Probing, Quadratic Probing and Double Hashing.

List of Practicals / Experiments

Array

Program to implement insertion and deletion operations in arrays

Searching

Program to implement different searching techniques - linear and binary search

Sorting

Program to implement different sorting techniques - bubble, selection and insertion sort

Linked List

Program to implement searching, insertion and deletion operations in linked list

Doubly Linked List

Program to implement searching, insertion and deletion operations in doubly linked list

Stack

Program to implement push and pop operations in stacks using both arrays and linked list

Queues

Program to implement enqueue and dequeue operations in queues using both arrays and linked list

Recursions

Program to demonstrate concept of recursions with problem of tower of Hanoi

Recursive Sorting

Program to implement recursive sorting techniques - merge sort, quick sort

Tree

Program to create and traverse a binary tree recursively

Binary Search Tree

Program to implement insertion and deletion operations in BST

Heaps

Program to implement insertion and deletion operations in Heaps and Heap Sort

CSE306: Computer Networks

Unit 1

Introduction

Networks and Types, Uses of Computer Networks, Network software architecture and its layers and protocols, Network hardware architecture and its topologies and device like HUB, Switch and Routers

Network Models

Protocol Layering, OSI Model, TCP/IP protocol suite

Unit 2

Physical Layer: Signal and Media

Basics for Data Communications and Analog and Digital signals, Transmission Impairments and Performance, Data Rate, Transmission media like Guided and Unguided media, Cabling standards

Physical Layer: Modulation and Multiplexing

Digital to Digital Conversion, Analog to Digital Conversion, Analog to Analog conversion, Digital to Analog conversion, Multiplexing

Unit 3

Data Link Layer

Data link Layer design issues, Elementary Datalink Protocols, Error Detection and Correction- Hamming code, CRC, Parity, Checksum, Switch working

MAC Sublayer

Multiple Access Protocols: ALOHA, CSMA and CSMA/CD, Random Access, Controlled access, Ethernet protocol

Unit 4

Network Layer: IP Addressing

Network layer design issue, IP Addressing Both Classfull and Classless, Subnetting and Supernetting, Subnetting examples, Network layer services, Network layer performance, Forwarding of IP packets, IP Header, IPv6 addressing

Unit 5

Network Layer: Routing

Routing Algorithm-Shortest path algorithm, Distance vector Routing, Link State routing, Routing algorithms, Unicast routing protocols

Network Layer: Congestion Control

Congestion Control Algorithms

Unit 6

Transport Layer

Transport Layer Services, TCP- Header format and handshaking operation, UDP- Header format

Application Layer

Domain Name System, E Mail, FTP

CSE307: Internetworking Essentials

Network hardware and IP addressing concept

- Working of hub, switch and Router, Adding of interfaces in devices
- Cabling - Creation of straight and Cross cable using crimping tool
- IP addressing basics, configuration using CLI, VLSM and FLMS on single router
- Implementation of Star, Mesh, Bus and Hybrid Topology

Network Commands

Ping, traceroute, arp, netstat, ipconfig, ftp, nslookup, snmpget, snmpgetbulk and snmpset (use DOS and scenario based configuration)

Network layer routing protocols

- Implementation of Static Routing using Classful and classless (FLSM)
- Implementation of Static Routing using VLSM
- Routing information Protocol(RIP) using classful and classless (FLSM)
- Routing information protocol(RIP) using VLSM

Server Configuration and LAN Setup

- Implementation of FTP, Implementation of HTTP and Email setup on server
- Implementation of DNS, Implementation of DHCP
- Implementation of LAN with configuration of inter-networking devices and any application layer protocol

IPv6 addressing and routing

- IPv6 Addressing and Stateless Address Auto Configuration (SLAAC)
- IPv6 Neighbor Discovery
- IPv6 Static Routing
- IPv6 Dynamic Routing

CSE320: Software Engineering

Unit 1

Introduction to Software Engineering

Evolution and impact of software engineering, Software life cycle models, Waterfall model, Prototyping model, Evolution and spiral models, Feasibility study, Functional and non-functional requirements, Requirement gathering, Requirement analysis and specification

Unit 2

Issues in software design

Basic issues in software design, Modularity, Cohesion, Coupling and layering, Function oriented software design, Data flow diagram and structure chart

Unit 3

Object Modelling

User interface design, unified process, Object modelling using UML, use case model development, Coding standards and code review techniques

Unit 4

Testing

Fundamentals of testing, Black box testing techniques, White box testing techniques, Levels of testing, Test cases

Introduction to Selenium

Feature of selenium, Versions of selenium, Record and playback

Unit 5

Software project management

Project management, Project planning and control, Cost estimation, Project scheduling using PERT and Gantt charts, Software configuration management

Unit 6

Quality management

Quality management, ISO and SEI CMMI, PSP and six sigma, Computer aided software engineering, Software maintenance, Software reuse, Component based software development

Advanced techniques of software engineering

Agile development methodology, Scrum, Aspect oriented programming, Extreme Programming, Adaptive software development, Rapid application development (RAD), Software cloning

INT213: Python Programming

Unit 1

Introduction

Python programming language, introduction to program and debugging, formal and natural language

Variables, Expression and Statements

Values and types, variables, variable name and keywords, statements, operators and operand, order of operations, operations on string, composition and comments

Conditionals and Iteration

Modulus operator, boolean expressions, logic operators, conditional, alternative execution, nested conditionals and return statements, while statements, encapsulation and generalization

Functions and recursion

function calls, type conversion and coercion, math functions, adding new function, parameters and argument, recursion and its use

Unit 2

String

string a compound data type, length, string traversal, string slices, comparison, find function, looping and counting

Lists

list values, length, membership, operations, slices, deletion, accessing elements, list and for loops, list parameters and nested list

Tuples and Dictionaries

mutability and tuples, tuple assignment, tuple as return values, random numbers and list of random numbers, counting and many buckets, dictionaries operations and methods, sparse matrices, aliasing and coping

Unit 3

Classes and objects

creating classes, creating instance objects, accessing attributes, overview of OOP terminology

Object oriented programming terminology

Class Inheritance, Overriding Methods, Data Hiding, Function Overloading

Unit 4

Files and exceptions

text files, writing variables, directories, pickling, exceptions, glossary

Building GUI using python

tkinter programming, tkinter widgets like button, canvas, entry, frame, label, list box, menu, message, scale, text, spinbox, label frame, tkMessageBox, standard attributes, GUI and database with sqlite3, geometry management

Regular Expressions

Concept of regular expression, various types of regular expressions, using match function, Web Scraping by using Regular Expressions

Unit 5

Using Databases with Python

Installation of MySQL Database Software, Verifying MySQL in the windows Operating system, Installing MySQLdb Module, Verifying the MySQLdb Interface Installation, Working with MySQL Database, Using MySQL from python, Retrieving All Rows from a Table, Inserting Rows into a Table, Deleting Rows into a Table, Updating Rows in a Table, Creating Database Tables through python, Creating a GUI that handles an event

Unit 6

Data visualization with matplotlib

line plot, multiple subplots in one figure, histograms, bar charts, pie charts, scatter plots

Handling data with pandas

series, dataframes, read and write csv file, operations using dataframe

Numpy arrays

numpy - datatype, array operations, statistical functions, broadcasting

INT306: Database Management Systems

Unit 1

Introduction to Databases

purpose of database systems, components of dbms, applications of dbms, three tier dbms architecture, data independence, database schema, instance, data modeling, entity relationship model, relational model

Unit 2

Relational query language

relational algebra, introduction to data definition language, data manipulation, data control and transaction control language, integrity constraints, database keys, SQL basic operations, Aggregate functions, Sql joins, set operators, views, subqueries

Unit 3

Relational Database Design

data integrity rules, functional dependency, need of normalization, first normal form, second normal form, third normal form, boyce codd normal form, multivalued dependencies, fourth normal form, join dependencies, fifth normal form and pitfalls in relational database design

Unit 4

Database Transaction Processing

transaction system concepts, desirable properties of transactions, schedules, serializability of schedules, concurrency control, recoverability

Unit 5

Programming constructs in Database

flow control statements, functions, stored procedures, cursors, triggers, exception handling

Unit 6

File Organization and Trends in Databases

file organizations and its types, indexing, types of indexing, hashing, hashing techniques, introduction to big data, nosql systems

List of Practicals/Experiments

SQL,PL/SQL

Set Operations, Basic Structure, Aggregate functions, DDL, DML, DCL

Data Manipulation

Add New Rows to a Table

Retrieve Data using the SQL SELECT Statement

List the capabilities of SQL SELECT statements

Aggregated Data Using the Group Functions

Usage of the aggregation functions in SELECT statements to produce meaningful reports

Usage of Subqueries to Solve Queries

Use a Subquery to Solve a Problem

SET Operators

Describe the SET operators

Creating Views

Create, modify, and retrieve data from a view

Manipulating Data by Using Subqueries

Using Subqueries to Manipulate Data

Introduction to PL/SQL

PL/SQL Overview

PL/SQL Identifiers

List the different Types of Identifiers in a PL/SQL subprogram

Write Executable Statements

Basic PL/SQL Block Syntax Guidelines

Explicit Cursors

Understand Explicit Cursors

Exception Handling

What are Exceptions?

Stored Procedures and Functions

What are Stored Procedures and Functions?

MTH401: Discrete Mathematics

Unit 1

Logic and Proofs

Propositional logic, propositional equivalences, quantifiers, Introduction to proof, direct proof, proof by contraposition, vacuous and trivial proof, proof strategy, proof by contradiction, proof of equivalence and counterexamples, mistakes in proof

Unit 2

Recurrence relations

recurrence relation, modelling with recurrence relations, homogeneous linear recurrence relations with constant coefficients, Method of inverse operator to solve the non-homogeneous recurrence relation with constant coefficient, generating functions, solution of recurrence relation using generating functions

Unit 3

Counting principles and relations

principle of Inclusion-Exclusion, Pigeonhole, generalized pigeonhole principle, relations and their properties, combining relation, composition, representing relation using matrices and graph, equivalence relations, partial and total ordering relations, lattice, sub lattice, Hasse diagram and its components

Unit 4

Graphs theory I

graph terminologies, special types of graphs(complete, cycle, regular, wheel, cube, bipartite and complete bipartite), representing graphs, adjacency and incidence matrix, graph-isomorphism, path and connectivity for

undirected and digraphs, Dijkstra's algorithm for shortest path problem

Unit 5

Graphs theory II

planner graphs, Euler formula, colouring of a graph and chromatic number, tree graph and its properties, rooted tree, spanning and minimum spanning tree, decision tree, infix, prefix, and postfix notation

Unit 6

Number theory and its application in cryptography

divisibility and modular arithmetic, primes, greatest common divisors and least common multiples, Euclidean algorithm, Bezout's lemma, linear congruence, inverse of a modulo m , Chinese remainder theorem, encryption and decryption by Caesar cipher and affine transformation, Fermat's little theorem

PEL136: Advanced Communication Skills-II

Language Skills

Listening

multiple choice questions, understanding conversation to answer subjective questions, taking detailed notes on given information, short answer question, agree or disagree, matching

Speaking

discussion, group presentation, pair discussion, storytelling, role play, group discussion, presenting information, short answer questions

Reading

fill in the blank, subjective questions, matching statement with authors, vocabulary, answering short questions, word meaning, multiple choice question, true false and not given, long length questions, match the columns, matching paragraphs information based, correct ending, match the word with correct definition, description matching, fact or opinion based questions

Writing

paragraph writing, answering problem statement, message writing, story writing, critical review writing, website post writing, notes writing, essay writing, personal statement writing for application

Language Skills

Grammar

relative pronouns as subjects and objects, gerund phrases as subjects and objects, requests with modals, past continuous vs. simple past, past participle, passive in present continuous, would rather and would prefer, suggestions with modals, gerunds, negative questions and infinitives, time clause, past modals for degree of certainty, passive modals, simple past and present perfect

Vocabulary

words related to personality traits, suffixes, verb-noun collocations, exceptional events, problems with electronics, global challenges, life skills, three-word phrasal verbs, personal characteristics, reactions, community issues, antonyms

Practical

listening to description of jobs, people, important events, and various problems, listening to issues, complaints and solutions, listening to experts and news stories, speaking on various topics, narrating a story, speaking about different personalities, possible careers, problems and preferences, reading about internet and online content, reading about contemporary issues, reading about various study styles, reading about sports, writing about internet and social sites, writing essay, review and various types of messages, writing about career and personal statement for an application