

# 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 FLISM 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 names 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

### Vocabular

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