Fundamentals of Computers, Its Organization and Architecture
Introduction to computers: Numbers, transfer of binary to octal to hexadecimal and vice versa. Computer systems, computer languages, software development methods, flowcharts, CPU, main memory, peripherals, I/O devices, algorithms, and pseudocodes.

C Programming
Imperative languages: Introduction, syntax, and constructs of C (or any other imperative language, but preferably C); variables, assignment, declarations, expressions, statements, input/output, conditionals, branching, iteration. Data handling: Arrays, pointers, static and dynamic structures, dynamic allocation, file structures.

Data Structure
Searching and sorting: Binary search, bubble sort, insertion sort, quick sort, merge sort. Data structures: Introduction, abstract data types, array, linked list, stack, queue, tree.

Introduction to Database Management System
Introduction to database management system (DBMS): What is Database? Purpose of DBMS, types of databases, data models, DBMS architecture, schemes and instances, database designers, administrators and users, interactions; data dictionary, data independence, overall system structure; database languages, storage system, DBMS vs. file system, indexing, hashing.

Data Visualization
Tools and techniques for gaining a qualitative understanding. Line plot, Bar chart, Pie and Donut charts, Histogram plot, and Scatter plot. Visualizing big data: Kernel density estimation for non-parametric data, Box and Whisker plot for large data. Semi-structured and unstructured data: Word clouds, network diagram, correlation matrices.

Data Wrangling, Exploration & Cleaning:
Dimensionality Reduction, Principal Component Analysis, Handling Large Datasets and Data Wrangling.

Data Mining
Data cleaning and preparation; Tracking patterns; Classification; Association; Outlier detection; Clustering; Regression; Prediction; Sequential patterns; Decision trees; Statistical techniques; Visualization; Neural networks; Data warehousing; Long-term memory processing; Basics of Machine learning and artificial intelligence.

Markov Chains
Discrete-time and Continuous-time Markov chains: classes, hitting times, absorption probabilities, positive and null recurrence, transience, invariant distribution, limiting distribution, reversibility, ergodic theorem. Holding times, explosion, forward/backward Kolmogorov equations. Stationary distributions, limit theorems. Periodicity.