# Course Content – Module-3-Data Structures and Algorithms

## Duration: 2/3 days

## Introduction

* Why to learn data structure and algorithm?
* What are Algorithms?
* What are Data Structures?
* Use of Data Structures and Algorithms to Make Your Code Scalable

## 2. Algorithm Analysis

* Need for theoretical Asymptotic Analysis
* Inadequacy of practical tests
* Big O, Omega and Theta Notations
* Time complexity
* Space complexity

## 3. Data structure

* Introduction
* Need of data structures
* Different types of data structures
* Applications of Data structure

## 4. Stack, Queues and Other of Data Structures

* Stack
* Queue
* Types of Queue
  + Circular queue
  + Priority Queue
  + DeQueue
* Linked List
* Linked List operations
* Types of Linked List
* Hash Table
* Heap Data structure
* Fibonacci Heap
* Decrease Key and Delete Node Operations on a Fibonacci Heap

## 5. Tree based DSA

* B Tree
  + Insertion in a B-tree
  + Deletion from a B-tree
* B+ Tree
  + Insertion on a B+ Tree
  + Deletion from a B+ Tree
* Red-Black Tree
  + Red-Black Tree Insertion
  + Red-Black Tree Deletion

## 6. Graph based DSA

* Graph Data Structure
* Spanning Tree
* Strongly Connected Components
* Adjacency Matrix
* Adjacency List
* DFS Algorithm
* Breadth-first Search
* Bellman Ford's Algorithm

## 7. Sorting and Searching Algorithms

* Bubble Sort
* Selection Sort
* Insertion Sort
* Merge Sort
* Quicksort
* Counting Sort
* Radix Sort
* Bucket Sort
* Heap Sort
* Shell Sort
* Linear Search
* Binary Search