

**Manipal School of Information Sciences (MSIS)**  
**Manipal Academy of Higher Education, Manipal**  
**Master of Engineering - ME (Big Data Analytics)**

**Course File**

**Course Name** : Algorithm and Data Structures for Big Data Lab

**Course Code** : BDA 5151

**Academic Year** : 2024 – 2025

**Semester** : I

**Name of the Course Coordinator** : Mr. DEEPAK RAO B

**Name of the Program Coordinator** : Dr. PRATHVIRAJ N

<b>Signature of Program Coordinator</b> <b>with Date</b>	<b>Signature of Course Coordinator</b> <b>with Date</b>

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## Program Education Objectives (PEOs)

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for **ME (Big Data Analytics)**, program are as follows.

PEO No.	Education Objective
PEO 1	Develop in depth understanding of the key technologies in data engineering, data science and business analytics.
PEO 2	Practice problem analysis and decision-making using machine learning techniques.
PEO 3	Gain practical, hands-on experience with statistics, programming languages and big data tools through coursework and applied research experiences.

## Program Outcomes (POs)

By the end of the postgraduate program in Big Data Analytics, graduates will be able to:

PO1	Independently carry out research /investigation and development work to solve practical problems.
PO2	Write and present a substantial technical report/document.
PO3	Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

<b>PO4</b>	Develop and implement big data analysis strategies based on theoretical principles, ethical considerations, and detailed knowledge of the underlying data.
<b>PO5</b>	Demonstrate knowledge of the underlying principles and evaluation methods for analyzing data for decision-making.

## 1. Course Plan

### 1.1 Primary Information

<b>Course Name</b>	:	Algorithms and Data Structures for Big Data Lab
<b>L-T-P-C</b>	:	0-0-3-1
<b>Contact Hours</b>	:	36 Hours
<b>Pre-requisite</b>	:	Programming with Python or C

### 1.2 Course Outcomes (COs)

<b>CO</b>	<b>At the end of this course, the student should be able to:</b>	<b>No. of Contact Hours</b>	<b>Program Outcomes (PO's)</b>	<b>BL</b>
CO1	Design programs for implementation of linked lists, stack and queues.	15	PO4	5

CO2	Design programs for implementation of binary search tree, sorting and searching, dictionary and Hash Table	12	PO4	5
CO3	Design programs for graphs and shortest path techniques.	9	PO4	5

### 1.3 Assessment Plan

Components	Lab Test	Flexible Assessments (5- 6 in number)	End semester/ Makeup examination
<b>Duration</b>	90 minutes	To be decided by the faculty.	180 minutes
<b>Weightage</b>	0.3	0.2	0.5
<b>Typology of questions</b>	Applying; Analyzing.	Applying; Analyzing. Evaluating.	Applying; Analyzing; Evaluating.

<b>Pattern</b>	Answer all the questions. Maximum marks 30.	<b>Assignment:</b> develop applications using various data structures and different design techniques	Answer all the questions. Maximum marks 50.
<b>Schedule</b>	As per academic calendar.	<b>Assignment submission:</b> November 2024	As per academic calendar.
<b>Topics covered</b>	Linked List, Stack, Queue, Trees, Searching & Sorting, Hash tables, Graphs		Comprehensive examination covering the full syllabus.

#### 1.4 Lesson Plan

L. No.	TOPICS	Course Outcome Addressed
L0	Course delivery plan, Course assessment plan, Course outcomes, Program outcomes, CO-PO mapping, reference books	---
Lab1	Linked List: Implementing Single Linked List	CO1
Lab2	Linked List: Implementing Double Linked List	CO1
Lab3	Linked List: Application development using linked lists	CO1

Lab4	Stack: Implementation and applications of Stack	CO1
Lab5	Queue: Implementation and applications of Queue	CO1
Lab6	Tree: Implementation and applications of Tree	CO2
IT1	Internal lab test	CO1, CO2
Lab7	Applications using different search and sorting techniques.	CO2
Lab8	Applications using different search and sorting techniques.	CO2
Lab9	Application using Hash Table	CO2
Lab10	Graph representation using list and matrix method	CO3
Lab11	Graph traversal	CO3
Lab12	Graph: Shortest path technique	CO3

## 1.5 References

1. Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest. MIT Press.
2. Data Structures and Algorithms - Aho, Hopcroft and Ullmann. Pearson Publishers.
3. Data Structures and Algorithms in Python - Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser. John Wiley & Sons.
4. Data Streams: Algorithms and Applications - S. Muthukrishnan. Foundations and Trends in Theoretical Computer Science archive, Volume 1 Issue 2, August 2005, Pages 117 – 236



## 1.6 Other Resources (Online, Text, Multimedia, etc.)

1. Web Resources: Blog, Online tools and cloud resources.
2. Journal Articles.

## 1.7 Course Timetable

1 <sup>st</sup> Semester Big Data Analytics				Room: LG1 LH 3		Lab: Data Science Lab		
	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5
MON								
TUE								
WED								
THU								
FRI						ADS LAB		
SAT								

## 1.8 Assessment Plan

COs		Marks & weightage			
CO No.	CO Name	Lab Test (Max. 30)	Assignment (Max. 20)	End Semester (Max. 50)	CO wise Weightage
CO1	Design programs for implementation of linked lists, stack and queues.	15	10	25	<b>0.5</b>
CO2	Design programs for implementation of binary search tree, sorting and searching, dictionary and Hash Table	10	6	15	<b>0.31</b>
CO3	Design programs for graphs and shortest path techniques.	5	4	10	<b>0.19</b>
	Marks (weightage)	<b>0.3</b>	<b>0.2</b>	<b>0.5</b>	<b>1.0</b>

- In-semester Assessment is considered as the Internal Assessment (IA) in each subject for 50 marks, which includes the performances in class / tutorial participation, assignment work, lab work, class tests, mid-term tests, quizzes etc.
- End-semester examination (ESE) for each lab subject is conducted for a maximum of 50.
- End-semester mark for a maximum of 50 and IA marks for a maximum of 50 are added for a maximum of 100 marks to decide upon the grade in a subject.

### 1.9 Assessment Details

The assessment tools to be used for the Current Academic Year (CAY) are as follows:

SI. No.	Tools (TLP)	Weightage	Frequency	Details of Measurement (Weightage/Rubrics/Duration, etc.)
1	Sessional	0.3	2	<ul style="list-style-type: none"><li>Performance is measured using sessional attainment level.</li><li>Reference: question paper and answer scheme.</li><li>Each sessional is assessed for a maximum of 30 marks.</li></ul>
2	Assignments	0.2	-	<ul style="list-style-type: none"><li>Performance is measured using assignments/quiz attainment level.</li><li>Assignments/quiz are evaluated for a maximum of 20 marks.</li></ul>
3	ESE	0.5	1	<ul style="list-style-type: none"><li>Performance is measured using ESE attainment level.</li><li>Reference: question paper and answer scheme.</li><li>ESE is assessed for a maximum of 50 mark.</li></ul>

### 1.10 Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5
CO1				Y	
CO2				Y	

CO3				Y	
Average Articulation Level			*	*	*