Manipal School of Information Sciences (MSIS) **Manipal Academy of Higher Education, Manipal

Master of Engineering - ME (Big Data Analytics)**

Course File

Course Name : Algorithms and Data Structures for Big Data

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Course Code : BDA 5101

Academic Year : 2024 - 2025

Semester : I

Name of the Course Coordinator : Mr. DEEPAK RAO B

Name of the Program Coordinator : Dr. PRATHVIRAJ N

Signature of Program Coordinator Signature of Course Coordinator

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with Date with Date

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. |

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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.

PO4 Develop and implement big data analysis strategies based on theoretical principles, ethical considerations, and detailed

knowledge of the underlying data.

1. Course Plan

1.1 Primary Information

Course Name : Algorithms and Data Structures for Big Data

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L-T-P-C : 3-0-0-3

Contact Hours : 36 Hours

Pre-requisite : Programming with Python or C

Core/ PE/OE : Core

1.2 Course Outcomes (COs), Program outcomes (POs) and Bloom's Taxonomy Mapping

CO	At the end of this course, the student should be able to:	No. of Contact Hours	Marks	Program Outcomes (PO's)	BL
CO1	Analyze recursive programs, solve a general class of recurrence relations	3	10	PO3	3
CO2	Design programs for implementation of linked lists, stack, queues and binary search tree	10	40	PO4	4
CO3	Design programs for dictionary, hash tables, graphs,	14	40	PO4	4

shortest path techniques, sorting and searching.

CO4 Design string and text processing programs. 9 10 PO4 4

  Total   100

1.3 Assessment Plan

Components Mid Semester Flexible Assessments End semester/ Makeup

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   (2 - 3 in number) examination

Duration 90 minutes To be decided by the faculty. 180 minutes

Weightage 30% 20% 50%

Typology of Applying; Analyzing and Applying; Analyzing. Applying; Analyzing;

questions Evaluating Evaluating. Evaluating.

Answer all 5 Quiz / Test: 10%

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questions of 10 Assignment 1: (Text processing Answer all 10 full questions of

marks each. Each algorithms, 5% weightage) 10 marks each. Each question Pattern

question may have Assignment 2: (Data Streaming may have 2 to 3 parts of

2 to 3 parts of algorithms, 5% weightage) 3/4/5/6/7 marks.

3/4/5/6/7 marks.

Quiz / Test: September 2024 As per academic

Schedule Assignment 1: October 2024 As per academic calendar. calendar.

Assignment 2: November 2024

Algorithm Analysis

Techniques

Elementary Data Comprehensive examination

structures covering the full syllabus.

Topics covered Trees Students are expected to

Sorting, Searching answer all questions.

Dictionary and

Hashing

1.4 Lesson Plan

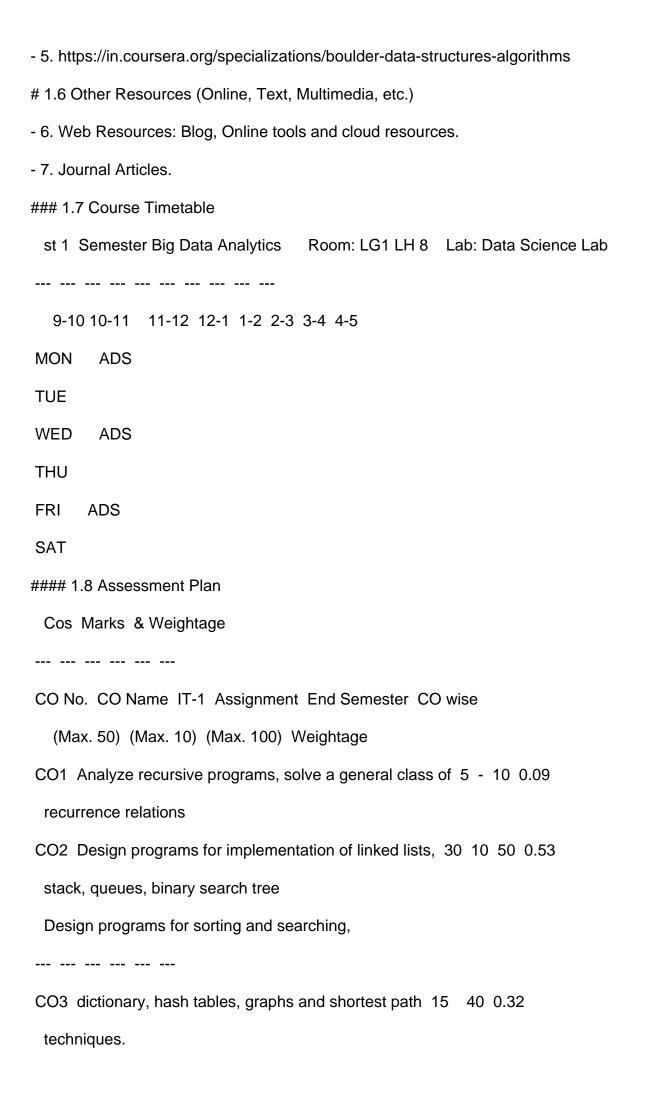| L. No.	TOPICS	Course Outcome Addressed
L0	Course delivery plan, Course assessment plan, Course outcomes, Program outcomes, CO-PO mapping, reference books	
L1	Analysis of recursive programs.	CO1
L2	Solving recurrence equations.	CO1
L3	General solution for a large class of recurrences.	CO1
L4	Implementation of lists.	CO2
L5	Implementation of lists.	CO2
L6	Implementation of lists.	CO2
L7	Implementation of stacks.	CO2
L8	Implementation of stacks.	CO2
L9	Implementation of queues.	CO2
L10	Implementation of queues.	CO2
L11	Implementation of Trees.	CO2
L12	Implementation of Trees.	CO2
L13	Implementation of Trees.	CO2
L14	Sorting - bubble, selection and insertion	CO3
L15	Sorting - Quick sort	CO3
L16	Sorting - Merge sort	CO3
L17	Sorting - Heap Sort	CO3
L18	Searching - Linear and binary	CO3

L19 Dictionary and Hash Tables CO3

L20 Dictionary and Hash Tables CO3

L21 Dictionary and Hash Tables CO3

 Mid Semester Evaluation CO1 , CO2, CO3

L22 Graph Terminology CO3

L23 Representation of graphs CO3

L24 Traversing Graphs CO3

L25 Shortest Path algorithm CO3

L26 Shortest Path algorithm CO3

L27 String and Text processing CO4

L28 String and Text processing CO4

L29 String and Text processing CO4

L30 String and Text processing CO4

L31 Data streaming algorithms CO4

L32 Data streaming algorithms CO4

L33 Data streaming algorithms CO4

L34 Data streaming algorithms CO4

L35 Data streaming algorithms CO4

L36 Data streaming algorithms CO4

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 Ulmann. 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

- 5. https://in.coursera.org/specializations/boulder-data-structures-algorithms

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

- 6. Web Resources: Blog, Online tools and cloud resources.

- 7. Journal Articles.

1.7 Course Timetable

st 1 Semester Big Data Analytics   Room: LG1 LH 8   Lab: Data Science Lab

	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5
MON	ADS							
TUE								
WED	ADS							
THU								
FRI	ADS							
SAT								

1.8 Assessment Plan

Cos Marks & Weightage

CO No.	CO Name	IT-1 (Max. 50)	Assignment (Max. 10)	End Semester (Max. 100)	CO wise Weightage
CO1	Analyze recursive programs, solve a general class of recurrence relations	5	-	10	0.09
CO2	Design programs for implementation of linked lists, stack, queues, binary search tree Design programs for sorting and searching,	30	10	50	0.53
CO3	dictionary, hash tables, graphs and shortest path techniques.	15		40	0.32

CO4 Design string and text processing programs. - 10   0.06

 Marks (weightage) 0.3 0.2 0.5 1.0

Note:

- In-semester Assessment is considered as the Internal Assessment (IA) in this course for 50 marks, which includes the performances in class participation, assignment work, class tests, mid-term tests, quizzes etc.

- End-semester examination (ESE) for this course is conducted for a maximum of 100 and the same will be scaled down to 50.

End-semester marks 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 this course.

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	Mid Semester	0.3	- 1	Performance is measured using sessional attainment level.
				- Reference: question paper and answer scheme.
				- Mid semester exam is assessed for a maximum of 50 marks and scaled down to
				30 marks
2	Assignments	0.2	1	- Performance is measured using assignments/quiz attainment level.
				- Assignments/quiz are evaluated for a maximum of 20 marks.
				- Performance is measured using ESE attainment level.
3	ESE	0.5	1	- Reference: question paper and answer scheme.
				- ESE is assessed for a maximum of 100 marks and scaled down to 50 marks.

1.10 Course Articulation Matrix

| CO | PO1 | PO2 | PO3 | PO4 | PO5 |

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CO1   Y

CO2   Y

CO3   Y

CO4   Y

Average Articulation Level   * *