



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade,

ISO 21001:2018, 50001:2018, 14001:2015 Certified Institution

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada.

L.B.REDDY NAGAR, MYLAVARAM. NTR District, AP, India. 521230.

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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor** :Dr. B. PHANI KRISHNA  
**Course Name & Code** : BIGDATA ANALYTICS, 23AD09  
**L-T-P Structure** : **3-0-0** Credits: 3  
**Program/Sem/Sec** : B. Tech/VI/B-Sec **A.Y.:** 2025-26

**PREREQUISITE:** - Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in the Hadoop ecosystem.

**Course Outcomes:** - At the end of the course the student will be able to

S. No	Course Outcome (CO)	Blooms Level
1	<b>CO1:</b> Implement object-oriented data structures and generic programming concepts in Java to handle data efficiently.	<b>L3: Apply</b>
2	<b>CO2:</b> Explain the architectural building blocks of Hadoop Distributed File System (HDFS) and configure Hadoop clusters in various modes.	<b>L2: Understand</b>
3	<b>CO3:</b> Develop MapReduce applications using the Hadoop API to process and analyze large-scale datasets.	<b>L3: Apply</b>
4	<b>CO4:</b> Analyze data stream models and utilize Spark Resilient Distributed Datasets (RDDs) for real-time data processing.	<b>L4: Analyze</b>
5	<b>CO5:</b> Construct Pig Latin scripts and HiveQL queries to summarize, query, and manage data stored in the Hadoop ecosystem.	<b>L6: Create</b>

### **Blooms Taxonomy Level Reference:**

- **L1: Remember** - Recall facts and basic concepts.
- **L2: Understand** - Explain ideas or concepts.
- **L3: Apply** - Use information in new situations.
- **L4: Analyze** - Draw connections among ideas.
- **L5: Evaluate** - Justify a stand or decision.

- **L6: Create** - Produce new or original work.

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	2	-	-	-	-	-	-	1	3	-	2
CO2	3	2	2	-	3	-	-	-	-	-	-	1	3	1	-
CO3	3	3	3	2	3	-	-	-	-	-	-	1	3	-	2
CO4	3	3	2	2	3	-	-	-	-	-	-	1	3	2	2
CO5	3	3	3	2	3	-	-	-	-	-	-	1	3	-	3
<b>1 - Low 2 -Medium 3 - High</b>															

**Textbooks:**

1. Wiley & Big Java 4th Edition, Cay Horstmann, Wiley John Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd.Edition, O'reilly

**Reference Books:**

1. Hadoop in Action by Chuck Lam, MANNING Publ.
2. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss
3. Hadoop in Practice by Alex Holmes, MANNING Publ.
4. Big Data Analytics by Dr. A.Krishna Mohan and Dr.E.Laxmi Lydia
5. Hadoop Map Reduce Cookbook, SrinathPerera, ThilinaGunarathne

**Software Links:**

1. Hadoop: <http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
3. Piglatin: <http://pig.apache.org/docs/r0.7.0/tutorial.html>

**PART-B**

**COURSE DELIVERY PLAN (LESSON PLAN):**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
<b>UNIT I</b>						
<b>Data Structures in Java &amp; Generics</b>						
1	Data structures in Java: Linked List	1	01-12-2025 (Mon)		TLM1	
2	Stacks, Queues	1	02-12-2025 (Tue)		TLM1	
3	Sets, Maps	1	03-12-2025		TLM1	

			(Wed)			
4	Generics: Generic classes and Type parameters	1	04-12-2025 (Thu)		TLM2	
5	Implementing Generic Types	1	08-12-2025 (Mon)		TLM4	
6	Generic Methods	1	09-12-2025 (Tue)		TLM4	
7	Wrapper Classes	1	10-12-2025 (Wed)		TLM1	
8	Concept of Serialization	1	11-12-2025 (Thu)		TLM2	
9	Unit I Revision & Tutorial	1	15-12-2025 (Mon)		TLM3	
<b>UNIT II</b>	<b>Working with Big Data &amp; HDFS</b>					
10	Introduction to Big Data & Google File System (GFS)	1	16-12-2025 (Tue)		TLM2	
11	Hadoop Distributed File System (HDFS) Overview	1	17-12-2025 (Wed)		TLM2	
12	Building blocks of Hadoop (Name node, Data node)	1	18-12-2025 (Thu)		TLM1	
13	Secondary Name node, Job Tracker, Task Tracker	1	22-12-2025 (Mon)		TLM1	
14	Configuring Hadoop cluster (Local & Pseudo-distributed mode)	1	23-12-2025 (Tue)		TLM4	
15	Configuring Hadoop cluster (Fully Distributed mode)	1	24-12-2025 (Wed)		TLM4	
16	Configuring XML files	1	24-12-2025 (Wed)		TLM4	
17	HDFS Architecture Deep Dive	1	29-12-2025 (Mon)		TLM5	
18	Unit II Review & Quiz	1	30-12-2025 (Tue)		TLM3	
19	Extra Lab Session: Hadoop Setup Troubleshooting	1	31-12-2025 (Wed)		TLM4	
<b>UNIT III</b>	<b>Writing Map Reduce Programs</b>					
20	Intro to MapReduce: A Weather Dataset	1	05-01-2026 (Mon)		TLM2	

21	Hadoop API for Map Reduce Framework (Old and New)	1	05-01-2026 (Mon)		TLM2	
22	Basic programs of Hadoop Map Reduce: Driver code	1	06-01-2026 (Tue)		TLM4	
23	Writing Mapper code	1	07-01-2026 (Wed)		TLM4	
24	Writing Reducer code	1	08-01-2026 (Thu)		TLM4	
25	Record Reader Mechanics	1	12-01-2026 (Mon)		TLM1	
26	Combiner Optimization	1	13-01-2026 (Tue)		TLM2	
27	Practitioner: Custom Partitioning	1	19-01-2026 (Mon)		TLM4	
28	MapReduce Execution Flow	1	20-01-2026 (Tue)		TLM1	
29	MapReduce Hands-on Example	1	21-01-2026 (Wed)		TLM4	
30	Unit III Tutorial	1	22-01-2026 (Thu)		TLM3	
UNIT IV	Stream Memory and Spark					
31	Introduction to Streams Concepts: Data Model	1	02-02-2026 (Mon)		TLM2	
32	Stream Architecture & Stream Computing	1	03-02-2026 (Tue)		TLM1	
33	Sampling Data in a Stream	1	04-02-2026 (Wed)		TLM2	
34	Filtering Streams (Bloom Filters)	1	05-02-2026 (Thu)		TLM1	
35	Counting Distinct Elements in a Stream (DGIM)	1	09-02-2026 (Mon)		TLM1	
36	Introduction to Spark Concept vs Hadoop	1	10-02-2026 (Tue)		TLM2	
37	Spark Architecture and Components	1	11-02-2026 (Wed)		TLM5	
38	Spark Installation & Setup	1	12-02-2026 (Thu)		TLM4	
39	Spark RDD (Resilient Distributed Dataset) Intro	1	16-02-2026 (Mon)		TLM1	
40	Spark RDD Operations:	1	17-02-2026		TLM4	

	<b>Transformations</b>		<b>(Tue)</b>			
<b>41</b>	<b>Spark RDD Operations: Actions</b>	<b>1</b>	<b>18-02-2026 (Wed)</b>		<b>TLM4</b>	
<b>42</b>	<b>Writing Spark Applications</b>	<b>1</b>	<b>19-02-2026 (Thu)</b>		<b>TLM4</b>	
<b>43</b>	<b>Unit IV Tutorial</b>	<b>1</b>	<b>23-02-2026 (Mon)</b>		<b>TLM3</b>	
<b>UNIT V</b>	<b>Pig and Hive</b>					
<b>44</b>	<b>Pig: Hadoop Programming Made Easier, Architecture</b>	<b>1</b>	<b>24-02-2026 (Tue)</b>		<b>TLM2</b>	
<b>45</b>	<b>Pig Latin Application Flow</b>	<b>1</b>	<b>25-02-2026 (Wed)</b>		<b>TLM1</b>	
<b>46</b>	<b>Working through the ABCs of Pig Latin</b>	<b>1</b>	<b>26-02-2026 (Thu)</b>		<b>TLM2</b>	
<b>47</b>	<b>Evaluating Local and Distributed Modes of Pig</b>	<b>1</b>	<b>02-03-2026 (Mon)</b>		<b>TLM4</b>	
<b>48</b>	<b>Checking out the Pig Script Interfaces</b>	<b>1</b>	<b>04-03-2026 (Wed)</b>		<b>TLM4</b>	
<b>49</b>	<b>Scripting with Pig Latin</b>	<b>1</b>	<b>05-03-2026 (Thu)</b>		<b>TLM4</b>	
<b>50</b>	<b>Applying Structure to Hadoop Data with Hive: Intro</b>	<b>1</b>	<b>09-03-2026 (Mon)</b>		<b>TLM2</b>	
<b>51</b>	<b>Seeing How the Hive is Put Together (Architecture)</b>	<b>1</b>	<b>10-03-2026 (Tue)</b>		<b>TLM1</b>	
<b>52</b>	<b>Getting Started with Apache Hive</b>	<b>1</b>	<b>11-03-2026 (Wed)</b>		<b>TLM4</b>	
<b>53</b>	<b>Examining the Hive Clients</b>	<b>1</b>	<b>12-03-2026 (Thu)</b>		<b>TLM4</b>	
<b>54</b>	<b>Working with Hive Data Types</b>	<b>1</b>	<b>16-03-2026 (Mon)</b>		<b>TLM1</b>	
<b>55</b>	<b>Creating and Managing Databases and Tables</b>	<b>1</b>	<b>17-03-2026 (Tue)</b>		<b>TLM4</b>	
<b>56</b>	<b>Hive Data Manipulation Language (DML)</b>	<b>1</b>	<b>18-03-2026 (Wed)</b>		<b>TLM4</b>	
<b>57</b>	<b>Querying and Analyzing data: Select &amp; Filters</b>	<b>1</b>	<b>19-03-2026 (Thu)</b>		<b>TLM4</b>	
<b>58</b>	<b>Querying and Analyzing data: Aggregation</b>	<b>1</b>	<b>23-03-2026 (Mon)</b>		<b>TLM4</b>	
<b>59</b>	<b>Comparison: Pig vs Hive</b>	<b>1</b>	<b>24-03-2026 (Tue)</b>		<b>TLM6</b>	
<b>60</b>	<b>Unit V Tutorial</b>	<b>1</b>	<b>25-03-2026 (Wed)</b>		<b>TLM3</b>	

CONTENT BEYOND THE SYLLABUS						
61	Modern Spark – DataFrames & Spark SQL	1	30-03-2026 (Mon)		TLM3	
62	Real-Time Ingestion – Apache Kafka	1	31-03-2026 (Tue)		TLM3	
63	NoSQL Databases – CAP Theorem & HBase	1	01-04-2026 (Wed)		TLM3	

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

### PART-C

#### EVALUATION PROCESS (R17 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

### PART-D

#### PROGRAMME OUTCOMES (POs):

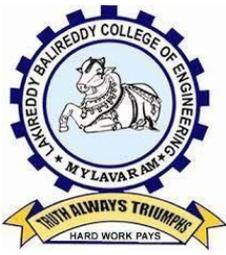
PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal,

	and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
<b>PO 9</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and author effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	The ability to apply Software Engineering practices and strategies in software projects. development using open-source programming environment for the success of organization.
<b>PSO 2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs
<b>PSO 3</b>	To inculcate an ability to analyze, design and implement database applications.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>K. Sudhakar</b>	<b>K. Sudhakar</b>	<b>Dr.V.Surya Narayana</b>	<b>Dr. P. Bhagath</b>
<b>Signature</b>				



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## DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Mr. RAMESH SAGGURTHI

**Course Name & Code** : Deep Learning (23AM06)

**L-T-P Structure** : 3-0-0

**Credits:** 3

**Program/Sem/Sec** : B. Tech /VI-Sem /B-Sec

**A.Y.:** 2025-26

**PREREQUISITE:** Linear algebra, calculus, probability, Python, Machine Learning, Neural Networks

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The main objectives of the course is to make students. The objective of this course is to cover the fundamentals of neural networks as well as some advanced topics such as recurrent neural networks, long short-term memory cells and convolution neural networks.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Understand the fundamental concepts of artificial neurons, perceptrons, and learning rules used in basic neural network models. ( <b>Understand – L2</b> )
<b>CO2</b>	Apply feed-forward neural network architectures and backpropagation algorithms for supervised learning tasks. ( <b>Apply – L3</b> )
<b>CO3</b>	Apply various optimization and regularization techniques to improve deep neural network training performance. ( <b>Apply – L3</b> )
<b>CO4</b>	Implement the working of RNNs, LSTMs, CNNs, and generative models (RBMs, DBMs) for sequential and visual data. ( <b>Apply – L3</b> )
<b>CO5</b>	Apply GPT-based models for NLP, vision, and speech applications ( <b>Apply – L3</b> )

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
<b>CO1</b>	1	2	1	1	1	-	-	-	-	-	-	2	2	1	-	
<b>CO2</b>	3	3	2	1	2	-	-	-	-	-	-	2	3	2	1	
<b>CO3</b>	3	3	2	2	2	-	-	-	-	-	-	3	3	2	1	
<b>CO4</b>	3	3	2	2	2	-	-	-	-	-	-	2	3	3	1	
<b>CO5</b>	2	2	2	1	2	-	-	-	-	-	-	2	2	3	1	
	<b>1-Low</b>			<b>2 -Medium</b>					<b>3-High</b>							

#### **Text books:**

1. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

#### **Reference books:**

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007
3. Deep Learning with Python, François Chollet, Manning Publications, 2017

#### PART-B

**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and Cos and DL Syllabus discussion	1	01-12-2025		TLM1& TLM2	
2.	<b>Basics-</b> Biological Neuron.	1	03-12-2025		TLM1& TLM2	
3.	Idea of computational units.	1	04-12-2025		TLM1& TLM2	
4.	McCulloch–Pitts unit and Thresholding logic.	1	06-12-2025		TLM1& TLM2	
5.	Linear Perceptron.	1	08-12-2025		TLM1& TLM2	
6.	Perceptron Learning Algorithm.	2	10-12-2025 11-12-2025		TLM1& TLM2	
7.	Linear separability.	1	13-12-2025		TLM1& TLM2	
8.	Convergence theorem for Perceptron Learning Algorithm.	2	15-12-2025 17-12-2025		TLM1& TLM2	
<b>No. of classes required to complete UNIT-I:10</b>				<b>No. of classes taken:</b>		

**UNIT-II:**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9	<b>Feed forward Networks-</b> Multilayer Perceptron	1	18-12-2025		TLM1&	

10	Gradient Descent	1	20-12-2025		TLM1& TLM2	
11	Backpropagation	1	22-12-2025		TLM1& TLM2	
12	Empirical Risk Minimization	1	24-12-2025		TLM1& TLM2	
13	Regularization	1	27-12-2025		TLM1& TLM2	
14	Auto encoders.	1	29-12-2025		TLM1& TLM2	
15	Deep Neural Networks: Difficulty of training deep neural networks,	2	31-12-2025 03-01-2026		TLM1& TLM2	
16	Greedy layer wise training.	1	05-01-2026		TLM1 & TLM2	
<b>No. of classes required to complete UNIT-II:9</b>				<b>No. of classes taken:</b>		

### UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17	<b>Better Training of Neural Networks:</b>	1	07-01-2026		TLM1& TLM2	
18.	Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG),	3	08-01-2026 10-01-2026 19-01-2026		TLM1& TLM2	
19.	Second order methods for training,	1	21-01-2026		TLM1& TLM2	
20.	Saddle point problem in neural networks,	1	02-02-2026		TLM1& TLM2	
21.	Regularization methods (dropout, drop connect, batch normalization).	2	04-02-2026 05-02-2026		TLM1& TLM2	
<b>No. of classes required to complete UNIT-III:08</b>				<b>No. of classes taken:</b>		

### UNIT-IV:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
22.	<b>Recurrent Neural Networks-Back propagation through time</b>	1	07-02-2026		TLM1& TLM2	
23.	Long Short Term Memory,	1	09-02-2026		TLM1&	

24	Gated Recurrent Units	1	11-02-2026		TLM2
25	Bidirectional LSTMs,	1	12-02-2026		TLM1& TLM2
26	Bidirectional RNNs.	1	14-02-2026		TLM1& TLM2
27	<b>Convolutional Neural Networks: LeNet</b>	1	16-02-2026 18-02-2026		TLM1& TLM2
28	AlexNet.	1	19-02-2026 21-02-2026		TLM1& TLM2
29	Generative models: Restrictive Boltzmann Machines (RBMs)	1	23-02-2026		TLM1& TLM2
30	Introduction to MCMC and Gibbs Sampling,	1	25-02-2026 26-02-2026		TLM1& TLM2
31	Gradient computations in RBMs	1	28-02-2026		TLM1& TLM2
32	Deep Boltzmann Machines.	2	02-03-2026 05-03-2026		TLM1& TLM2
<b>No. of classes required to complete UNIT-IV:12</b>				<b>No. of classes taken:</b>	

#### UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33	<b>Recent trends-Variational Auto encoders.</b>	1	07-03-2026		TLM1& TLM2	
	Transformers.	2	09-03-2026 11-03-2026		TLM1& TLM2	
	GPT Applications: Vision.	2	12-03-2026 14-03-2026		TLM1& TLM2	
34	NLP	2	16-03-2026 18-03-2026		TLM1& TLM2	
35	Speech.	3	23-03-2026 25-03-2026 28-03-2026		TLM1& TLM2	
36	Subject Overview	1	30-03-2026		TLM1& TLM2	
37.	Revision	2	02-04-2026 04-04-2026		TLM1& TLM2	
<b>No. of classes required to complete UNIT-V:13</b>				<b>No. of classes taken:</b>		

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration(Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT(NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I(Units-I,II&UNIT-III(Half of the Syllabus))	A1=5
I-Descriptive Examination(Units-I,II&UNIT-III(Half of the Syllabus))	M1=15
I-Quiz Examination(Units-I,II&UNIT-III(Half of the Syllabus))	Q1=10
Assignment-II(Unit-III(Remaining (Half of the Syllabus),IV&V)	A2=5
II-Descriptive Examination(UNIT-III(Remaining Half of the Syllabus),IV&V)	M2=15
II-Quiz Examination(UNIT-III(Remaining Half of the Syllabus),IV&V)	Q2=10
MidMarks=80%ofMax((M1+Q1+A1),(M2+Q2+A2))+20%ofMin((M1+Q1+A1),(M2+Q2+A2))	M=30
CumulativeInternalExamination(CIE):M	30
SemesterEndExamination(SEE)	70
TotalMarks=CIE+ SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO1</b>	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	Problem analysis : Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO3</b>	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO4</b>	Conduct investigations of complex problems: Use research-based knowledge and Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5</b>	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO6</b>	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent Responsibilities relevant to the professional engineering practice
<b>PO7</b>	Environment and sustainability: Understand the impact of the professional engineering Solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8</b>	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
<b>PO11</b>	Project management and finance: Demonstrate knowledge and understanding of the

	Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.
<b>PO12</b>	Life-long learning: Recognize the need for and have the preparation and ability to engage In independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO1</b>	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
<b>PSO2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
<b>PSO3</b>	To inculcate an ability to analyze, design and implement database applications.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr. S.Ramesh</b>	<b>Dr.P. Bhagath</b>	<b>Dr.V. Suryanarayana</b>	<b>Dr.P.Bhagath</b>
<b>Signature</b>				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade,

ISO 21001:2018, 50001:2018, 14001:2015 Certified Institution

Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada.

L.B.REDDY NAGAR, MYLAVARAM. NTR District, AP, India. 521230.

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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor: Mr. S. V. V. D. JAGADEESH**

**Course Name & Code : NATURAL LANGUAGE PROCESSING (23AM05)**

**L-T-P Structure : 3-0-0**

**Credits: 3**

**Program/Sem/Sec :III B.Tech /VI Sem /AI & DS - B**

**A.Y.: 2025-26**

**PREREQUISITE:** Knowledge of Python programming, Formal Language Theory

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

- This course introduces the fundamental concepts and techniques of natural language processing (NLP).
- Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

**COURSE OUTCOMES (CO's):** After successful completion of the course the students are able to

<b>CO1</b>	Understand the basic components of NLP( <b>Understand-L2</b> )
<b>CO2</b>	Apply N-grams models to predict a sequence of text. ( <b>Apply-L3</b> )
<b>CO3</b>	Apply a grammar rule to write the syntax of a language. ( <b>Apply-L3</b> )
<b>CO4</b>	Apply a grammar rule to write the semantic and pragmatics of a language. ( <b>Apply-L3</b> )
<b>CO5</b>	Apply the Discourse Analysis and Lexical Resources of NLP( <b>Apply-L3</b> )

#### **COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
<b>CO1</b>	1	1	1	1	1	-	-	-	-	-	-	2		1	-	
<b>CO2</b>	2	2	2	1	2	-	-	-	-	-	-	2	1	2	1	
<b>CO3</b>	2	2	2	2	2	-	-	-	-	-	-	3	1	2	1	
<b>CO4</b>	2	2	2	2	2	-	-	-	-	-	-	2	1	3	1	
<b>CO5</b>	1	1	2	1	2	-	-	-	-	-	-	2	1	3	1	
	<b>1 - Low</b>			<b>2 -Medium</b>					<b>3 - High</b>							

#### **TEXTBOOKS:**

Speech and Language Processing: An Introduction to Natural Language Processing,

**T1** Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin - Pearson Publication,2014.

Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward

**T2** Loper, OReilly Media,2009.

**REFERENCE BOOKS:**

- R1** Language Processing with Java and Ling Pipe Cookbook, 1st Edition, Breck Baldwin, Atlantic Publisher, 2015.
- R2** Natural Language Processing with Java, 2nd Edition, Richard M Reese, OReilly Media,2015.
- R3** Handbook of Natural Language Processing, Second, Nitin Indurkha and Fred J. Damerau, Chapman and Hall/CRC Press, 2010.Edition
- R4** Natural Language Processing and Information Retrieval, 3rd Edition, Tanveer Siddiqui, U.S. Tiwary, Oxford University Press,2008.

**E-resources:**

1. <https://web.stanford.edu/~jurafsky/slp3/>
2. <https://nlp.stanford.edu/IR-book/html/htmledition/finite-state-automata-1.html>
3. <https://www.nltk.org/book/ch03.html>
4. [https://www.nltk.org/\\_modules/nltk/metrics/distance.html](https://www.nltk.org/_modules/nltk/metrics/distance.html)

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction to NLP**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to NLP	1	01-12-25		TLM 2	
2.	Origins and challenges of NLP	1	03-12-25		TLM 2	
3.	Language Modeling: Grammar Based- LM, Statistical LM	1	05-12-25		TLM 2	
4.	Regular Expressions-Examples	1	06-12-25		TLM 1	
5.	Finite-State Automata	1	08-12-25		TLM 1	
6.	Finite-State Automata – Examples	1	10-12-25		TLM 1	
7.	English Morphology	1	12-12-25		TLM 2	
8.	Transducers for lexicon	1	13-12-25		TLM 2	
9.	Transducers for rules	1	15-12-25		TLM 2	
10.	Tokenization	1	17-12-25		TLM 2	
11.	Detecting and Correcting Spelling Errors	1	19-12-25		TLM 2	
12.	Minimum Edit Distance-Algorithm	1	20-12-25		TLM 1	
13.	Minimum Edit Distance-Example	1	22-12-25		TLM 1	
14.	Case Study on Minimum Edit Distance	1	24-12-25		TLM 4	
<b>No. of classes required to complete UNIT-I: 14</b>				<b>No. of classes taken:</b>		

**UNIT-II: Word Level Analysis**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Unsmoothed N-grams	1	26-12-25		TLM 2	
16.	Unsmoothed N-grams	1	27-12-25		TLM 2	
17.	Evaluating N-grams	1	29-12-25		TLM 4	
18.	Smoothing, Interpolation and Backoff – Word Classes	1	31-12-25		TLM 2	
19.	Interpolation and Backoff – Word Classes	1	02-01-26		TLM 2	
20.	Part- of-Speech Tagging	1	03-01-26		TLM 1	
21.	Rule-based POS Tagging	1	05-01-26		TLM 1	
22.	Stochastic-based POS Tagging	1	07-01-26		TLM 1	
23.	Transformation-based POS tagging	1	09-01-26		TLM 1	
24.	Issues in PoS tagging	1	10-01-26		TLM 2	
25.	Hidden Markov Models	1	19-01-26		TLM 1	
26.	Maximum Entropy models	1	21-01-26		TLM 1	
27.	Case Studies on POS Tagging and Hidden Markov Models	1	23-01-26		TLM 4	
<b>No. of classes required to complete UNIT-II: 13</b>				<b>No. of classes taken:</b>		

**UNIT-III: Syntactic Analysis**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	Context-Free Grammars	1	24-01-26		TLM 2	
29.	Grammar rules for English	1	02-02-26		TLM 2	
30.	Treebanks, Normal Forms for grammar	1	04-02-26		TLM 2	
31.	Dependency Grammar	1	06-02-26		TLM 2	
32.	Syntactic Parsing, Ambiguity	1	07-02-26		TLM 2	
33.	Dynamic Programming parsing	1	09-02-26		TLM 1	
34.	Shallow parsing Probabilistic CFG	1	11-02-26		TLM 1	
35.	Probabilistic CYK	1	13-02-26		TLM 1	
36.	Probabilistic Lexicalized CFGs	1	14-02-26		TLM 1	
37.	Feature structures, Unification of feature structures	1	16-02-26		TLM 2	
38.	Case Study on Grammar Rules	1	18-02-26		TLM 4	
<b>No. of classes required to complete UNIT-III: 11</b>				<b>No. of classes taken:</b>		

**UNIT-IV: Semantics and Pragmatics**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	Requirements for representation	1	20-02-26		TLM 2	
40.	First-Order Logic	1	21-02-26		TLM 1	
41.	Description Logics – Syntax-Driven Semantic analysis	1	23-02-26		TLM 1	
42.	Semantic attachments – Word Senses	1	25-02-26		TLM 2	
43.	Relations between Senses, Thematic Roles	1	27-02-26		TLM 2	

44.	selectional restrictions – Word Sense Disambiguation	1	28-02-26		TLM 1
45.	WSD using Supervised, Dictionary methods	1	02-03-26		TLM 2
46.	WSD using Thesaurus, Bootstrapping methods	1	04-03-26		TLM 1
47.	Word Similarity using Thesaurus methods.	1	06-03-26		TLM 1
48.	Word Similarity using Distributional methods.	1	07-03-26		TLM 1
49.	Case Study on Word Sense Disambiguity	1	09-03-26		TLM 4
<b>No. of classes required to complete UNIT-IV: 11</b>				<b>No. of classes taken:</b>	

#### UNIT-V: Discourse Analysis And Lexical Resources

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
50.	Discourse segmentation	1	11-03-26		TLM 2	
51.	Coherence – Reference Phenomena	1	13-03-26		TLM 2	
52.	Anaphora Resolution using Hobbs and Centering Algorithm	1	14-03-26		TLM 1	
53.	Anaphora Resolution using Hobbs and Centering Algorithm	1	16-03-26		TLM 1	
54.	Coreference Resolution	1	18-03-26		TLM 2	
55.	Resources: Porter Stemmer, Lemmatizer	1	20-03-26		TLM 2	
56.	Penn Treebank	1	21-03-26		TLM 2	
57.	Brill's Tagger, WordNet	1	23-03-26		TLM 2	
58.	PropBank, FrameNet	1	25-03-26		TLM 2	
59.	Brown Corpus, British National Corpus (BNC)	1	27-03-26		TLM 2	
60.	Detailed Case Study on NLP Tasks	1	28-03-26		TLM 4	
<b>No. of classes required to complete UNIT-V: 12</b>				<b>No. of classes taken:</b>		

#### CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
61.	Grammar Rules for Telugu Language	1	30-03-26		TLM 1	
62.	POS Tagging for Telugu Language	1	01-04-26		TLM 1	
63.	Rule Based Semantic analysis on Telugu Language	1	03-04-26		TLM 4	
64.	Sentiment Analysis on Telugu Language	1	04-04-26		TLM 4	

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
<b>PO 11</b>	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
<b>PSO 2</b>	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
<b>PSO 3</b>	To provide a concrete foundation and enrich their abilities for Employment and Higher studies in Artificial Intelligence and Data science with ethical values.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr. S.V.V.D.Jagadeesh</b>	<b>Mr. K Venkatesh</b>	<b>Dr. V Suryanarayana</b>	<b>Dr. P. Bhagath</b>
<b>Signature</b>				



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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor:** Dr Ch. Rajendra Babu

**Course Name & Code** : Operating Systems -23CS06

**L-T-P Structure** : 3-0-0

**Credits:** 3

**Program/Sem/Sec** : III B.tech/VI-sem /Sec B

**A.Y.:** 2025-26

**PREREQUISITE:** Knowledge of Computer fundamentals & Data structures & algorithms

**COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The main objective of the course is to provide basic knowledge of computer operating system structure and functioning. Students able to understand how Operating Systems evolved with advent of computer architecture. Comprehend the different CPU scheduling algorithms, page replacement algorithms, and identify best one.

**COURSE OUTCOMES (COs):** At the end of the course, student will be able to

<b>CO1</b>	Implement and evaluate fundamental operating system concepts through programming exercises, including UNIX commands, system calls, and simulations of CPU scheduling algorithms. (L3)
<b>CO2</b>	Analyze synchronization mechanisms (semaphores and monitors) and memory allocation algorithms (first-fit, worst-fit, best-fit) through writing concurrent programs using the pthreads library. (L4)
<b>CO3</b>	Apply operating system concepts of memory management, deadlock avoidance, and file allocation strategies through simulations and experimentation with a real operating system (Nachos). (L3)
<b>CO4</b>	Improve individual/ Teamwork skills, communication and report writing skills with ethical values.

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	1													
<b>CO2</b>		2	1												
<b>CO3</b>		2	1												
<b>CO4</b>								2	2	2					
	1 - Low			2 - Medium				3 - High							

**TEXTBOOKS:**

**T1** Operating System Concepts, Silberschatz A, GalvinPB, GagneG,10thEdition, Wiley, 2018.

**T2** Modern Operating Systems, Tanenbaum AS,4th Edition, Pearson ,2016

**REFERENCE BOOKS:**

**R1** Operating Systems -Internals and Design Principles, Stallings W, 9 thedition, Pearson, 2018

- R2** Operating Systems: A Concept Based Approach, D. M Dhamdhere, 3 rd Edition, McGraw- Hill, 2013.
- R3** <https://nptel.ac.in/courses/106/106/106106144/>
- R4** <http://peterindia.net/OperatingSystems.html>.

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: Operating Systems Overview:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, Operating system functions	1	12/02/25		TLM2	
2.	Operating systems operations, Computing environments,	1	12/03/25		TLM2	
3.	Operating System Services, User and Operating-System Interface	1	12/05/25		TLM2	
4.	System Calls	1	12/09/25		TLM2	
5.	Types of System Calls,	1	12/10/25		TLM2	
6.	System Programs	1	12/12/25		TLM2	
7.	Operating-System Design and Implementation	1	12/16/25		TLM2	
8.	Operating-System Structure	1	12/17/25		TLM2	
9.	Building and Booting an Operating System, Operating system debugging	1	12/19/25		TLM2	
<b>No. of classes required to complete UNIT-I: 9</b>				<b>No. of classes taken:</b>		

#### UNIT-II: Processes

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	<b>Processes:</b> Process concept, Process scheduling,	1	12/23/25		TLM2	
11.	Operations on process	1	12/24/25		TLM2	
12.	IPC	1	12/26/25		TLM2	
13.	Threads and Concurrency:, Multithreading Models	1	12/30/25		TLM2	
14.	Thread libraries and Thread issues	1	12/31/25		TLM2	
15.	CPU Scheduling: Basic concepts,	1	01/02/26		TLM2	
16.	Scheduling Criteria	1	01/06/26		TLM2	
17.	Scheduling algorithms	1	01/07/26		TLM2	
18.	Multiple processor scheduling.	1	01/09/26		TLM2	
<b>No. of classes required to complete UNIT-II: 9</b>				<b>No. of classes taken:</b>		

#### UNIT-III: Synchronization Tools

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
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19.	The Critical section problem, Peterson's solutions	1	01/16/26		TLM1	
20.	Mutex Locks, semaphores,	1	01/20/26		TLM1	
21.	Monitors,	1	01/21/26		TLM1	
22.	Classic problems of Synchronization	1	01/23/26		TLM1	
23.	Deadlocks: system Model, Deadlock characterization	1	02/03/26		TLM1	
24.	System model and deadlock characterization	1	02/04/26		TLM1	
25.	Methods for Handling deadlocks	1	02/06/26		TLM1	
26.	Deadlock prevention	1	02/10/26		TLM1	
27.	Deadlock Avoidance	1	02/11/26		TLM1	
28.	Deadlock detection, Recovery from Deadlock.	1	02/13/26		TLM1	
<b>No. of classes required to complete UNIT-III: 10</b>				<b>No. of classes taken:</b>		

#### UNIT-IV: Memory management Strategies:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Introduction,	1	02/17/26		TLM1	
30.	Contiguous Memory Allocation	1	02/18/26		TLM1	
31.	Paging	1	02/20/26		TLM1	
32.	Structure of Page table	1	02/24/26		TLM1	
33.	Swapping, Virtual Memory Management: Introduction,	1	02/25/26		TLM1	
34.	Demand paging, Copy-on-write	1	02/27/26		TLM1	
35.	Page replacement Allocation of frames	1	03/03/26		TLM1	
36.	Thrashing Storage Management	1	03/06/26		TLM1	
37.	Overview of Mass Storage Structure	1	03/10/26		TLM1	
38.	HDD Scheduling		03/11/26			
<b>No. of classes required to complete UNIT-IV: 10</b>				<b>No. of classes taken:</b>		

#### UNIT-V: File System

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	File System Interface: File concept, Access methods,	1	03/13/26		TLM2	
40.	Directory Structure	1	03/17/26		TLM2	

41.	File system Implementation: File-system structure,	1	03/18/26		TLM2
42.	File-system Operations,	1	03/20/26		TLM2
43.	File-System Internals: Filesystem Mounting, Partitions and Mounting,	1	03/24/26		TLM2
44.	File Sharing. Protection: Goals of protection	1	03/25/26		TLM2
45.	Principles of protection,	1	03/27/26		TLM2
46.	Protection Rings, Domain of protection,	1	03/31/26		TLM2
47.	Access Matrix	1	04/01/26		TLM2
<b>No. of classes required to complete UNIT-V: 9</b>				<b>No. of classes taken:</b>	

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab-Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL-Swayam Prabha-MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion-Project

### **PART-C**

#### **EVALUATION PROCESS (R20 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
<b>Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))</b>	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
<b>Total Marks = CIE + SEE</b>	<b>100</b>

### **PART-D**

#### **PROGRAMME OUTCOMES (POs):**

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

<b>PO 3</b>	<b>Design-development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
<b>PSO 2</b>	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
<b>PSO 3</b>	To provide a concrete foundation and enrich their abilities for Employment and Higher studies in Artificial Intelligence and Data science with ethical values.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Dr Ch Rajendra Babu</b>	<b>Dr V Suryanarayana</b>	<b>Dr Ch Rajendra Babu</b>	<b>Dr P Bhagath</b>
<b>Signature</b>				



**TEXTBOOKS:**

- T1** Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition,2019.

**REFERENCE BOOKS:**

- R1** Carpenter, J. & Hewitt, E. (2022). Cassandra: The Definitive Guide (3rd ed.). O'Reilly.  
**R2** Redmond, E. & Wilson, J. (2018). Seven Databases in Seven Weeks (2nd ed.). Pragmatic Bookshelf. \*(Riak, Neo4j)\*

**e-Resources:**

1. <https://www.ibm.com/cloud/learn/nosql-databases>
2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-databa>

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction to NoSQL Databases**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, course objectives, Course Outcomes, CO-PO mapping, Syllabus,	1	1.12.2025		TLM 1&2	
2.	Overview & History: Understand evolution from RDBMS to NoSQL	1	2.12.2025		TLM 1&2	
3.	Four Types of NoSQL, Value of RDBMS	1	5.12.2025		TLM 1&2	
4.	Persistent Data & Concurrency - Explain data access and concurrency issues	1	8.12.2025		TLM 1&2	
5.	Integration & Impedance Mismatch - Understand integration challenges	1	9.12.2025		TLM 1&2	
6.	Application vs Integration DBs - Differentiate use cases	1	12.12.2025		TLM 1&2	
7.	Attack of the Clusters - Explore distributed systems	1	15.12.2025		TLM 1&2	
8.	Emergence of NoSQL - Justify NoSQL adoption	1	16.12.2025		TLM 1&2	
<b>No. of classes required to complete UNIT-I: 08</b>				<b>No. of classes taken:</b>		

**UNIT-II: RDBMS vs NoSQL & Data Models**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
9.	RDBMS vs NoSQL - Compare architectures and models	1	19.12.2025		TLM 1&2	
10.	MongoDB, Cassandra, HBase, Neo4j - Explore deployment and use cases	1	22.12.2025		TLM 1&2	
11.	Application, RDBMS approach, Challenges NoSQL approach	1	23.12.2025		TLM 1&2	
12.	Key-Value & Document Models - Understand structure and access	1	26.12.2025		TLM 1&2	
13.	Column-Family Stores - Analyze columnar storage	1	29.12.2025		TLM 1&2	
14.	Aggregate-Oriented DBs - Learn aggregation logic	1	30.12.2025		TLM 1&2	
15.	Replication & Sharding - Understand scaling methods	1	02.01.2026		TLM 1&2	
16.	MapReduce - Apply distributed querying	1	05.01.2026		TLM 1&2	

17.	Distribution Models - Compare server architectures	1	06.01.2026		TLM 1&2	
18.	Master-Slave Replication, Peer-to-Peer Replication	1	09.01.2026		TLM 1&2	
19.	Combining Sharding and Replication.	1	12.01.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-II: 11</b>					<b>No. of classes taken:</b>	

### UNIT-III: Document-Oriented NoSQL Databases

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	MongoDB Architecture - Understand internal structure	1	13.01.2026		TLM 1&2	
21.	Features: Consistency, Transactions - Explore ACID/BASE trade-offs	1	19.01.2026		TLM 1&2	
22.	Availability & Query Feature - Learn query optimization	1	20.01.2026		TLM 1&2	
23.	Scaling - Apply horizontal scaling	1	23.01.2026		TLM 1&2	
24.	Use Cases - Identify suitable applications	1	2.02.2026		TLM 1&2	
25.	Event Logging, Content Management Systems, Blogging Platforms	1	3.02.2026		TLM 1&2	
26.	Web Analytics or Real-Time Analytics, E-Commerce Applications	1	6.02.2026		TLM 1&2	
27.	Complex Transactions - Handle multi-op queries	1	9.02.2026		TLM 1&2	
28.	Varying Aggregate Structures - Query flexible schemas	1	10.02.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-III: 09</b>					<b>No. of classes taken:</b>	

### UNIT-IV: Column-Oriented NoSQL Databases

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Column-oriented NoSQL databases using Apache HBASE	1	13.02.2026		TLM 1&2	
30.	Column-oriented NoSQL databases using Apache Cassandra	1	16.02.2026		TLM 1&2	
31.	Architecture of HBASE, Column-Family Data Store Features	1	17.02.2026		TLM 1&2	
32.	Consistency, Transactions, Availability & Query Features - Learn query patterns	1	20.02.2026		TLM 1&2	
33.	Scaling Apply distributed scaling, Use Cases - Identify suitable domains	1	23.02.2026		TLM 1&2	
34.	Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.	1	24.02.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-IV: 06</b>					<b>No. of classes taken:</b>	

### UNIT-V: Key-Value & Graph Databases

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Riak Architecture Understand key-value storage	1	27.02.2026		TLM 1&2	
36.	Key-Value Databases, Key-Value Store Features -Explore basic operations	1	2.03.2026		TLM 1&2	
37.	Consistency, Transactions, Query Features & Scaling-Apply query logic	1	3.03.2026		TLM 1&2	
38.	Suitable Use Cases, Storing Session Information	1	6.03.2026		TLM 1&2	
39.	User Profiles, Preferences, Shopping Cart Data	1	9.03.2026		TLM 1&2	

40.	Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets	1	10.03.2026		TLM 1&2	
41.	Graph DBs: Neo4j- Explore graph structures	1	13.03.2026		TLM 1&2	
42.	Graph Features- Understand traversal & relationships	1	16.03.2026		TLM 1&2	
43.	NoSQL Dev Tools-Use MongoDB Compass, Neo4j Browser	1	17.03.2026		TLM 1&2	
44.	Programming Languages Apply Python/Java with NoSQL	1	23.03.2026		TLM 1&2	
<b>No. of classes required to complete UNIT-V: 10</b>				<b>No. of classes taken:</b>		

### CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45.	Vector Databases & AI Integration	1	24.03.2026		TLM 1&2	
46.	Polyglot Persistence & Multi-Model Databases	1	30.03.2026		TLM 1&2	

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## PART-C

### EVALUATION PROCESS (R20 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II- Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>

## PART-D

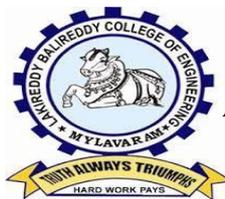
### PROGRAMME OUTCOMES (POs):

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<b>PO 3</b>	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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<b>PO 10</b>	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
<b>PO 11</b>	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	To apply the fundamental engineering knowledge, computational principles, and methods for extracting knowledge from data to identify, formulate and solve real time problems.
<b>PSO 2</b>	To develop multidisciplinary projects with advanced technologies and tools to address social and environmental issues.
<b>PSO 3</b>	To provide a concrete foundation and enrich their abilities for Employment and Higher studies in Artificial Intelligence and Data science with ethical values.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr J Nagaraju</b>	<b>Ms V Sowjanya</b>	<b>Dr. D. Srinivasa Rao</b>	<b>Dr. P. Bhagath</b>
<b>Signature</b>				



# LAKIREDDY BALIREDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC & NBA (Under Tier-I), ISO 9001:2015 Certified Institution Approved

by AICTE, New Delhi. And Affiliated to JNTUK, Kakinada

L.B.REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF MECHANICAL ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** V.Sankararao, Sr. Assistant Professor

**Course Name & Code** : Applied Operations Research- 23ME83

**Regulation:** R23

**L-T-P Structure** : 3-0-0

**Credits:** 03

**Program/Sem/Sec** : B.Tech- AI&DS VI Sem B/S

**A.Y.:** 2025-26

**PREREQUISITE** : Nil

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** This course introduces students to various models and techniques used in Operations Research for effective decision-making. It covers linear programming, transportation and sequencing problems, replacement analysis, game theory, queuing models, and project management techniques like PERT and CPM. Students will also gain knowledge in dynamic programming and simulation to solve complex industrial and managerial problems.

**COURSE OUTCOMES (COs):** At the end of the course, the student will be able to

<b>CO 1</b>	Formulate and solve linear programming problems using graphical and simplex methods for optimal decision-making. ( <b>Applying – L3</b> )
<b>CO 2</b>	Apply appropriate methods to solve transportation, assignment, sequencing, and travelling salesman problems in production and logistics scenarios. ( <b>Applying – L3</b> )
<b>CO 3</b>	Develop replacement models and queuing systems to support maintenance and service operations. ( <b>Applying – L3</b> )
<b>CO 4</b>	Demonstrate and design strategies using game theory and apply inventory models to optimize resource allocation. ( <b>Applying – L3</b> )
<b>CO5</b>	Apply dynamic programming techniques to solve optimization problems and simulate real world systems for decision support. ( <b>Applying – L3</b> )

#### COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
<b>CO2</b>	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
<b>CO3</b>	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
<b>CO4</b>	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
<b>CO5</b>	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 – Moderate (Medium), 3 - Substantial (High).

#### TEXTBOOKS

1. Taha, H. A. (2022). Operations Research: An Introduction (11th ed.). Pearson.
2. Sharma, S. D. (2012). Operations Research: Theory, Methods & Applications. Kedar Nath Ram Nath & Co.

#### REFERENCE BOOKS:

- R1.** Hillier, F. S., & Lieberman, G. J. (2014). Introduction to Operations Research (10th ed.). McGraw-Hill.
- R2.** Sharma, J. K. (1997). Operations Research: Theory & Applications. Macmillan India
- R3.** Natarajan, A. M., Balasubramani, P., & Tamilarasi, A. (2005). Operations Research. Pearson Education

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNT-I INTRODUCTION TO OPERATIONS RESEARCH

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Course Outcomes <b>Introduction</b>	1	01-12-2025		<b>TLM2</b>	
2.	Definition, characteristics and phases	1	03-12-2025		<b>TLM2</b>	
3.	Types of operation research models	1	05-12-2025		<b>TLM2</b>	
4.	Applications.	1	08-12-2025		<b>TLM2</b>	
5.	<b>Linear Programming:</b> Problem formulation	1	10-12-2025		<b>TLM1</b>	
6.	Graphical solution	1	12-12-2025		<b>TLM1</b>	
7.	Simplex method	1	15-12-2025		<b>TLM1</b>	
8.	Artificial variables techniques	1	17-12-2025		<b>TLM1</b>	
9.	Big-M method	1	19-12-2025		<b>TLM1</b>	
10.	Two-phase method	1	22-12-2025		<b>TLM1</b>	
11.	Duality principle.	1	24-12-2025		<b>TLM1</b>	
<b>No. of classes required to complete UNIT-I: 11</b>				No. of classes taken:		

#### UNIT-II: TRANSPORTATION PROBLEM, SEQUENCING

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	<b>Transportation Problem:</b> Formulation & optimal solution	1	26-12-2025		<b>TLM2</b>	
2.	Unbalanced transportation problem	1	29-12-2025		<b>TLM1</b>	
3.	Degeneracy	1	31-12-2025		<b>TLM1</b>	
4.	<b>Assignment problem:</b> Formulation, optimal solution	1	02-01-2026		<b>TLM1</b>	
5.	Variants of assignment problem	1	05-01-2026		<b>TLM1</b>	
6.	Travelling salesman problem	1	07-01-2026		<b>TLM1</b>	
7.	<b>Sequencing:</b> Introduction, flow-shop sequencing	1	09-01-2026		<b>TLM1</b>	
8.	n jobs through two machines	1	09-01-2026		<b>TLM1</b>	
9.	n jobs through three machines	1	19-01-2026		<b>TLM1</b>	
10.	Job shop sequencing	1	21-01-2026		<b>TLM1</b>	
11.	Two jobs through 'm' machines	1	23-01-2026		<b>TLM1</b>	
<b>No. of classes required to complete UNIT-II: 11</b>				No. of classes taken:		

**UNIT-III REPLACEMENT THEORY, GAME THEORY**

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	<b>Replacement Theory:</b> Introduction, replacement of items that deteriorate with time	1	02-02-2026		TLM2	
2.	When money value is not counted and counted	1	04-02-2026		TLM1	
3.	Replacement of items that fail completely	1	06-02-2026		TLM1	
4.	Group replacement	1	09-02-2026		TLM1	
5.	<b>Game Theory:</b> Introduction, mini. max (max. mini)	1	11-02-2026		TLM1	
6.	Criterion and optimal strategy, solution of games with saddle points	1	13-02-2026		TLM1	
7.	Rectangular games without saddle points	1	16-02-2026		TLM1	
8.	2 x 2 games, dominance principle	1	18-02-2026		TLM1	
9.	m x 2 & 2 x n games, graphical method.	1	20-02-2026		TLM1	
<b>No. of classes required to complete UNIT-III: 09</b>				No. of classes taken:		

**UNIT-IV QUEUING SYSTEMS, PROJECT MANAGEMENT**

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	<b>Waiting Lines:</b> Introduction	1	23-02-2026		TLM2	
2.	Single channel-poisson arrivals-exponential service times-with infinite population	1	25-02-2026		TLM2	
3.	Single channel-poisson arrivals-exponential service times-with finite population models	1	27-02-2026		TLM1	
4.	Multichannel-poisson arrivals-exponential service times with infinite population single channel.	1	02-03-2026		TLM1	
5.	<b>Project Management:</b> Basics for construction of network diagram,	1	04-03-2026		TLM2	
6.	Program Evaluation and Review Technique PERT	1	06-03-2026		TLM1	
7.	Critical Path Method CPM, PERT Vs. CPM	1	09-03-2026		TLM1	

8.	Determination of floats	1	11-03-2026		<b>TLM1</b>	
9.	Project crashing and its procedure.	1	13-03-2026		<b>TLM2</b>	
<b>No. of classes required to complete UNIT-IV:09</b>				No. of classes taken:		

#### UNIT-V DYNAMIC PROGRAMMING, SIMULATION

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	<b>Dynamic Programming:</b> Introduction, Bellman's principle of optimality	1	16-03-2026		<b>TLM2</b>	
2.	Applications of dynamic programming-shortest path problem	1	18-03-2026		<b>TLM1</b>	
3.	Linear programming problem	1	20-03-2026		<b>TLM1</b>	
4.	Problems	1	23-03-2026		<b>TLM2</b>	
5.	<b>Simulation:</b> Definition, types of simulation models	1	25-03-2026		<b>TLM2</b>	
6.	Phases of simulation	1	27-03-2026		<b>TLM2</b>	
7.	Applications of simulation	1	30-03-2026		<b>TLM2</b>	
8.	Inventory and queuing problems	1	01-04-2026		<b>TLM1</b>	
9.	Advantages and disadvantages	1	03-04-2026		<b>TLM1</b>	
<b>No. of classes required to complete UNIT-V: 09</b>				No. of classes taken:		

Teaching Learning Methods			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

#### Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	01-12-2025	24-01-2026	8
I MID Examinations	26-01-2026	31-01-2026	1
II Phase of Instructions	02-02-2026	04-04-2026	9
II MID Examinations	06-04-2026	11-04-2026	1
Preparation and Practicals	13-04-2026	18-04-2026	1
Semester End Examinations	20-04-2026	02-05-2026	2

## PART-C

### EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II & UNIT-III (Half of the Syllabus))	A1=5
I-Descriptive Examination (Units-I, II & UNIT-III (Half of the Syllabus))	M1=15
I-Quiz Examination (Units-I, II & UNIT-III (Half of the Syllabus))	Q1=10
Assignment-II (Unit-III (Remaining Half of the Syllabus), IV & V)	A2=5
II-Descriptive Examination (UNIT-III (Remaining Half of the Syllabus), IV & V)	M2=15
II-Quiz Examination (UNIT-III (Remaining Half of the Syllabus),IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1),(M2+Q2+A2))+20% of Min((M1+Q1+A1),(M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE):M	30
Semester End Examination (SEE)	70
Total Marks = CIE+SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
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**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO1</b>	To apply the principles of thermal sciences to design and develop various thermal systems.
<b>PSO2</b>	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
<b>PSO3</b>	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>HoD</b>
Mr.V.Sankararao	Mr.D.Mallikharjuna Rao	Mr. J. Subba Reddy	Dr. M B S Sreekara Reddy



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(AUTONOMOUS)

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[hodads@lbrce.ac.in](mailto:hodads@lbrce.ac.in), [ads@lbrce.ac.in](mailto:ads@lbrce.ac.in), Phone: 08659-222933, Fax: 08659-222931

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor:** Mr. S. Ramesh/ Mr.S.V.V.D.Jagadeesh

**Course Name & Code** : Deep Learning and Natural Language Processing Lab (23AD56)

**L-T-P Structure** : 0-0-3

**Credits:** 1.5

**Program/Sem/Sec** : B.Tech /VI Sem/ B

**A.Y.:** 2025-26

**PRE-REQUISITE:** Probability and Statistics, Python Programming

**COURSE EDUCATIONAL OBJECTIVES (CEOs):**The objective of this lab is to Make use of Data sets in implementing the machine learning algorithms in any suitable language of choice.

**COURSE OUTCOMES (COs):** At the end of the course, students are able to

CO 1	Design Neural networks to solve real world problems ( <b>Apply – L3</b> )
CO 2	Build RNN, CNN models for classification ( <b>Apply – L3</b> )
CO 3	Choose appropriate pre-trained model to solve real time problem ( <b>Apply – L3</b> )
CO 4	Apply different NLP techniques using NLTK package. ( <b>Apply – L3</b> )
CO 5	Design solutions to real-world problems using NLP.( <b>Apply – L3</b> )
CO 6	Improve individual / teamwork skills, communication & report writing skills with ethical values.

**COURSE ARTICULATION MATRIX** (Correlation between COs, POs & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-	-	1			2	3	1	1
CO2	3	3	2	2	3	-	-	-	1			2	3	1	1
CO3	2	2	2	2	3	-	-	-	1			2	3	1	1
CO4	3	3	2	2	3	-	-	-	1			2	3	1	1
CO5	3	3	3	2	3	-	-	-	2			2	3	2	2

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 – Moderate (Medium), 3 - Substantial (High).

### PART-B

**COURSE DELIVERY PLAN (LESSON PLAN): Section-A**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actually Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Implement Multilayer Perceptron algorithm for MNIST Handwritten Digit Classification.	3	04-12-2025		TLM4	
2	Implement Multilayer Perceptron algorithm for MNIST Handwritten Digit Classification.	3	11-12-2025		TLM4	
3	Design Neural Network for following problem i) Movie reviews classification	3	18-12-2025		TLM4	

	(Binary Classification) using IMDB dataset.				
4	Design Neural Network for following problem ii) News Wires classification (Multiclass Classification) using Reuters dataset.	3	06-01-2026		TLM4
5	Implement a Recurrent Neural Network (RNN) and LSTM for IMDB movie review classification problem.	3	08-01-2026		TLM4
6	Implement a Recurrent Neural Network (RNN) and LSTM for IMDB movie review classification problem.	3	05-01-2026		TLM4
7	Build a Convolution Neural Network for simple image (dogs and Cats) Classification	3	22-01-2026		TLM4
8	Use a Pre-trained Convolution Neural Network LeNet, Alex Net for image classification.	3	05-02-2026		TLM4
9	Implement One Hot Encoding and Word Embeddings on any real-world dataset.	3	12-02-2026		TLM4
10	Create Sample list at least 10 words POS tagging and find the POS for any given word.	3	19-02-2026		TLM4
11	Write a Python program to i) Perform Morphological Analysis using NLTK library ii) Generate n-grams using NLTK N-Gram's library iii) Implement N-Grams Smoothing	3	26-02-2026		TLM4
12	Write a program to implement Named Entity Recognition (NER) for any corpus.	3	05-03-2026		TLM4
13	Using NLTK package to convert audio files to text and text file to audio files.	3	12-03-2026		TLM4
14	Write a program to perform Auto-Correction of spellings for any text.	3	19-03-2026		TLM4
15	Implement twitter sentiment analysis using NLP.	3	26-03-2026		TLM4
16	Internal Exam	3	02-04-2026		TLM4

Teaching Learning Methods			
TLM1	Chalk and talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
TLM3	Tutorial	TLM6	Group Discussion/Project

## PART-C

### PROGRAMME OUTCOMES (POs):

PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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PO 4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	<b>Engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice
PO 7	<b>Environment and sustainability:</b> Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO 11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	<b>Life-long learning:</b> Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES (PSOs):**

<b>PSO 1</b>	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
<b>PSO 2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
<b>PSO 3</b>	To inculcate an ability to analyze, design and implement database applications.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	<b>Mr.S. Ramesh/Mr. S.V.V.D.Jagadeesh</b>	<b>Mr.K.Venkatesh</b>	<b>Dr.V.Surya Narayana.</b>	<b>Dr.P.Bhagath</b>
<b>Signature</b>				



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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

## COURSE HANDOUT

### PART-A

<b>Name of Course Instructor</b>	: Dr. B. PHANI KRISHNA
<b>Course Name &amp; Code</b>	: Big Data Analytics Lab, 23AD57
<b>L-T-P Structure</b>	: <b>0-0-3</b>
<b>Credits</b>	: 3
<b>Program/Sem/Sec</b>	: B.Tech /VI/B
<b>A.Y.</b>	: 2025-26

**PREREQUISITE:** - Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment

#### **Course Educational Objectives (CEOs)**

- Optimize business decisions and create competitive advantage with Big Data analytics.
- Introducing Java concepts required for developing MapReduce programs.
- Derive business benefit from unstructured data.
- Imparting the architectural concepts of Hadoop and introducing MapReduce paradigm.
- To introduce programming tools PIG & HIVE in the Hadoop ecosystem.

**Course Outcomes:-** At the end of the course the student will be able to

S. No	Course Outcome (CO)	Blooms Level
CO1	Implement object-oriented data structures and generic programming concepts in Java to handle data efficiently.	L3: Apply
CO2	Explain the architectural building blocks of Hadoop Distributed File System (HDFS) and configure Hadoop clusters in various modes.	L2: Understand
CO3	Develop MapReduce applications using the Hadoop API to process and analyze large-scale datasets.	L3: Apply
CO4	Analyze data stream models and utilize Spark Resilient Distributed Datasets (RDDs) for real-time data processing.	L4: Analyze
CO5	Construct Pig Latin scripts and HiveQL queries to summarize, query, and manage data stored in the Hadoop ecosystem.	L6: Create



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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

### COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	2	-	-	-	-	-	-	1	3	-	2
CO2	3	2	2	-	3	-	-	-	-	-	-	1	3	-	-
CO3	3	3	3	2	3	-	-	-	-	-	-	1	3	-	2
CO4	3	3	2	2	3	-	-	-	-	-	-	1	3	2	2
CO5	3	3	3	-	3	-	-	-	-	-	-	1	3	-	3

**Note:** 1- Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High)

### PART-B:

### COURSE DELIVERY PLAN (LESSON PLAN):

S. No	Experiment / Topic	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1	Exp 1: Implement Linked Lists, Stacks, and Queues in Java	3	02-12-2025		
2	Exp 1 (Cont): Implement Sets and Maps in Java	3	09-12-2025		
3	Exp 2: Installation of Hadoop (Standalone, Pseudo-distributed)	3	16-12-2025		
4	Exp 3: HDFS File Management (Add, Retrieve, Delete files)	3	23-12-2025		
5	Exp 4: Basic Word Count MapReduce Program	3	30-12-2025		
6	Exp 5: Weather Data Analytics using MapReduce	3	06-01-2026		
7	Exp 7: Social Network Analysis (Common Friends)	3	20-01-2026		
8	Exp 8: Iterative PageRank Algorithm	3	03-02-2026		
9	Exp 9: Efficient Semi-Join using Bloom Filters	3	10-02-2026		
10	Exp 10: Pig Installation & Basic Pig Latin Scripts	3	17-02-2026		
11	Exp 10 (Cont): Sort, Group, Join, Project, and Filter in Pig	3	24-02-2026		



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12	Exp 12: Hive Installation & DDL (Create, Alter, Drop Tables)	3	10-03-2026		
13	Exp 12 (Cont): Hive DML (Select, Where, Group By)	3	17-03-2026		
14	Spark Setup & RDD Basics (Theory Alignment Unit IV)	3	24-03-2026		
15	Lab Internal Assessment / Final Record Submission	3	31-03-2026		

### PART-C

#### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO 5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
<b>PO 6</b>	<b>The engineer and society:</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
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<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
<b>PO 9</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and draft effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO 11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to



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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

engage in independent and life-long learning in the broadest context of technological change
--

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

<b>PSO 1</b>	The ability to apply Software Engineering practices and strategies in software projects. development using open-source programming environment for the success of organization.
<b>PSO 2</b>	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
<b>PSO 3</b>	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Faculty Name	K. Sudhakar	K. Sudhakar	Dr. V. Surya Narayana	Dr.P.Bhagath
Signature				



## COURSE HANDOUT

### PART-A

Name of Course Instructor	: Ms. K. Sridevi	
Course Name & Code	: Soft Skills & 23HSS1	
L-T-P Structure	: 0-1-2	Credits: 02
Program/Sem/Sec	: B. Tech- VI SEM -AI&DS-B	
Academic Year	: 2025-26	
PREREQUISITE	: NIL	

### Course Objectives:

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

### COURSE ARTICULATION MATRIX (Correlation between COs & POs)

Course Outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
PO's												
CO1.				1		1		3	3	3		2
CO2.				1				3	3	3		3
CO3.								3	3	3		3
CO4.				2		2		3	3	3		3
CO5.								3	3	3		3
1 = Slight (Low)                      2= Moderate (Medium)                      3 = Substantial (High)												

## **UNIT – I**

**Analytical Thinking & Listening Skills:** Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.

**Communication Skills:** Verbal Communication; Non Verbal Communication (Body Language)

## **UNIT – II**

**Self-Management Skills:** Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities

**Etiquette:** Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

## **UNIT – III**

**Standard Operation Methods :** Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing.

## **UNIT-IV**

**Job-Oriented Skills:** Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

## **UNIT-V**

**Interpersonal relationships:** Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

### **Text books:**

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

### **References:**

1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
2. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

### **E-resources:**

1. [https://swayam-plus.swayam2.ac.in/courses/course-details?id=P\\_CAMBR\\_01](https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01)

**COURSE DELIVERY PLAN (LESSON PLAN)**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	HOD Sign
1.	<b>Analytical Thinking &amp; Listening Skills:</b> Self-Introduction	1+2	06/12/2025		
2.	Self – Analysis, Developing Positive Attitude, Perception	1+2	13/12/2025		
3.	Verbal Communication; Non Verbal Communication (Body Language)	1+2	20/12/2025		
4.	<b>Self-Management Skills:</b> Anger Management, Stress Management	1+2	27/12/2025		
5.	Time Management, Six Thinking Hats	1+2	03/1/2026		
6.	Team Building and Leadership Qualities	1+2	10/01/2026		
7.	<b>Standard Operation Methods :</b> Basic Grammars, Tenses, and Prepositions	1+2	24/01/2026		
8.	Pronunciation, Letter Writing	1+2	07/02/2026		
9.	Note Making, Note Taking, Minutes Preparation, Email	1+2	14/02/2026		
10.	<b>Job-Oriented Skills:</b> Group Discussion, Mock Group Discussions	1+2	21/02/2026		
11.	Mock Group Discussions	1+2	28/02/2026		
12.	Resume Preparation	1+2	07/03/2026		
13.	Interview Skills, Mock Interviews	1+2	14/03/2026		
14.	Interview Skills, Mock Interviews	1+2	21/03/2026		
15.	<b>Interpersonal relationships:</b> Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships	1+2	28/03/2026		
16.	Accommodating different styles, Consequences of interpersonal relationships	1+2	4/04/2026		
<b>No. of classes required to complete Syllabus :48</b>					

<b>Teaching Learning Methods</b>			
<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Demonstration (Lab/Field Visit)
<b>TLM2</b>	PPT	<b>TLM5</b>	ICT (NPTEL/Swayam Prabha/MOOCs)
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Group Discussion/Project

## Laboratory Examination:

Evaluation Task	Marks
Day-to-Day Work	A1 = 10
Record & Observation	B1 = 5
Internal Exam	C1 = 15
Cumulative Internal Examination (CIE): (A1+B1+C1)	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

## PROGRAMME OUTCOMES (POs):

PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO 11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty				
Signature	Ms. K. Sridevi	Dr Padma Venkat	Dr Padma Venkat	Dr. T Satyanarayana