



COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs. K. Samaikya

Course Name & Code : Soft Skills & 23HSS1

L-T-P Structure : 0-1-2

Credits: 02

Program/Sem/Sec : B. Tech- VI SEM AI&DS-A

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 PO's	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
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

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.	<i>Analytical Thinking & Listening Skills:</i> Self-Introduction Self – Analysis, Developing Positive Attitude, Perception (Listening activity)	1+2	04/12/2025		
2.	Verbal Communication; Non Verbal Communication (Body Language)	1+2	11/12/2025		
3.	<i>Self-Management Skills:</i> Anger Management, Stress Management, Time Management, Six Thinking Hats	1+2	18/12/2025		
4.	Team Building and Leadership Qualities	1+2	08/01/2026		
5.	<i>Standard Operation Methods :</i> Basic Grammars, Tenses, and Prepositions	1+2	22/01/2026		
6.	Pronunciation, Letter Writing	1+2	05/02/2026		
7.	Note Making, Note Taking, Minutes Preparation, Email	1+2	12/02/2026		
8.	<i>Job-Oriented Skills:</i> Group Discussion, Mock Group Discussions	1+2	19/02/2026		
9.	Resume Preparation	1+2	26/03/2026		
10.	Interview Skills, Mock Interviews	1+2	05/03/2026		
11.	<i>Interpersonal relationships:</i> Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships	1+2	12/03/2026		
12.	Accommodating different styles, Consequences of interpersonal relationships	1+2	02/04/2026		
No. of classes required to complete Syllabus :36					

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

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	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
PO 4	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.
PO 5	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
PO 6	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
PO 7	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
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: 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	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.
PO 12	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.

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



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

hodads@lbrce.ac.in, 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: Dr.P.Bhagath

Course Name & Code : Deep Learning(23AM06)

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

Credits: 3

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

A.Y.: 2025-26

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

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective 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: At the end of the course student will be able to

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

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

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

TEXTBOOKS:

T1. Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

REFERENCE BOOKS:

R1. Neural Networks: A Systematic Introduction, Raúl Rojas,1996

R2. Pattern Recognition and Machine Learning, Christopher Bishop,2007

R3. Deep Learning with Python, François Chollet, Manning Publications,2017

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I : Basics

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	1	03-12-2025		1 & 2	
2.	Biological Neuron	1	03-12-2025		1 & 2	
3.	Idea of computational units	1	05-12-2025		1 & 2	
4.	McCulloch–Pitts unit and Thresholding logic	2	06-12-2025 10-12-2025		1 & 2	
5.	Linear Perceptron	1	10-12-2025		1 & 2	
6.	Perceptron Learning Algorithm	2	12-12-2025 13-12-2025		1 & 2	
7.	Linear separability	1	17-12-2025		1 & 2	
8.	Convergence theorem for Perceptron Learning Algorithm	2	17-12-2025 19-12-2025		1 & 2	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Feed forward Networks

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.	Multilayer Perceptron	2	20-12-2025 24-12-2025		1 & 2	
10.	Gradient Descent	1	24-12-2025		1 & 2	
11.	Backpropagation	2	26-12-2025 27-12-2025		1 & 2	
12.	regularization	1	31-12-2025 31-12-2025		1 & 2	
13.	auto encoders	1	02-01-2026		1 & 2	
14.	Deep Neural Networks	2	03-01-2026 07-01-2026		1 & 2	
15.	Difficulty of training deep neural networks	2	09-01-2026 10-01-2026		1 & 2	
16.	Greedy layer wise training	1	21-01-2026		1 & 2	
17.	Revision	1	21-01-2026		1 & 2	
18.	Revision	1	23-01-2026		1 & 2	
19.	Revision	1	24-01-2026		1 & 2	
No. of classes required to complete UNIT-II: 15				No. of classes taken:		

UNIT-III: Better Training of Neural Networks

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.	Newer optimization methods for neural networks - Adagrad,	2	04-02-2026		1 & 2	
21.	adadelta	1	04-02-2026		1 & 2	
22.	rmsprop	1	06-02-2026		1 & 2	
23.	Adam & NAG	1	07-02-2026		1 & 2	
24.	second order methods for training	1	11-02-2026		1 & 2	

25.	Saddle point problem in neural networks	2	11-02-2026		1 & 2
26.	Regularization methods	1	13-02-2026		1 & 2
27.	dropout, drop connect	1	14-02-2026		1 & 2
28.	batch normalization	1	18-02-2026		1 & 2
No. of classes required to complete UNIT-III: 11				No. of classes taken:	

UNIT-IV: Recurrent Neural Networks

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	20-02-2026		1 & 2	
30.	Back propagation through time	1	21-02-2026		1 & 2	
31.	Long Short-Term Memory	2	25-02-2026 25-02-2026		1 & 2	
32.	Gated Recurrent Units	2	27-02-2026 28-02-2026		1 & 2	
33.	Bidirectional LSTMs	1	06-03-2026		1 & 2	
34.	Bidirectional RNNs	1	07-03-2026		1 & 2	
35.	Convolutional Neural Networks: LeNet	1	11-02-2026		1 & 2	
36.	AlexNet	1	11-03-2026		1 & 2	
37.	Generative models: Restrictive Boltzmann Machines (RBMs)	1	13-03-2026		1 & 2	
38.	Introduction to MCMC and Gibbs Sampling	1	14-03-2026		1 & 2	
39.	gradient computations in RBMs	1	18-03-2026		1 & 2	
40.	Deep Boltzmann Machines	1	18-03-2026		1 & 2	
No. of classes required to complete UNIT-IV: 14				No. of classes taken:		

UNIT-V: Recent trends

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Introduction	1	20-03-2026		1 & 2	
42.	Variational Auto encoders	1	21-03-2026		1 & 2	
43.	Transformers	2	25-03-2026 25-03-2026		1 & 2	
44.	GPT Applications: Vision	1	27-03-2026		1 & 2	
45.	NLP	1	28-03-2026 01-04-2026		1 & 2	
46.	Speech	1	01-04-2026		1 & 2	
47.	Revision	1	03-04-2026		1 & 2	
48.	Revision	1	04-04-2026		1 & 2	
No. of classes required to complete UNIT-V: 09				No. of classes taken:		

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 (R20 Regulation):

Evaluation Task	Marks
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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	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
PO 4	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.
PO 5	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
PO 6	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
PO 7	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.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
PO 11	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.
PO 12	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):

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

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



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

hodads@lbrce.ac.in , 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: K.Venkatesh

Course Name & Code : Natural Language Processing(23AM05)

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

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

Credits: 3

A.Y.: 2025-26

PREREQUISITE: Knowledge of Python programming, Formal Language Theory

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objectives of the course is to make students

- 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 of describing the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

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

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

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

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

TEXTBOOKS:

T1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin – Pearson Publication,2014.

T2 Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward 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, O'Reilly 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.

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Origins and challenges of 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	1	01-12-2025		1 & 2	
2.	Origins and challenges of NLP – Language	1	03-12-2025		1 & 2	
3.	Language Modeling: Grammar-based LM	2	04-12-2025 05-12-2025		1 & 2	
4.	Statistical LM – Regular Expressions	2	08-12-2025 10-12-2025		1 & 2	
5.	Finite-State Automata – English Morphology	2	11-12-2025 12-12-2025		1 & 2	
6.	Transducers for lexicon and rules,	2	15-12-2025 17-12-2025		1 & 2	
7.	Tokenization	2	18-12-2025 19-12-2025		1 & 2	
8.	Detecting and Correcting Spelling Errors,	1	22-12-2025		1 & 2	
9.	Minimum Edit Distance	1	25-12-2025		1 & 2	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

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
10.	Word Level Analysis: Unsmoothed N-grams	1	26-12-2025		1 & 2	
11.	Evaluating N-grams	1	29-12-2025		1 & 2	
12.	Smoothing, Interpolation and Backoff – Word Classes	2	31-12-2025 02-01-2026		1 & 2	
13.	Part- of-Speech Tagging	2	07-01-2026 08-01-2026		1 & 2	
14.	Rule-based, Stochastic	1	09-01-2026		1 & 2	
15.	Transformation-based tagging	2	12-01-2026 19-01-2026		1 & 2	
16.	Issues in PoS tagging	1	21-01-2026		1 & 2	
17.	Hidden Markov and Maximum.	2	22-01-2026 23-01-2026		1 & 2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		

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
18.	Syntactic Analysis: Context-Free Grammars	1	02-02-2026		1 & 2	
19.	Grammar rules for English, Treebanks	1	04-02-2026		1 & 2	
20.	Normal Forms for grammar – Dependency Grammar	2	05-02-2026 06-02-2026		1 & 2	
21.	Syntactic Parsing, Ambiguity	1	09-02-2026		1 & 2	
22.	Dynamic Programming parsing	1	11-02-2026		1 & 2	
23.	Shallow parsing Probabilistic CFG,	1	12-02-2026		1 & 2	
24.	Probabilistic CYK	1	13-02-2026		1 & 2	
25.	Probabilistic Lexicalized CFGs	1	16-02-2026		1 & 2	
26.	Feature structures	1	18-02-2026		1 & 2	
27.	Unification of feature structures	1	19-02-2026		1 & 2	
No. of classes required to complete UNIT-III: 11				No. of classes taken:		

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
28.	Introduction	1	20-02-2026		1 & 2	
29.	Requirements for representation	1	23-02-2026		1 & 2	
30.	First-Order Logic, Description Logics	1	25-02-2026		1 & 2	
31.	Syntax-Driven Semantic analysis	1	26-02-2026		1 & 2	
32.	Semantic attachments – Word Senses	1	27-02-2026		1 & 2	
33.	Relations between Senses	1	02-03-2026		1 & 2	
34.	Thematic Roles, selection restrictions	1	05-03-2026		1 & 2	
35.	Word Sense Disambiguation,	1	06-03-2026		1 & 2	
36.	WSD using Supervised, Dictionary	1	09-03-2026		1 & 2	
37.	Thesaurus, Bootstrapping methods	1	11-03-2026		1 & 2	
38.	Word Similarity using Thesaurus and Distributional methods.	1	12-03-2026		1 & 2	
No. of classes required to complete UNIT-IV: 11				No. of classes taken:		

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
39.	Introduction	1	13-03-2026		1 & 2	
40.	Discourse segmentation, Coherence	1	16-03-2026		1 & 2	
41.	Reference Phenomena, Anaphora Resolution using Hobbs	1	18-03-2026		1 & 2	
42.	Centering Algorithm – Coreference Resolution	1	20-03-2026		1 & 2	
43.	Resources: Porter Stemmer, Lemmatizer	1	23-03-2026		1 & 2	
44.	Penn Treebank, Brill's Tagger,	2	25-03-2026 27-03-2026		1 & 2	
45.	WordNet, PropBank	1	01-03-2026		1 & 2	
46.	FrameNet, Brown Corpus	1	02-03-2026		1 & 2	
47.	British National Corpus (BNC)	1	03-03-2026		1 & 2	
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

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	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
PO 4	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.
PO 5	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
PO 6	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
PO 7	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.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
PO 11	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.
PO 12	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):

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

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



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.

hodads@lbrce.ac.in , 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.K.Venkatesh

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/ A

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 (Apply – L3)
CO 2	Build RNN, CNN models for classification (Apply – L3)
CO 3	Choose appropriate pre-trained model to solve real time problem (Apply – L3)
CO 4	Apply different NLP techniques using NLTK package. (Apply – L3)
CO 5	Design solutions to real-world problems using NLP.(Apply – L3)
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	01-12-2025		TLM4	
2	Implement Multilayer Perceptron algorithm for MNIST Handwritten Digit Classification.	3	08-12-2025		TLM4	
3	Design Neural Network for following problem i) Movie reviews classification (Binary Classification) using IMDB dataset.	3	15-12-2025		TLM4	

4	Design Neural Network for following problem ii) News Wires classification (Multiclass Classification) using Reuters dataset.	3	22-12-2025		TLM4
5	Implement a Recurrent Neural Network (RNN) and LSTM for IMDB movie review classification problem.	3	29-12-2025		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	12-01-2026		TLM4
8	Use a Pre-trained Convolution Neural Network LeNet, Alex Net for image classification.	3	19-01-2026		TLM4
9	Implement One Hot Encoding and Word Embeddings on any real-world dataset.	3	02-02-2026		TLM4
10	Create Sample list at least 10 words POS tagging and find the POS for any given word.	3	09-02-2026		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	16-02-2026		TLM4
12	Write a program to implement Named Entity Recognition (NER) for any corpus.	3	23-02-2026		TLM4
13	Using NLTK package to convert audio files to text and text file to audio files.	3	02-03-2026		TLM4
14	Write a program to perform Auto-Correction of spellings for any text.	3	09-03-2026		TLM4
15	Implement twitter sentiment analysis using NLP.	3	16-03-2026		TLM4
16	Practice Session	3	23-03-2026		TLM4
17	Internal Exam	3	30-03-2026		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	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
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PO 4	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.
PO 5	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
PO 6	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 professional engineering practice
PO 7	Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: 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, making effective presentations, and give and receiving clear instructions.
PO 11	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.
PO 12	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):

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

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



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L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLIGENCE S DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. V SURYANARAYANA

Course Name & Code : Operating Systems -23CS06

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

Credits: 3

Program/Sem/Sec : III B. Tech/VI-Sem /Sec A

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

CO1	Demonstrate the underlying principles and techniques of operating system (Understand-L2)
CO2	Interpret scheduling and communication methods of processes handled by operating systems (Understand-L2)
CO3	Distinguish the process synchronization methods and deadlock handling approaches employed in operating systems (Understand-L2)
CO4	Classify memory management techniques and virtual memory mechanisms (Understand-L2)
CO5	Interpret the strategies of disk scheduling algorithms and file system architecture (Understand-L2)

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	2												2		
CO2		2	1										2		
CO3		2	1										2		
CO4		2	1										2		
CO5		2	1										2		
	1 - Low			2 -Medium						3 - High					

TEXTBOOKS:

T1 Operating System Concepts, Silberschatz A, Galvin PB, 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, 9thedition, Pearson, 2018.

R2 Operating Systems: A Concept Based Approach, D. M Dhamdhere, 3rd Edition, McGraw- Hill, 2013.

ONLINE LEARNING RESOURCES :OLR1 <https://nptel.ac.in/courses/106/106/106106144/>OLR2 <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	1	02-12-2025		TLM2	
2.	Operating-System Functions & Operations	1	03-12-2025		TLM2	
3.	Computing Environments, Free and Open-Source operating systems	1	05-12-2025		TLM2	
4.	System Structures: Operating-System Services	1	09-12-2025		TLM2	
5.	User and Operating System Interface	1	10-12-2025		TLM2	
6.	System Calls, Types of System Calls, System Programs	1	12-12-2025		TLM2	
7.	Operating System Design and Implementation.	1	16-12-2025		TLM2	
8.	Operating System Structure	1	17-12-2025		TLM2	
9.	Building and Booting an Operating System	1	19-12-2025		TLM2	
10.	Operating System Debugging	1	23-12-2025		TLM2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Process 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
11.	Processes: Process concept, Inter-process Communication	1	24-12-2025		TLM2	
12.	Operations on process	1	26-12-2025		TLM2	
13.	IPC and examples on IPC	1	30-12-2025		TLM2	
14.	Threads and Concurrency	1	31-12-2025		TLM2	
15.	Multithreading Models	1	02-01-2026		TLM2	
16.	Thread libraries and Thread issues	1	06-01-2026		TLM2	
17.	Scheduling Criteria	1	07-01-2026		TLM2	
18.	Scheduling algorithms	1	09-01-2026		TLM2	
19.	Scheduling algorithms	1	20-01-2026		TLM2	
20.	Multi-Processor Scheduling	1	21-01-2026		TLM2	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

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
21.	The Critical section problem, Peterson's solutions	1	23-01-2026		TLM1	
22.	Synchronization hardware	1	24-01-2026		TLM1	
23.	Semaphores, Classic problems of Synchronization	1	03-02-2026		TLM1	
24.	Monitors, Synchronization examples	1	04-02-2026		TLM1	
25.	atomic transactions	1	06-02-2026		TLM1	
26.	System model and deadlock characterization	1	10-02-2026		TLM1	
27.	Methods for Handling deadlocks and deadlock prevention	1	11-02-2026		TLM1	
28.	Deadlock Avoidance	1	13-02-2026		TLM1	
29.	Deadlock detection	1	17-02-2026		TLM1	
30.	Recovery from deadlock	1	18-02-2026		TLM1	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV: Memory 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
31.	Swapping	1	20-02-2026		TLM1	
32.	Contiguous Memory Allocation	1	24-02-2026		TLM1	
33.	Paging and structure of a page table	1	25-02-2026		TLM1	
34.	Segmentation	1	27-02-2026		TLM1	
35.	Demand paging	1	03-03-2026		TLM1	
36.	Page replacement	1	04-03-2026		TLM1	
37.	Allocation of frames	1	06-03-2026		TLM1	
38.	Thrashing Storage Management	1	10-03-2026		TLM1	
39.	Mass Storage Structure overview	1	11-03-2026		TLM1	
40.	HDD Scheduling	1	13-03-2026		TLM1	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V: File System 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
41.	File System Interface	1	17-03-2026		TLM2	
42.	The Concept of a file and access methods	1	18-03-2026		TLM2	
43.	File System structure	1	20-03-2026		TLM2	
44.	File system implementation	1	24-03-2026		TLM2	
45.	Directory implementation	1	25-03-2026		TLM2	
46.	Allocation methods	1	31-03-2026		TLM2	
47.	File System Internals, Mounting	1	01-04-2026		TLM2	
48.	Partitions, Sharing and Protection	1	02-04-2026		TLM2	
49.	Domain of Protection and Access Matrix	1	03-04-2026		TLM2	
No. of classes required to complete UNIT-V: 09				No. of classes taken:		

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 (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):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
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PO 5	Modern tool usage: 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.
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PO 7	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.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: 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	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.
PO 12	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):

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

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

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	2.12.2025		TLM 1&2	
2.	Overview & History: Understand evolution from RDBMS to NoSQL	1	4.12.2025		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	9.12.2025		TLM 1&2	
5.	Integration & Impedance Mismatch - Understand integration challenges	1	11.12.2025		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	16.12.2025		TLM 1&2	
8.	Emergence of NoSQL - Justify NoSQL adoption	1	18.12.2025		TLM 1&2	
No. of classes required to complete UNIT-I: 08				No. of classes taken:		

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	23.12.2025		TLM 1&2	
11.	Application, RDBMS approach, Challenges NoSQL approach	1	26.12.2025		TLM 1&2	
12.	Key-Value & Document Models - Understand structure and access	1	30.12.2025		TLM 1&2	
13.	Column-Family Stores - Analyze columnar storage	1	02.01.2026		TLM 1&2	
14.	Aggregate-Oriented DBs - Learn aggregation logic	1	06.01.2026		TLM 1&2	
15.	Replication & Sharding - Understand scaling methods	1	08.01.2026		TLM 1&2	
16.	MapReduce - Apply distributed querying	1	09.01.2026		TLM 1&2	

17.	Distribution Models - Compare server architectures	1	20.01.2026		TLM 1&2	
18.	Master-Slave Replication, Peer-to-Peer Replication	1	22.01.2026		TLM 1&2	
19.	Combining Sharding and Replication.	1	23.01.2026		TLM 1&2	
No. of classes required to complete UNIT-II: 11					No. of classes taken:	

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	03.02.2026		TLM 1&2	
21.	Features: Consistency, Transactions - Explore ACID/BASE trade-offs	1	05.02.2026		TLM 1&2	
22.	Availability & Query Feature - Learn query optimization	1	06.02.2026		TLM 1&2	
23.	Scaling - Apply horizontal scaling	1	10.02.2026		TLM 1&2	
24.	Use Cases - Identify suitable applications	1	12.02.2026		TLM 1&2	
25.	Event Logging, Content Management Systems, Blogging Platforms	1	13.02.2026		TLM 1&2	
26.	Web Analytics or Real-Time Analytics, E-Commerce Applications	1	17.02.2026		TLM 1&2	
27.	Complex Transactions - Handle multi-op queries	1	19.02.2026		TLM 1&2	
28.	Varying Aggregate Structures - Query flexible schemas	1	20.02.2026		TLM 1&2	
No. of classes required to complete UNIT-III: 09					No. of classes taken:	

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	24.02.2026		TLM 1&2	
30.	Column-oriented NoSQL databases using Apache Cassandra	1	26.02.2026		TLM 1&2	
31.	Architecture of HBASE, Column-Family Data Store Features	1	27.02.2026		TLM 1&2	
32.	Consistency, Transactions, Availability & Query Features - Learn query patterns	1	03.03.2026		TLM 1&2	
33.	Scaling Apply distributed scaling, Use Cases - Identify suitable domains	1	05.03.2026		TLM 1&2	
34.	Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.	1	06.03.2026		TLM 1&2	
No. of classes required to complete UNIT-IV: 06					No. of classes taken:	

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	10.03.2026		TLM 1&2	
36.	Key-Value Databases, Key-Value Store Features -Explore basic operations	1	12.03.2026		TLM 1&2	
37.	Consistency, Transactions, Query Features & Scaling-Apply query logic	1	13.03.2026		TLM 1&2	
38.	Suitable Use Cases, Storing Session Information	1	17.03.2026		TLM 1&2	
39.	User Profiles, Preferences, Shopping Cart Data	1	19.03.2026		TLM 1&2	

40.	Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets	1	20.03.2026		TLM 1&2
41.	Graph DBs: Neo4j- Explore graph structures	1	24.03.2026		TLM 1&2
42.	Graph Features- Understand traversal & relationships	1	26.03.2026		TLM 1&2
43.	NoSQL Dev Tools-Use MongoDB Compass, Neo4j Browser	1	27.03.2026		TLM 1&2
44.	Programming Languages Apply Python/Java with NoSQL	1	02.04.2026		TLM 1&2
No. of classes required to complete UNIT-V: 10				No. of classes taken:	

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			TLM 1&2	
46.	Polyglot Persistence & Multi-Model Databases	1			TLM 1&2	

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 (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):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
PO 4	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.
PO 5	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
PO 6	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
PO 7	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.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
PO 11	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.
PO 12	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):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Ms V Sowjanya	Ms V Sowjanya	Dr. D. Srinivasa Rao	Dr. P. Bhagath
Signature				



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L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.

hodads@lbrce.ac.in , 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: Dr O Rama Devi

Course Name & Code : 23MC04-Technical Paper Writing & IPR

L-T-P Structure : 2-0-0

Program/Sem/Sec : III B.Tech., VI-Sem, A-Sec

Credits: --

A.Y.: 2025-26

Course Objective: The course will explain the basic related to writing the technical reports and understanding the concepts related to formatting and structuring the report. This will help students to comprehend the concept of proofreading, proposals and practice

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

C01	Understand the principles of technical writing, sentence formation, and report structuring. Understand(L2)
C02	Apply drafting techniques, design issues, and editing skills to prepare technical reports. Apply(L3)
C03	Demonstrate proficiency in proofreading, summarizing, and presenting technical reports effectively. Apply(L3)
C04	Utilize word processing tools for advanced document formatting, citations, and collaborative editing. Apply(L3)
C05	Describe the fundamentals of Intellectual Property Rights (IPR), including patents, copyrights, and international IP frameworks. Understand(L2)

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

CO	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C01	3	2	1	-	-	-	-	-	-	3	-	2	1	-	-
C02	3	2	2	1	2	-	-	-	1	3	-	2	2	-	-
C03	2	2	1	-	-	-	-	-	2	3	-	2	2	-	-
C04	2	1	-	-	3	-	-	-	1	3	-	2	1	-	-
C05	2	1	-	-	-	3	2	3	-	2	-	2	1	-	-

Text Books:

1. Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2. William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
3. .Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.

Reference Books:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
2. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press(2006)

E-resources:

1. <https://www.udemy.com/course/reportwriting/>
2. <https://www.udemy.com/course/professional-business-english-and-technical-report-writing/>
3. <https://www.udemy.com/course/betterbusinesswriting/>.

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

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, An introduction to writing technical reports, technical sentences formation	1	18-12-2025		TLM1	
2.	using transitions to join sentences, Using tenses for technical writing	1	20-12-2025		TLM1	
3.	Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report	1	27-12-2025		TLM1	
4.	Sections of a technical report, Minutes of meeting writing	1	03-01-2026		TLM1	
No. of classes required to complete UNIT-I: 4				No. of classes taken:		

UNIT-II: Drafting report and design issues

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
5.	Drafting report and design issues: The use of drafts, Illustrations and graphics.	1	08-01-2026		TLM1	
6.	Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English	1	22-01-2026		TLM1	
7.	Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity	1	24-01-2026		TLM1	
No. of classes required to complete UNIT-II: 3				No. of classes taken:		

UNIT-III: Proofreading and summaries

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Proofreading and summaries: Proofreading, summaries.	1	05-02-2026		TLM1, TLM2	
9.	Activities on summaries. Presenting final reports: Printed presentation	1	07-02-2026		TLM1, TLM2	
10.	Activities on summaries. Presenting final reports: Printed presentation	1	12-02-2026		TLM1, TLM2	
11.	Verbal presentation skills	1	19-02-2026		TLM1, TLM2	
12.	Introduction to proposals and practice.	1	21-02-2026		TLM1, TLM2	
13.	Tutorial	1	26-02-2026		TLM3	
No. of classes required to complete UNIT-III: 6				No. of classes taken:		

UNIT-IV: Using word processor

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index	1	28-02-2026		TLM1, TLM2	
15.	Creating an Outline, Adding Comments, Tracking Change, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes	1	05-03-2026		TLM1, TLM2	
16.	Working with Footnotes and Endnotes, Inserting citations and Bibliography	1	07-03-2026		TLM1, TLM2	
17.	Comparing Documents, Combining Documents, Mark documents final and make them read only.	1	12-03-2026		TLM1, TLM2	

Password protect Microsoft Word documents., Macros. Using	1	19-03-2026		TLM1, TLM2
No. of classes required to complete UNIT-IV: 5			No. of classes taken:	

UNIT-V: Nature of Intellectual Property

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Nature of Intellectual Property: Patents, Designs Trade and Copyright	1	21-03-2026		TLM1, TLM2	
19.	Process of Patenting and Development: technological research,	1	26-03-2026		TLM1, TLM2	
20.	innovation, patenting development.	1	28-03-2026		TLM1, TLM2	
21.	International Scenario: International cooperation on Intellectual Property development.	1	02-04-2026		TLM1, TLM2	
23	International Scenario: International cooperation on Intellectual Property.	1	04-04-2026		TLM1, TLM2	
No. of classes required to complete UNIT-V: 5				No. of classes taken:		

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.O.Rama Devi	Dr S Pichi Reddy	Dr V Suryanarayana	Dr P Bhagath
Signature				



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hodads@lbrce.ac.in , 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	: K. SUDHAKAR
Course Name & Code	: Big Data Analytics Lab, 23AD57
L-T-P Structure	: 0-0-3
Credits	: 3
Program/Sem/Sec	: B.Tech /VI/A
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 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		
12	Exp 12: Hive Installation & DDL	3	10-03-2026		



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	(Create, Alter, Drop Tables)				
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):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
PO 4	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.
PO 5	Modern tool usage: 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.
PO 6	The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: 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.
PO 11	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.



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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

PO 12	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
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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



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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : K. SUDHAKAR
Course Name & Code : BIGDATA ANALYTICS, 23AD09
L-T-P Structure : 3-0-0
Program/Sem/Sec : B.Tech/VI/A-Sec

Credits: 3
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	CO1: Implement object-oriented data structures and generic programming concepts in Java to handle data efficiently.	L3: Apply
2	CO2: Explain the architectural building blocks of Hadoop Distributed File System (HDFS) and configure Hadoop clusters in various modes.	L2: Understand
3	CO3: Develop MapReduce applications using the Hadoop API to process and analyze large-scale datasets.	L3: Apply
4	CO4: Analyze data stream models and utilize Spark Resilient Distributed Datasets (RDDs) for real-time data processing.	L4: Analyze
5	CO5: Construct Pig Latin scripts and HiveQL queries to summarize, query, and manage data stored in the Hadoop ecosystem.	L6: Create

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
1 - Low 2 -Medium 3 - High															

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
UNIT I	Data Structures in Java & Generics					
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 (Wed)		TLM1	

4	Generics: Generic classes and Type parameters	1	05-12-2025 (Fri)		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	12-12-2025 (Fri)		TLM2	
9	Unit I Revision & Tutorial	1	15-12-2025 (Mon)		TLM3	
UNIT II	Working with Big Data & HDFS					
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	19-12-2025 (Fri)		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	26-12-2025 (Fri)		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	
UNIT III	Writing Map Reduce Programs					
20	Intro to MapReduce: A Weather Dataset	1	02-01-2026 (Fri)		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	09-01-2026 (Fri)		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	23-01-2026 (Fri)		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	06-02-2026 (Fri)		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	13-02-2026 (Fri)		TLM4	
39	Spark RDD (Resilient Distributed Dataset) Intro	1	16-02-2026 (Mon)		TLM1	

40	Spark RDD Operations: Transformations	1	17-02-2026 (Tue)		TLM4	
41	Spark RDD Operations: Actions	1	18-02-2026 (Wed)		TLM4	
42	Writing Spark Applications	1	20-02-2026 (Fri)		TLM4	
43	Unit IV Tutorial	1	23-02-2026 (Mon)		TLM3	
UNIT V	Pig and Hive					
44	Pig: Hadoop Programming Made Easier, Architecture	1	24-02-2026 (Tue)		TLM2	
45	Pig Latin Application Flow	1	25-02-2026 (Wed)		TLM1	
46	Working through the ABCs of Pig Latin	1	27-02-2026 (Fri)		TLM2	
47	Evaluating Local and Distributed Modes of Pig	1	02-03-2026 (Mon)		TLM4	
48	Checking out the Pig Script Interfaces	1	04-03-2026 (Wed)		TLM4	
49	Scripting with Pig Latin	1	06-03-2026 (Fri)		TLM4	
50	Applying Structure to Hadoop Data with Hive: Intro	1	09-03-2026 (Mon)		TLM2	
51	Seeing How the Hive is Put Together (Architecture)	1	10-03-2026 (Tue)		TLM1	
52	Getting Started with Apache Hive	1	11-03-2026 (Wed)		TLM4	
53	Examining the Hive Clients	1	13-03-2026 (Fri)		TLM4	
54	Working with Hive Data Types	1	16-03-2026 (Mon)		TLM1	
55	Creating and Managing Databases and Tables	1	17-03-2026 (Tue)		TLM4	
56	Hive Data Manipulation Language (DML)	1	18-03-2026 (Wed)		TLM4	
57	Querying and Analyzing data: Select & Filters	1	20-03-2026 (Fri)		TLM4	
58	Querying and Analyzing data: Aggregation	1	23-03-2026 (Mon)		TLM4	
59	Comparison: Pig vs Hive	1	24-03-2026 (Tue)		TLM6	

60	Unit V Tutorial	1	25-03-2026 (Wed)		TLM3	
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):

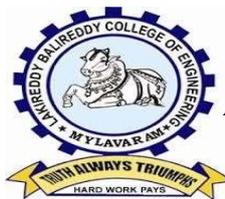
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching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

	mathematics, natural sciences, and engineering sciences.
PO 3	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.
PO 4	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.
PO 5	Modern tool usage: 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.
PO 6	The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO 9	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: 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.
PO 11	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.
PO 12	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):

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

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



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: Mallikarjuna Rao Dandu, Sr. Assistant Professor

Course Name & Code : Sustainable Energy Technologies- 23ME81 **Regulation:** R23

L-T-P Structure : 3-0-0 **Credits:** 03

Program/Sem/Sec : B.Tech- AI&DS V Sem A/S **A.Y.:** 2025-26

PREREQUISITE : Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-L2)

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

COs	PO1	P O2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO2	2	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO3	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO4	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO5	1	1	-	-	-	3	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).

TEXT BOOKS:

T1 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

R3. Non-conventional Energy Source- G S Sawhney- PHI, New Delhi, 2012

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

SOLAR RADIATION

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	1	30-06-2025		TLM2	
2.	Role and potential of new and renewable sources	1	02-07-2025		TLM2	
3.	The solar energy option, Environmental impact of solar power	1	05-07-2025		TLM2	
4.	Structure of the Sun, The solar constant	1	07-07-2025		TLM2	
5.	Sun-earth relationships	1	09-07-2025		TLM2	
6.	Coordinate systems and coordinates of the sun	1	14-07-2025		TLM2	
7.	Extraterrestrial and terrestrial solar radiation	1	16-07-2025		TLM2	
8.	Solar radiation on tilted surface	1	19-07-2025		TLM2	
9.	Instruments for measuring solar radiation and sun shine, Solar radiation data	1	21-07-2025		TLM2	
No. of classes required to complete UNIT-I: 09				No. of classes taken:		

UNIT-II:

SOLAR PV MODULES AND PV SYSTEMS

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.	PV module Circuit Design, Module Structure, Packing Density	1	23-07-2025		TLM2	
2.	Interconnections, Mismatch and temperature effects	1	28-07-2025		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules, Degradation and failure	1	30-07-2025		TLM2	
4.	PV module parameters, Efficiency of PV Systems	1	02-08-2025		TLM2	
5.	Solar PV Systems	1	04-08-2025		TLM2	
6.	Battery Operation, Types of Batteries, Battery parameters, Applications, Selection of batteries for Solar PV System	1	06-08-2025		TLM2	
No. of classes required to complete UNIT-II: 06				No. of classes taken:		

UNIT-III:**SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS**

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	09-08-2025		TLM2	
2.	Classification of concentrating collectors	1	11-08-2025		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	13-08-2025		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	18-08-2025		TLM2	
5.	Solar Applications-solar heating cooling technique	1	20-08-2025		TLM2	
6.	Solar distillation and drying	1	23-08-2025		TLM2	
7.	Solar cookers	1	01-09-2025		TLM2	
8.	Central power tower concept	1	03-09-2025		TLM2	
9.	Solar chimney	1	06-09-2025		TLM2	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV :**WIND ENERGY, BIO-MASS**

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.	Wind energy: Sources and potential	1	08-09-2025		TLM2	
2.	Horizontal and Vertical axis wind mill	1	10-09-2025		TLM2	
3.	Performance characteristics	1	13-09-2025		TLM2	
4.	Betz criteria	1	15-09-2025		TLM2	
5.	Types of winds	1	17-09-2025		TLM2	
6.	Wind data measurement	1	20-09-2025		TLM2	
7.	Bio-mass: Principles of bio-conversion	1	22-09-2025		TLM2	
8.	Anaerobic/aerobic digestion	1	24-09-2025		TLM2	
9.	Types of biogas digesters	1	27-09-2025		TLM2	
10.	Gas yield, Gasifiers	1	06-10-2025		TLM2	
11.	Applications	1	08-10-2025		TLM2	
No. of classes required to complete UNIT-IV:11				No. of classes taken:		

**UNIT-V :
GEOHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS**

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.	Geothermal Energy: Origin, Applications	1	11-10-2025		TLM2	
2.	Types of Geothermal Resources	1	13-10-2025		TLM2	
3.	Geothermal power generation	1	15-10-2025		TLM2	
4.	Relative merits and demerits	1	18-10-2025		TLM2	
5.	Ocean Energy: Ocean Thermal energy	1	20-10-2025		TLM2	
6.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	22-10-2025		TLM2	
7.	Challenges and applications, Fuel Cells: Introduction, Applications	1	25-10-2025		TLM2	
8.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell	1	27-10-2025		TLM2	
9.	Alkaline fuel cell	1	29-10-2025		TLM2	
10.	PEM fuel cell	1	29-10-2025		TLM2	
11.	MC fuel cell	1	01-11-2025		TLM2	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

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

Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	30-06-2025	23-08-2025	8
I MID Examinations	25-08-2025	30-08-2025	1
II Phase of Instructions	01-09-2025	01-11-2025	9
II MID Examinations	03-11-2025	08-11-2025	1
Preparation and Practicals	10-11-2025	15-11-2025	1
Semester End Examinations	17-11-2025	25-11-2025	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):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	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.
PO 3	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.
PO 4	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.
PO 5	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
PO 6	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
PO 7	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.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO	Communication: Communicate effectively on complex engineering activities with the

10	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	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.
PO 12	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):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	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.
PSO 3	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.

Course Instructor

Mallikarjuna Rao
Dandu

Course Coordinator

Dr. P.Vijay Kumar

Module Coordinator

Dr. P.Vijay Kumar

HOD

Dr. M B S
Sreekar Reddy