LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. M. Kishore Kumar
Course Name & Code : Artificial Intelligence (23AD02)
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., IV-Sem, B-Sec **A.Y.: 2025-26**

Prerequisites:
Course Objectives: The main objectives of the course are to

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. To learn different knowledge representation techniques
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. The student should be made to introduce the concepts of Expert Systems.

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

CO1	Enumerate the history & Foundation of AI (Understand-L2)
CO2	Apply the Searching algorithms for AI in problem solving (Apply-L3)
CO3	Choose the appropriate representation of knowledge (Apply-L3)
CO4	Choose the appropriate logic concepts (Apply-L3)
CO5	Understand the Expert systems techniques in AI (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
CO1	2	3	2	-	2	-	-	-	-	-	-	2	3	-	-
CO2	2	3	3	-	2	-	-	-	-	-	-	2	3	-	-
CO3	2	3	3	-	2	-	-	-	-	-	-	2	3	-	-
CO4	2	3	3	-	2	-	-	-	-	-	-	2	3	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	2	3	-	-

Textbooks:
1. S. Russel and P. Norvig "Artificial Intelligence–A Modern Approach", Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B. "Artificial Intelligence (SIE)", Mc Graw Hill

Reference Books:
1.David Poole, Alan Mack worth, Randy Goebel, "Computational Intelligence: a logical approach", Oxford University Press.
2.G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.

3.J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers.
4.Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

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.	AI problems	1	02/12/2025		TLM1,	
2.	Foundation of AI and history of AI	1	03/12/2025		TLM1, TLM2	
3.	Intelligent agents: Agents and Environments	1	04/12/2025		TLM1, TLM2	
4.	The concept of rationality	1	05/12/2025		TLM1, TLM2	
5.	The nature of environments	1	09/12/2025		TLM1, TLM2	
6.	Structure of agents	1	10/12/2025		TLM1, TLM2	
7.	Problem solving agents	1	11/12/2025		TLM1, TLM2	
8.	Problem formulation.	1	12/12/2025		TLM1, TLM2	
9.	Tutorial	1	16/12/2025		TLM3	
No. of classes required to complete UNIT-I: 09				**No. of classes taken:**		

UNIT-II: Searching

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.	Searching for solutions	1	17/12/2025		TLM1, TLM2	
11.	Uniformed search strategies – Breadth first search	1	18/12/2025		TLM1, TLM2	
12.	Depth first Search	1	19/12/2025		TLM1, TLM2	
13.	Search with partial information (Heuristic search) Hill climbing	1	23/12/2025		TLM1, TLM2	
14.	A*, Algorithms	2	24/12/2025 26/12/2025		TLM1, TLM2	
15.	AO* Algorithms	2	30/12/2025 31/12/2025		TLM1, TLM2	
16.	Problem reduction	1	02/01/2026		TLM1, TLM2	
17.	Game Playing-Adversial search, Games	1	06/01/2026		TLM1, TLM2	
18.	Minimax algorithm	1	07/01/2026		TLM1, TLM2	
19.	Optimal decisions in multiplayer games	1	08/01/2026		TLM1, TLM2	
20.	Problem in Game playing	2	09/01/2026 20/01/2026		TLM1, TLM2	
21.	AlphaBeta pruning	1	21/01/2026		TLM1, TLM2	
22.	Evaluation functions	1	22/01/2026		TLM1, TLM2	
23.	Tutorial	1	23/01/2026		TLM3	
No. of classes required to complete UNIT-II: 17				**No. of classes taken:**		

UNIT-III: Representation of Knowledge

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Knowledge representation issues	1	03/02/2026		TLM1, TLM2	
25.	Predicate logic- logic programming	1	04/02/2026		TLM1, TLM2	
26.	Semantic nets- frames and inheritance	1	05/02/2026		TLM1, TLM2	
27.	Constraint propagation	1	06/02/2026		TLM1, TLM2	
28.	Representing knowledge using rules	1	10/02/2026		TLM1, TLM2	
29.	Rules based deduction systems	1	11/02/2026		TLM1, TLM2	
30.	Reasoning under uncertainty	1	12/02/2026		TLM1, TLM2	
31.	Review of probability	1	13/02/2026		TLM1, TLM2	
32.	Bayes' probabilistic interferences and dempster shafer theory	2	17/02/2026 18/02/2026		TLM1, TLM2	
33.	Tutorial	1	19/02/2026		TLM3	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Logic concepts

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	First order logic, Inference in first order logic	1	20/02/2026		TLM1, TLM2	
35.	Propositional vs. first order inference	1	24/02/2026		TLM1, TLM2	
36.	Unification & lifts forward chaining	1	25/02/2026		TLM1, TLM2	
37.	Backward chaining	1	26/02/2026		TLM1, TLM2	
38.	Resolution, learning from observation Inductive learning	1	27/02/2026		TLM1, TLM2	
39.	Decision trees	2	03/03/2026 05/03/2026		TLM1, TLM2	
40.	Explanation based learning	1	06/03/2026		TLM1, TLM2	
41.	Statistical Learning methods	1	10/03/2026		TLM1, TLM2	
42.	Reinforcement Learning	1	11/03/2026		TLM1, TLM2	
43.	Tutorial	1	12/03/2026		TLM3	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Expert 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
44.	Architecture of expert systems	1	13/03/2026		TLM1, TLM2	
45.	Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics	2	17/03/2026 18/03/2026		TLM1, TLM2	
46.	Typical expert systems – MYCIN,	1	19/03/2026		TLM1, TLM2	
47.	DART, XCON	2	20/03/2026 24/03/2026		TLM1, TLM2	

48.	Expert systems shells	1	25/03/2026		TLM1, TLM2	
49.	Revision	6	26/03/2026 03/04/2026		TLM3	
No. of classes required to complete UNIT-V: 13				**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 (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,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 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 engineer**ing 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	**Mr. M. Kishore Kumar**	**Mr. G. Ram Babu**	**Dr. V. Surya Narayana**	**Dr. P. Bhagath**
Signature				

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ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

Part-A

PROGRAM : II B. Tech., II-Sem., AI&DS-B
ACADEMIC YEAR : 2025-26
COURSE NAME & CODE : STATISTICAL METHODS FOR DATA SCIENCE (23AD01)
L-T-P STRUCTURE : 3-0-0
COURSE CREDITS 3
COURSE INSTRUCTOR : **Dr. K Bhanu Lakshmi**
COURSE COORDINATOR :
PRE-REQUISITES : Basics of mathematics & statistics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

- To know basic concepts of statistics like Data Visualization and Estimation.
- To understand Regression Models, Time-Series Data & testing of hypothesis concepts.

COURSE OUTCOMES (COs): Upon successful completion of this course, the student should be able to

CO1: **A**nalyze the data using diagrams, draw conclusions about the data nature and fitting of suitable distributions to the given data. (L4)
CO2: Apply the inference tests when the sample data is large and/or small. (L3)
CO3: Use various Regression models for analyzing the data and draw inferences. (L3) CO4:
CO4: Fit various growth curves, trend and to measure seasonal indices. (L3)
CO5: Know the importance of the classification of data using Logistic Regression. (L4)

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	2	2	3	-	-	-	-	-	-	-	2	2	2	1
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-	-
CO4	3	2	2	3	-	-	-	-	-	-	-	2	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	2	2	1

Note: Enter Correlation Levels **1** or **2** or **3.** If there is no correlation, **put '-'**
1- Slight (Low), **2 –** Moderate (Medium), **3 -** Substantial (High).

BOS APPROVED TEXTBOOKS:

1. **Elizabeth Purdom**, "Statistical methods for Data science" (08.05.2023)
2. **K. Murugesan, P. Gurusamy,** "Probability, Statistics and Random Processes", Anuradha Publications (January-2009), ISBN-10(8189638289)/ISBN-13(978-8189638283).

BOS APPROVED REFERENCE ROOKS:

1. **Manoj Kumar Srivastava and Namita Srivastava**, Statistical Inference–Testing of Hypotheses, Prentice Hall of India, 2014.
2. **Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman**, Probability and Statistical Inference, 9thedition, Pearson publishers, 2013.
3. **Chris Chatfield**, "The analysis of time series-an introduction" 5th edition, Chapman& Hall/CRC.
4. **Peter J. Brockwell, Richard A.Davis**, "Introduction to Time series and Forecasting," Second edition, Springer.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Data Visualization and Distributions

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction class, Syllabus Co's, PO's	1	01-12-25		TLM1	CO1	T1,T2	
2.	Introduction to statistical methods, EDA	1	03-12-25		TLM1	CO1	T1,T2	
3.	Charts (Line, Pie, Bar)	1	04-12-25		TLM1	CO1	T1,T2	
4.	Plots (Bubble, Scatter); Maps (Heat, Dot Distribution)	1	06-12-25		TLM1	CO1	T1,T2	
5.	Diagrams (Trees and Matrices)	1	08-12-25		TLM1.2	CO1	T1,T2	
6.	Principal Components Analysis	1	10-12-25		TLM1	CO1	T1,T2	
7.	Distributions; Binomial	1	11-12-25		TLM1	CO1	T1,T2	
8.	Problems	1	13-12-25		TLM,1	CO1	T1,T2	
9.	Poison distribution, problems	1	15-12-25		TLM1	CO1	T1,T2	
10.	Problems	1	17-12-25		TLM1	CO1	T1,T2	
11.	Normal distribution, problems	1	18-12-25		TLM1	CO1	T1,T2	
12.	Problems	1	20-12-25		TLM1.2	CO1	T1,T2	
13.	Exponential, problems	1	22-12-25		TLM1.2	CO1	T1,T2	
No. of classes required to complete UNIT-I		13			No. of classes taken:			

UNIT-II: Hypothesis Testing

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
14.	Estimation, confidence intervals	1	24-12-25		TLM1.2	CO2	T1,T2	
15.	Confidence interval for mean	1	27-12-25		TLM1	CO2	T1,T2	
16.	For proportions	1	29-12-25		TLM1	CO2	T1,T2	
17.	Hypothesis testing	1	31-12-25		TLM1	CO2	T1,T2	
18.	Single mean tests	1	03-01-26		TLM1	CO2	T1,T2	
19.	Difference of means test	1	05-01-26		TLM1,2	CO2	T1,T2	
20.	Problems	1	07-01-26		TLM1	CO2	T1,T2	
21.	Applications	1	08-01-26		TLM1	CO2	T1,T2	
22.	Pairwise comparisons	1	10-01-26		TLM1	CO2	T1,T2	
No. of classes required to complete UNIT-II		09			No. of classes taken:			

I MID EXAMINATIONS (26-01-2026 TO 31-02-2026)

UNIT-III: Linear Regression and Multiple Regression

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
23.	Linear Regression, Regression lines	1	19-01-26		TLM1,2	CO3	T1,T2	
24.	Problems	1	21-01-26		TLM1	CO3	T1,T2	
25.	Curvilinear regression	1	22-01-26		TLM1	CO3	T1,T2	
26.	Exponential regression	1	24-01-26		TLM1	CO3	T1,T2	
27.	Polynomial regression	1	02-02-26		TLM1,2	CO3	T1,T2	
28.	Power curve	1	04-02-26		TLM1	CO3	T1,T2	
29.	Nature of the relationship	1	05-02-26		TLM1	CO3	T1,T2	
30.	Multiple linear regression	1	07-02-26		TLM1	CO3	T1,T2	
31.	Measurements of estimate	1	09-02-26		TLM1	CO3	T1,T2	
32.	Multiple regression	1	11-02-26		TLM1,2	CO3	T1,T2	
33.	Inference in Multiple regression	1	12-02-26		TLM1	CO3	T1,T2	
34.	Variable selection	1	14-02-26		TLM1	CO3	T1,T2	
No. of classes required to complete UNIT-III		12			No. of classes taken:			

UNIT-IV: Time Series

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
35.	Introduction: Significance of time series analysis	1	16-02-26		TLM1,2	CO4	T1,T2	
36.	Components of time series	1	18-02-26		TLM1	CO4	T1,T2	
37.	Measures of Trend: Graphic method	2	19-02-26 21-02-26		TLM1	CO4	T1,T2	
38.	Semi-average method	1	23-02-26		TLM1	CO4	T1,T2	
39.	Moving average method	1	25-02-26		TLM1	CO4	T1,T2	
40.	Method of least squares	1	26-02-26		TLM1,2	CO4	T1,T2	
41.	Logarithmic method	1	28-02-26		TLM1	CO4	T1,T2	
42.	Seasonal variations-simple averages	2	02-03-26 04-03-26		TLM1	CO4	T1,T2	
43.	Ratio-to-trend method	1	05-03-26		TLM1	CO4	T1,T2	
44.	Ratio-to-Moving averages	1	07-03-26		TLM1,2	CO4	T1,T2	
45.	Link relatives' method	1	09-03-26		TLM1	CO4	T1,T2	
46.	Problems	1	11-03-26		TLM1,2	CO4	T1,T2	
No. of classes required to complete UNIT-IV		14			No. of classes taken:			

UNIT-V: Logistic Regression

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Textbook followed	HOD Sign Weekly
47.	The classification problem	2	12-03-26 14-03-26		TLM1,2	CO5	T1,T2	
48.	Logistic regression setup	2	16-03-26 18-03-26		TLM1	CO5	T1,T2	
49.	Logistic regression setup	1	19-03-26		TLM1	CO5	T1,T2	
50.	Interpreting the results	1	21-03-26		TLM1	CO5	T1,T2	
51.	Interpreting the results	1	23-03-26		TLM1	CO5	T1,T2	
52.	Comparing models	1	25-03-26		TLM1	CO5	T1,T2	
53.	Classification	1	26-03-26		TLM1	CO5	T1,T2	
54.	Applications	1	28-03-26		TLM1	CO5	T1,T2	
55	Assignment Activity	1	30-03-26					
No. of classes required to complete UNIT-V		11			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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
55.	Bivariate and Multiple correlation	1	01-04-26		TLM2	C03	T1,T2	
56.	Advance Time series models	1	03-04-26 04-04-26		TLM2	CO2	T1,T2	
No. of classes		3			No. of classes taken:			
II MID EXAMINATIONS (06-04-2026 TO 11-04-2026)								

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)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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):	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 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	**Ethic**s: 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.

Dr. K BHANU LAKSHMI	**Dr. K BHANU LAKSHMI**	**Dr.V. SURYANARAYANA**	**Dr. P. BHAGATH**
Course Instructor	Course Coordinator	Module Coordinator	HOD

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.Divvela Srinivasa Rao
Course Name & Code : DL&CO 20IT01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : II B.Tech., IV-Sem, B-Sec **A.Y.: 2025-26**

Prerequisites:

Course Objectives: The main objectives of the course are to

1. Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals.
2. Describe memory hierarchy concepts.
3. Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices.

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

CO1	Evaluate digital number systems and use Boolean algebra theorems, Properties and Canonical forms for digital logic circuit design. **(Understand- L2)**
CO2	Design Sequential logic circuits and understand basic functional blocks a computer system. **(Apply- L3)**
CO3	Understand computer architecture and Data representation to perform computer arithmetic operations and processor organization. **(Understand- L2)**
CO4	Analyze the memory hierarchy in a computer system. **(Understand- L2)**
CO5	Understand the I/O operations and the interfaces **(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
CO1	3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

Textbooks:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education.
3. Computer Organization and Architecture, William Stallings, 11thEdition, Pearson.

Reference Books:

1. Computer Systems Architecture, M. Moris Mano, 3rd Edition, Pearson
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Number systems, Logic gates and Boolean algebra, Combinational circuits

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 DLD	1	09-12-2025		TLM1,	
2.	Number systems	1	10-12-2025		TLM1, TLM2	
3.	Different Number systems	1	11-12-2025		TLM1, TLM2	
4.	Conversions of one number to another number	2	12-12-2025 16-12-2025		TLM1, TLM2	
5.	Data Representations	1	17-12-2025		TLM1, TLM2	
6.	Binary codes	1	18-12-2025		TLM1, TLM2	
7.	Basic Logic gates and Universal gates	1	19-12-2025		TLM1, TLM2	
8.	Boolean Logic functions	1	23-12-2025		TLM1, TLM2	
9.	K-Maps Simplications	3	24-12-2025 26-12-2025 30-12-2025		TLM1, TLM2	
10.	Combinational circuits, Desing Decoder and Multiplexers	1	31-12-2025 02-01-2025 06-01-2025		TLM1, TLM2	
11.	Tutorial	1	07-01-2026		TLM3	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Sequential Logic Circuits, Basic structure of computer, Computer generations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Introduction to sequential circuits	1	08-01-2026		TLM1, TLM2	
13.	Flip-flops(RS,J,T,D)	1	09-01-2026		TLM1, TLM2	
14.	Master slave flip-flop	1	20-01-2026		TLM1, TLM2	
15.	Conversion of flip-flops, Truth & excitation tables	1	21-01-2026		TLM1, TLM2	
16.	Registers	1	22-01-2026		TLM1, TLM2	
17.	counters	1	23-01-2026		TLM1, TLM2	
18.	Basic structure of computer, Bus structure	1	22-01-2026		TLM1, TLM2	
19.	Multi processors and multi computers, Computer generations	1	22-01-2026		TLM1, TLM2	
20.	Von- Neumann Architecture	1	23-01-2026		TLM1, TLM2	
21.	Tutorial	1	24-01-2026		TLM3	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Data Representation, Processor Organization

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.	Signed Number representation	1	03-02-2026		TLM1, TLM2	
23.	Addition and Subtraction of Signed Numbers	1	04-02-2026		TLM1, TLM2	
24.	Design of Fast Adders	1	05-02-2026		TLM1, TLM2	
25.	Multiplication of Positive Numbers	1	06-02-2026		TLM1, TLM2	
26.	Signed-operand Multiplication	1	10-02-2026		TLM1, TLM2	
27.	Fast Multiplication	1	11-02-2026		TLM1, TLM2	
28.	Integer Division,	1	12-02-2026		TLM1, TLM2	
29.	Floating-Point Numbers and Operations	1	13-02-2026		TLM1, TLM2	
30.	Processor Organization of Fundamental Concepts	1	17-02-2026		TLM1, TLM2	
31.	Execution of a Complete Instruction	1	18-02-2026		TLM1, TLM2	
32.	Multiple-Bus Organization	1	19-02-2026		TLM1, TLM2	
33.	Hardwired Control, Micro programmed Control	1	20-02-2026		TLM1, TLM2	
34.	Tutorial	1	24-02-2026		TLM3	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Memory organization, Virtual Memories

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.	Memory organization	1	25-02-2026		TLM1, TLM2	
36.	Semiconductor RAM Memories	1	26-02-2026		TLM1, TLM2	
37.	Concept of memory hierarchical organization	1	27-03-2026		TLM1, TLM2	
38.	Read-Only Memories, Speed, Size and Cost	1	03-03-2026		TLM1, TLM2	
39.	Cache memory	1	04-03-2026		TLM1, TLM2	
40.	Virtual Memories	2	05-03-2026 06-03-2026		TLM1, TLM2	
41.	Memory Management Requirements, Secondary Storage	1	10-03-2026		TLM1, TLM2	
42.	Tutorial	1	11-03-2026		TLM3	
No. of classes required to complete UNIT-IV: 9				**No. of classes taken:**		

UNIT-V: Input/output Organization: & Peripheral devices, DMA

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
43.	Input/Output Organization: Accessing I/O Devices	1	12-03-2026		TLM1, TLM2	
44.	Interrupts	1	13-03-2026		TLM1, TLM2	
45.	Processor Examples	1	17-03-2026		TLM1, TLM2	
46.	Interface Circuits	1	18-03-2026		TLM1, TLM2	

47.	Peripheral devices –I/O sub-systems	1	19-03-2026		TLM1, TLM2	
48.	I/O device interface	1	20-03-2026		TLM1, TLM2	
49.	I/O transfers-program controlled	1	24-03-2026		TLM1, TLM2	
50.	Interrupt driven	1	25-03-2026		TLM1, TLM2	
51.	DMA	2	26-03-2026 27-03-2026		TLM1, TLM2	
52.	Revision	4	31-03-2026 01-04-2026 02-04-2026 03-04-2026		TLM3	
No. of classes required to complete UNIT-V: 14				**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 (R23 Regulation):

Evaluation Task	**Marks**
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III ,IV & V)	A2=5
II- Descriptive Examination (Unit-III ,IV & V)	M2=15
II-Quiz Examination (Unit-III ,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 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 engineer**ing 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.D.Srinivasa Rao	Dr.O.Rama Devi	Dr Ch.Rajendra Babu	Dr P Bhagath
Signature				

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FRESHMAN ENGINEERING DEPARTMENT

COURSE HANDOUT

Part-A

PROGRAM	**:** II B. Tech., IV-Sem., AI&DS-B
ACADEMIC YEAR	**:** 2025-26
COURSE NAME & CODE	**: Environmental Science**
L-T-P STRUCTURE	**:** 2-0-0
COURSE CREDITS	**:** 0
COURSE INSTRUCTOR	**:** Dr. V. Bhagya Lakshmi
COURSE COORDINATOR	**:** Dr. V. Bhagya Lakshmi
PRE-REQUISITES	**:** Biology, Chemistry, Geology, Mathematics or Physics

Course Objectives:

1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To furnish the learners with basic concepts and techniques at intermediate level to lead them into advanced level by handling various real-world applications.

Course Outcomes (COs): At the end of the course, students will be able to

CO 1	The necessity of resources, their exploitation and sustainable management	L2
CO 2	The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation.	L2
CO 3	Environmental problems like pollution, disasters and possible solutions.	L1
CO 4	The importance of environmental decision making in organizations through understanding the environmental law and environmental audits.	L2
CO 5	Environmental issues like over population, human health etc related to local, regional and global levels.	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	3	3	-	-	-	3	3	3	-	-	-	3	-	-	-
CO2	3	3	-	-	-	3	3	-	-	-	-	3	-	-	-
CO3	3	-	3	-	-	-	2	-	-	-	-	2	-	-	-
CO4	3	-	-	-	-	2	3	2	-	-	-	3	-	-	-
CO5	3	3	3	3	-	3	3	3	-	-	-	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).

BOS APPROVED TEXT BOOKS:

T1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses,Universities Press (India) Private Limited, 2019.

T2. Palaniswamy,EnvironmentalStudies,2/e,Pearsoneducation,2014.

T3.S.AzeemUnnisa,EnvironmentalStudies,AcademicPublishingCompany,2021.

T4.K.RaghavanNambiar,"TextbookofEnvironmentalStudiesforUndergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

ReferenceBooks:

R1.KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.
R2. DeekshaDaveandE.SaiBabaReddy,TextbookofEnvironmentalScience,2/e, Cengage Publications, 2012.
R3.M.AnjiReddy,"TextbookofEnvironmentalSciencesandTechnology",BSPublication, 2014.
R4.J.P.Sharma,ComprehensiveEnvironmentalstudies,Laxmipublications,2006.
R5.J.GlynnHenryandGaryW.Heinke,EnvironmentalSciencesandEngineering, Prentice Hall of India Private limited, 1988.
R6.G.R.Chatwal,ATextBookofEnvironmentalStudies,HimalayaPublishingHouse, 2018.
R7. GilbertM.MastersandWendellP.Ela,IntroductiontoEnvironmentalEngineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction to the course	1	04-12-2025		TLM2			
2.	Multidisciplinary Nature ofEnvironmental Studies	1	06-12-2025		TLM2			

UNIT-I: Multidisciplinary Nature of Environmental Studies

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
3.	Natural Resources – Forest resources	1	11-12-2025		TLM1	CO1	T1,T2	
4.	Water resources	1	18-12-2025		TLM1	CO1	T1,T2	
5.	Mineral resources & Energy resources	1	20-12-2025		TLM1	CO1	T1,T2	
6.	Food resources	1	27-12-2025		TLM1	CO1	T1,T2	
No. of classes required to complete UNIT-I		06			No. of classes taken:			

UNIT-II: Ecosystems and Biodiversity

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
7.	Ecosystems – Structure & Functions	1	03-01-2026		TLM1	CO2	T1,T2	
8.	Ecological succession &	1	08-01-2026		TLM1	CO2	T1,T2	
9.	Food chains, Food webs & Ecological Pyramids	1	17-01-2026		TLM1	CO2	T1,T2	
10.	Types of ecosystems	1	22-01-2026		TLM1	CO2	T1,T2	
11.	Biodiversity – introduction, levels, bio geographic classification	1	22-01-2026		TLM1	CO2	T1,T2	

12.	Values of Biodiversity, India as mega diversity nation. Threats to biodiversity and Conservation of biodiversity	1	24-01-2026		TLM1	CO2	T1,T2	
No. of classes required to complete UNIT-II		05			No. of classes taken:			

I MID EXAMINATIONS (26-01-2026 TO 31-01-2026)

UNIT-III: Environmental Pollution

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
13.	Environmental pollution -Air pollution	1	05-02-2026		TLM1	CO3	T1,T2	
14.	Water pollution, Marine pollution, Thermal pollution	1	07-02-2026		TLM1	CO3	T1,T2	
15.	Soil pollution	1	12-02-2026		TLM1	CO3	T1,T2	
16.	Noise pollution & Nuclear Hazards	1	19-02-2026		TLM1	CO3	T1,T2	
17.	Solid waste management	1	21-02-2026		TLM1	CO3	T1,T2	
18.	Disaster management	1	26-02-2026		TLM1	CO3	T1,T2	
No. of classes required to complete UNIT-III		06			No. of classes taken:			

UNIT-IV: Social Issues and Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
19.	From Unsustainable to Sustainable development	1	28-02-2026		TLM1	CO4	T1,T2	
20.	Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns	1	28-02-2026		TLM1	CO4	T1,T2	
21.	Environmental ethics, Climate change. Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products	1	05-03-2026		TLM1	CO4	T1,T2	
22.	Environmental Acts	1	07-03-2026		TLM1	CO4	T1,T2	
No. of classes required to complete UNIT-IV		04			No. of classes taken:			

UNIT-V: Human Population & Environment

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
23.	Population growth, variation among nations. Population explosion – Family Welfare Programmes.	1	12-03-2026		TLM1	CO5	T1,T2	
24.	Environment and human health –Human Rights – Value Education. HIV/AIDS	1	28-03-2026		TLM1	CO5	T1,T2	
25.	Women and Child Welfare	1	02-04-2026		TLM1	CO5	T1,T2	
26.	Role of information Technology in Environment and human health	1	04-04-2026		TLM1	CO5	T1,T2	
No. of classes required to complete UNIT-V		04			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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
27.	Case studies	2	22-01-2026 02-04-2026		TLM2	CO2	T1,T2	
No. of classes		2			No. of classes taken:			
II MID EXAMINATIONS (06-04-2026 TO 11-04-2026)								

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

PART-C EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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):	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 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	**Ethic**s: 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.

Dr. V. Bhagya Lakshmi	**Dr. Shaheda Niloufer**	**Dr. Shaheda Niloufer**	**Dr. T. Satyanarayana**
Course Instructor	Course Coordinator	Module Coordinator	HOD

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. V. Chandra Kumar
Course Name & Code : INTRODUCTION TO DATA SCIENCE (23AD03)
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec :II **B.Tech /IV Sem /AI & DS - B** **A.Y.:** 2025-26

PREREQUISITE: Knowledge of Computer fundamentals and Data structures

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To introduce students to the mathematical foundations of computation like automata theory, the theory of formal languages and grammars, the notion of algorithm, decidability, complexity, and computability. Understand the theory and practice of compiler implementation.

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

CO1	Understand the basic concepts of Data Science. **(Understand-L2)**
CO2	Apply the Machine Learning Activities on Data **(Apply-L3)**
CO3	Choose the appropriate databases for handling big data. **(Understand-L2)**
CO4	Enumerate the tools and applications on data science. **(Understand-L2)**
CO5	Understand the Visualization and development tools for data **(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	-	-	1
CO2	2	3	2	-	-	-	-	-	-	-	-	2	2	-	1
CO3	2	2	-	-	-	-	-	-	-	-	-	2	2	-	1
CO4	1	2	-	-	2	-	-	-	-	-	-	2	2	-	1
CO5	1	2	2	-	-	-	-	-	-	-	-	2	2	-	1
1 - Low			**2 –**Medium					**3 –** High							

TEXTBOOKS:

T1 Davy Cielen, Arno D.B. Meysman, and Mohamed Ali, "Introducing to Data Science using Python tools", Manning Publications Co, Dream tech press, 2016

T2 Prateek Gupta, "Data Science with Jupyter" BPB publishers,2019 for basics

REFERENCE BOOKS:

R1 Joel Grus "Data Science From Scratch", OReilly,2019

R2 Doing Data Science: Straight Talk from the Frontline,1st Edition, Cathy O' Neil and Rachel Schutt, O'Reilly, 2013

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Data Science

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 Data Science	1	1-12-2025		TLM 1	
2.	Benefits and Uses of Data Science	1	2-12-2025		TLM 1	
3.	Facets of Data	1	5-12-2025		TLM 1	
4.	Data Science Process in Brief	1	6-12-2025		TLM 1	
5.	Big Data Ecosystem and Data Science	1	8-12-2025		TLM 1	
6.	Overview of Data Science Process	1	9-12-2025		TLM 1	
7.	Defining Goals and Creating Project Charter	1	12-12-2025		TLM 1	
8.	Retrieving Data	1	13-12-2025		TLM 1	
9.	Data Cleansing	1	15-12-2025		TLM 1	
10.	Integrating and Transforming Data	1	16-12-2025		TLM 1	
11.	Exploratory Analysis	1	19-12-2025		TLM 1	
12.	Model Building	1	20-12-2025		TLM 1	
13.	Presenting Findings	1	22-12-2025		TLM 1	
14.	Building Applications on Top of Them	1	23-12-2025		TLM 1	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Applications of ML, Handling large data

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.	Applications of Machine Learning in Data Science	1	26-12-2025		TLM 1	
16.	Role of ML in DS	1	27-12-2025		TLM 1	
17.	Python Tools like sklearn	1	29-12-2025		TLM 1	
18.	Modeling Process for Feature Engineering	1	30-12-2025		TLM 1	
19.	Model Selection	1	2-1-2026		TLM 1	
20.	Validation and Prediction	1	3-1-2026		TLM 1	
21.	Types of ML	1	5-1-2026		TLM 1	
22.	Semi-Supervised Learning	1	6-1-2026		TLM 1	
23.	Problems and General Techniques for Handling Large Data	1	9-1-2026		TLM 1	
24.	Programming Tips for Dealing Large Data	1	19-1-2026		TLM 1	
25.	Case Studies on DS Projects for Predicting Malicious URLs	1	20-1-2026		TLM 1	

26.	Case Studies for Building Recommender Systems	1	23-1-2026		TLM 1	
27.	Case Studies for Building Recommender Systems	1	24-1-2026		TLM 1	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: NoSQL movement for handling Big data

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.	NoSQL Movement for Handling Big Data	1	2-2-2026		TLM 1	
29.	Distributing Data Storage and Processing with Hadoop Framework	1	3-2-2026		TLM 1	
30.	Case Study on Risk Assessment for Loan Sanctioning	1	6-2-2026		TLM 1	
31.	ACID Principle of Relational Databases	1	7-2-2026		TLM 1	
32.	CAP Theorem	1	9-2-2026		TLM 1	
33.	Base Principle of NoSQL Databases	1	10-2-2026		TLM 1	
34.	Types of NoSQL Databases	1	13-2-2026		TLM 1	
35.	Types of NoSQL Databases	1	14-2-2026		TLM 1	
36.	Case Study on Disease Diagnosis and Profiling	1	16-2-2026		TLM 1	
37.	Case Study on Disease Diagnosis and Profiling	1	17-2-2026		TLM 1	
38.	NoSQL Movement for Handling Big Data	1	20-2-2026		TLM 1	
No. of classes required to complete UNIT-III: 11				**No. of classes taken:**		

UNIT-IV: Tools and Applications of Data Science

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.	Tools and Applications of Data Science	1	21-2-2026		TLM 1	
40.	Introducing Neo4j for Dealing with Graph Databases	1	23-2-2026		TLM 1	
41.	Introducing Neo4j for Dealing with Graph Databases	1	24-2-2026		TLM 1	
42.	Graph Query Language Cypher	1	27-2-2026		TLM 1	
43.	Graph Query Language Cypher	1	28-2-2026		TLM 1	
44.	Applications Graph Databases	1	2-3-2026		TLM 1	
45.	Python Libraries like nltk and SQLite for Handling Text Mining and Analytics	1	3-3-2026		TLM 1	
46.	Python Libraries like nltk and SQLite for Handling Text Mining and Analytics	1	6-3-2026		TLM 1	
47.	Python Libraries like nltk and SQLite for Handling Text Mining and Analytics	1	7-3-2026		TLM 1	
48.	Case Study on Classifying Reddit Posts	1	9-3-2026		TLM 1	

49.	Case Study on Classifying Reddit Posts	1	10-3-2026		TLM 1	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Data Visualization and Prototype Application Development

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.	Data Visualization Options	1	13-3-2026		TLM 1	
51.	Cross Filter	1	14-3-2026		TLM 1	
52.	JavaScript Map Reduce Library	1	17-3-2026		TLM 1	
53.	JavaScript Map Reduce Library	1	18-3-2026		TLM 1	
54.	Creating an Interactive Dashboard with dc.js	1	20-3-2026		TLM 1	
55.	Creating an Interactive Dashboard with dc.js	1	21-3-2026		TLM 1	
56.	Dashboard Development Tools	1	24-3-2026		TLM 1	
57.	Applying the Data Science Process for Real World Problem Solving Scenarios	1	25-3-2026		TLM 1	
58.	Applying the Data Science Process for Real World Problem Solving Scenarios	2	27-3-2026 TO 28-3-2026		TLM 1	
59.	Detailed Case Study	1	1-4-2026		TLM 1	
60.	Detailed Case Study	1	2-4-2026		TLM 1	
No. of classes required to complete UNIT-V: 12				**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
61.	Introduction to JSON	1	30-3-2026		TLM 1	
62.	Introduction to React Js	1	31-3-2026		TLM 1	

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	**Mr. V.Chandra Kumar**	**Mr.V.Chandra Kumar**	**Dr. V Surya narayana**	**Dr. P.Bhagath**
Signature				

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DEPARTMENTOFARTIFICIALINTELLIGENCE&DATASCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.Ch.Rajendra Babu, Dr.Divvela Srinivasa Rao
Course Name & Code : Design Thinking & Innovation (23ME57)
Regulation : R23
L-T-P Structure : 1-0-2 **Credits:** 02
Program/Sem/Sec : B.Tech – IV Semester – B Section **A.Y.:** 2025-26

PREREQUISITE: None

COURSE OBJECTIVES:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process

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

CO1	Apply fundamental design components, principles, and new materials to createand improve design projects. **(Applying-L3)**
CO2	Apply the design thinking process to develop and present innovative productsolutions. **(Applying-L3)**
CO3	Analyze the relationship between creativity and innovation, evaluate their rolesin organizations, and develop strategic plans for transforming creative ideas intoinnovative solutions**. (Analyzing-L4)**
CO4	Analyze to work in a multidisciplinary environment. **(Analyzing-L4)**
CO5	Apply design thinking principles to address business challenges, develop and testbusiness models and prototypes, and evaluate the value of creativity. **(Evaluating-L5)**

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	1			3							2		3	
CO2	1	2	2		3							2		3	
CO3	3	3		2	3							3			3
CO4	1	1			3							2			3
1 - Low			**2 –**Medium							**3 -** High					

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S. No.	Topics to be covered (Experiment Name)	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	UNIT–I: INTRODUCTION TO DESIGN THINKING					
1	Introduction to elements and principles of Design	1	12/1/2025		TLM2	
	Activity: To understand the importance of design	2	12/1/2025		TLM6	
2	History of Design Thinking, New materials in Industry	1	12/8/2025		TLM2	
	Activity: To understand the importance of team work	2	12/8/2025		TLM6	
3	Basics of design-dot, line, shape, form as fundamental design components	1	12/15/2025		TLM2	
	Activity: Developing sketches using dot, line and form	2	12/15/2025		TLM6	
	UNIT–II: DESIGN THINKING PROCESS					
4	Design thinking process: Empathy	1	12/22/2025		TLM2	
	Activity: To understand the significance of Empathy	2	12/22/2025		TLM6	
5	Design thinking process: Define or Analyze	1	12/22/2025		TLM2	
	Activity: To understand the significance of Define/analyze	2	12/29/2025		TLM6	
6	Design thinking process: Ideate	1	12/29/2025		TLM2	
	Activity: To understand the significance of Ideate	2	12/29/2025		TLM6	
7	Design thinking process: Prototype	1	1/5/2026		TLM2	
	Activity: To understand the significance of Prototype	2	1/5/2026		TLM6	
8	Tools of design thinking in social innovations	1	1/5/2026		TLM2	
	Activity: Students should present their understanding of DTI elements using example	2	1/5/2026		TLM6	
	UNIT – III: INNOVATION					
9	Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations	1	1/12/2026		TLM2	
	Activity: Debate on innovation and creativity, Flow and	2	1/19/2026		TLM6	

	planning from idea to innovation, Debate on value-based innovation					
	UNIT – IV: PRODUCT DESIGN					
10	Problem formation, introduction to product design, Product strategies, Product value	1	2/2/2026		TLM2	
	Activity: Development of Business models, setting of specifications	2	2/9/2026		TLM6	
11	Product planning, product specifications. Innovation towards product design Case studies.	1	2/16/2026		TLM2	
	Activity: Explaining their own product and model design, case studies	2	2/23/2026		TLM6	
	UNIT – V: DESIGN THINKING IN BUSINESS PROCESSES					
12	Business & Strategic Innovation, Business challenges, Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes	1	3/2/2026		TLM2	
	Activity: Marketing strategies of our own product, its maintenance, Reliability and plan forstartup	2	3/9/2026		TLM6	
I Mid Exams: 27-01-2025 to 01-02-2025						
II Mid Exams: 06-04-2025 to 12-04-2025						
No. of classes required to complete: 36				**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-B

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	**Marks**
Internal Examination	30
Semester End Examination	70
Total Marks:	**100**

ACADEMIC CALENDAR

Commencement of IV Semester Classwork	01-12-2025		
Description	**From**	**To**	**Weeks**
I Phase of Instructions	01-12-2025	24-01-2026	8W
I Mid Examinations	**26-01-2026**	**31-01-2026**	1 W
II Phase of Instructions	02-02-2026	04-04-2026	9 W
II Mid Examinations	**06-04-2026**	**11-04-2026**	1 W
Preparation and Practicals	13-04-2026	18-04-2026	1 W
Semester End Examinations	**20-04-2026**	**02-05-2026**	2 W
Internship	05-05-2026	28-06-2026	8 W
Commencement of V Semester Classwork	**29 –06–2026**		

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 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.
PO10	**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.
PO11	**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.
PO12	**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.

Signature				
Name of the Faculty	Dr.Ch.Rajendra Babu Dr.D.Srinivasa Rao	Dr V. Ramakrishna	Dr.Ch.Rajendra Babu	Dr. P Bhagath
Designation	**Course Instructors**	**Course Coordinator**	**Module Coordinator**	**HoD**

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. M. Kishore Kumar
Course Name & Code **:** Artificial Intelligence Lab (23AD51)
L-T-P Structure **: 0-0-3** **Credits:** 3
Program/Sem/Sec : II B.Tech., IV-Sem, B-Sec **A.Y.: 2025-26**

PRE-REQUISITE: **1.**Knowledge in Computer Programming.

2. Background in linear algebra, data structures and algorithms

Course Educational Objective:

1.The student should be made to study the concepts of Artificial Intelligence.
2.The student should be made to learn the methods of solving problems using Artificial Intelligence.
3.The student should be made to introduce the concepts of Expert Systems and machine learning.

Course Outcomes (CO): At the end of this course, the student will be able to:
CO 1: Apply the basic concepts of Python libraries. (Apply-L3)
CO 2: Perform various operations using Numpy & Pandas. (Apply-L3)
CO 3: Implement different searching algorithms using python. (Apply-L3)
CO 4: 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	3						3	3		2	3	1	1
CO2	3	3	3						3	3		2	3	1	1
CO3	3	3	3						1			2	3	2	1

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

DATA WAREHOUSING AND DATA MINING LAB SCHEDULE (LESSON PLAN): Section-B

Expt. No	Experiments to be conducted	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Pandas Library a) Write a python program to implement Pandas Series with labels. b) Create a Pandas Series from a dictionary. c) Creating a Pandas Data Frame. d) Write a program which makes use of the following Pandas methods i)	1	02/12/2025		TLM8	

	describe() ii) head() iii) tail() iv) info()					
2	Pandas Library: Visualization a) Write a program which use pandas in built visualization to plot following graphs: i) Bar plots ii) Histograms iii) Line plots iv) Scatter plots	1	09/12/2025		TLM8	
3	Write a Program to Implement Breadth First Search using Python.	1	16/12/2025		TLM8	
4	Write a Program to Implement Depth First Search using Python.	1	23/12/2025		TLM8	
5	Write a program to implement Best First Searching Algorithm.	1	30/12/2025		TLM8	
6	Write a program to implement the Heuristic Search.	1	06/01/2026		TLM8	
7	Write a python program to implement A*and AO*algorithm. (Ex: find the shortest path).	1	20/01/2026		TLM8	
8	Write a Program to Implement Water-Jug problem using Python.	1	27/01/2026		TLM8	
9	Write a Program to Implement Alpha-Beta Pruning using Python.	1	10/02/2026		TLM8	
10	Write a Program to implement 8-Queens Problem using Python.	1	17/02/2026		TLM8	
11	Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.	1	24/02/2026		TLM8	
12	Write a program to implement the Unification algorithm	1	03/03/2026		TLM8	
13	Develop a knowledge base system consisting of facts and rules about some specialized knowledge Domain.	1	10/03/2026		TLM8	
14	Write a program to implement 8 puzzle programs using different heuristics. Using it play the game.	1	17/03/2026		TLM8	
15	Tic-Tac- Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.	1	24/03/2026		TLM8	
16	Internal Lab	1	31/03/2026			

Teaching Learning Methods					
TLM1	Chalk and Talk	**TLM4**	Problem Solving	**TLM7**	Seminars or GD
TLM2	PPT	**TLM5**	Programming	**TLM8**	Lab Demo
TLM3	Tutorial	**TLM6**	Assignment or Quiz	**TLM9**	Case Study

PART-C

EVALUATION PROCESS (R20 Regulations):

According to Academic Regulations of R20 Distribution and Weightage of Marks for Laboratory Courses is as follows

(a) Continuous Internal Evaluation (CIE): The Continuous Internal Evaluation (CIE) is based on the following parameters:

Parameter	Marks
Day to Day work	10
Record	05
Internal Test	15
Total	30

(b) Semester End Examinations (SEE) : The Semester End examinations (SEE) for laboratory courses shall be jointly conducted by internal and external examiners with 3 hours duration and evaluated for 35 marks. The performance of the student shall be evaluated as per the parameters indicated below:

Parameter	Marks
Procedure/Algorithm	20
Experimentation/Program execution	30
Observations/Calculations/Validation	
Result/Inference	
Viva voce	20
Total	70

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	**Ethic**s: 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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. M. Kishore Kumar	**Mr. G. Ram Babu**	**Dr. V. Surya Narayana**	**Dr. P. Bhagath**

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT
PART-A

Name of Course Instructor: Mr. V. Chandra Kumar/ V. Sowjanya
Course Name & Code :DATA SCIENCE USING PYTHON LAB (23AD52)
L-T-P Structure : 0-0-3 **Credits:**1.5
Program/Sem/Sec : II B.Tech IV Sem AI & DS - B **A.Y.:** 2025-26

PRE-REQUISITE:INTRODUCTION TO PROGRAMMING AND DATA STRUCTURES

COURSE EDUCATIONAL OBJECTIVES (CEOs):
The main objective of the course is to inculcate the basic understanding of Data Science and its practical implementation using Python.

COURSE OUTCOMES (COs): After successful completion of the course the students are able to

CO 1	Apply the basic concepts of Python libraries.**(Apply-L3)**
CO 2	Perform various operations using Numpy & Pandas**. (Apply-L3)**
CO 3	Apply the Advanced packages like NLTK,SciKit-Learn and Spicy**(Apply-L3)**
CO 4	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	2	2	-	3	-	-	-	-	-	-	2	2	-	1
CO2	3	2	2	-	3	-	-	-	-	-	-	2	2	-	1
CO3	3	2	2	-	3	-	-	-	-	-	-	2	2	-	1
CO4	-	-	-	-	-	-	-	2	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	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Creating a NumPy Array a. Basic ndarray b. Array of zeros c. Array of ones d. Random numbers in ndarray e. An array of your choice f. Imatrix in NumPy g. Evenly spaced ndarray	3	3-12-2025		TLM4	
2	The Shape and Reshaping of NumPy Array a. Dimensions of NumPy array b. Shape of NumPy array c. Size of NumPy array d. Reshaping a NumPy array e. Flattening a NumPy array f. Transpose of a NumPy array	3	10-12-2025		TLM4	
3	Expanding and Squeezing a NumPy Array a. Expanding a NumPy array b. Squeezing a NumPy array c. Sorting in NumPy Arrays Indexing and Slicing of NumPy Array a. Slicing 1-D NumPy arrays b. Slicing 2-D NumPy arrays c. Slicing 3-D NumPy arrays d. Negative slicing of NumPy array	3	17-12-2025		TLM4	
4	Stacking and Concatenating Numpy Arrays a. Stacking ndarrays b. Concatenating ndarrays c. Broadcasting in Numpy Arrays	3	24-12-2025		TLM4	
5	Perform following operations usingpandas a. Creating data frame b. concat() c. Setting conditions d. Adding a new column	3	7-1-2026		TLM4	
6	Perform following operations using pandas a. Filling NaN with string b. Sorting based on column values c. groupby()	3	21-1-2026		TLM4	
7	Read the following file formats using pandas a. Text files b. CSV files c. Excel files d. JSON files	3	4-2-2026		TLM4	
8	Read the following file formats a. Pickle files b. Image files using PIL c. Multiple files using Glob d. Importing data from database	3	11-2-2026		TLM4	
9	Demonstrate web scraping using python Perform following preprocessing techniques on loan prediction dataset a. Feature Scaling b. Feature Standardization c. Label Encoding d. One Hot Encoding	3	18-2-2026		TLM4	
10	Perform following visualizations using matplotlib a. Bar Graph b. Pie Chart c. Box Plot d. Histogram e. Line Chart and Subplots f. Scatter Plot	3	4-3-2026		TLM4	
11	Getting started with NLTK, install NLTK using PIP	3	11-3-2026		TLM4	

12	. Python program to implement with Python SciKit-Learn & NLTK	3	18-3-2026		TLM4	
13	Python program to implement with Python NLTK/Spicy/PyNLPI	3	25-3-2026		TLM4	
14	Internal Exam	3	1-4-2026		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

EVALUATIONPROCESS(R23Regulation):

EvaluationTask	**Marks**
DaytoDayWork:	15
InternalTest	15
ContinuousInternalAssessment	30
Procedure	20
Execution&Results	30
Viva-voce	20
SemesterEndExamination(SEE)	70
TotalMarks=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	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the 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, 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	**Mr. V. Chandra Kumar**	**Mr. V. Chandra Kumar**	**Dr.V Suryanarayana**	**Dr.P.Bhagath**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT
PART-A

Name of Course Instructor: K. Lakshmi Padmavathi
Course Name & Code : FULL STACK DEVELOPMENT-I (23CSS2)
L-T-P Structure : 0-1-2 **Credits: 2**
Program/Sem/Sec : II B.Tech IV Sem AI & DS - B **A.Y.: 2025-26**

PRE-REQUISITE: INTRODUCTION TO PROGRAMMING IN C.

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objectives of the course are to make use of HTML for designing static webpages.
COURSE OUTCOMES (COs): After successful completion of the course the students are able to

CO 1	**Design static webpages by using HTML elements. (Apply-L3)**
CO 2	**Develop a webpage by applying appropriate CSS styles to HTML elements. (Apply-L3)**
CO 3	**Develop dynamic web pages and validate forms using JavaScript. (Apply-L3)**
CO 4	**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	2	2	-	3	-	-	-	-	-	-	2	2	-	1
CO2	3	2	2	-	3	-	-	-	-	-	-	2	2	-	1
CO3	3	2	2	-	3	-	-	-	-	-	-	2	2	-	1
CO4	-	-	-	-	-	-	-	2	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	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Lists, Links and Images a. Write a HTML program to explain the working of lists.Write a HTML program to explain the working of hyperlinks using<a>tag and href, target Attributes.	3	05-12-2025		TLM4	
2	HTML Tables, Forms and Frames Write a HTML program to explain the working of tables. (use tags: <table>,<tr>,<th>, <td> and attributes: border, rowspan, colspan) Write a HTML program to explain the working of tables by preparing a timetable (Note: Use <caption>tag to set the caption to the table & also use cell spacing, cell padding, border, row span, col span etc.).	3	12.12.2025		TLM4	
3	HTML5 and Cascading Style Sheets, Types of CSS Write a HTML program that makes use of <article>, <aside>, <figure>, <figcaption>,<footer>,<header>,<main>,<nav>, <section>, ,tags. Write a HTML program, to embed audio and video into HTML web page. Write a program to apply different types (or levels of styles or style specification formats) -in line, internal, external styles to HTML elements (identify selector, property and value).	3	19.12.2025		TLM4	
4	Selector forms:Write a program to apply different types of selector forms. Simples elector (element, id, class, group, universal). Combinator selector (descendant, child, adjacent sibling, general sibling). Pseudo-class selector. Pseudo-element selector. Attribute selector	3	26.12.2025		TLM4	
5	CSS with Color, Background, Font, Text and CSS Box Model. Write a program to demonstrate the various ways you can reference a color in CSS. Write a CSS rule that places a back ground image half way down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.	3	02.01.2026		TLM4	

6	Applying JavaScript-internal and external, I/O, Type Conversion. Write a program to embed internal and external JavaScript in a webpage. Write a program to explain the different ways for displaying output.	3	09.01.2026		TLM4	
7	JavaScript Pre-defined and User-defined Objects. Write a program using document object properties and methods. Write a program using window object properties and methods. Write a program using array object properties and methods.	3	06.02.2026 13.02.2026		TLM4	
8	JavaScript Conditional Statements and Loops. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS". Write a program to display weekdays using switch case.	3	20.02.2026 27.02.2026		TLM4	
9	JavaScript Functions and Events. Design an appropriate function should be called to display. Factorial of that number. Fibonacci series upto that number. Prime numbers upto that number	3	06.03.2026 13.03.2026		TLM4	
	Project implementation		20.03.2026			
	Internal Exam		27.03.2024			

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 (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20

Execution & Results	**30**
Viva-voce	**20**
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 engineeringproblems.**
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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mrs.K.Lakshmi Padmavathi**	**Dr.S.Nagarjuna Reddy**	**Dr.D.Srinivasa Rao**	**Dr.P.Bhagath**
Signature				