LAKIREDDY BALI REDDY 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, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. V Suryanarayana
Course Name & Code   : Design and Analysis of Algorithms (20CS06)
L-T-P Structure   : 3-0-0   **Credits:** 3
Program/Sem/Sec   : B.Tech IV Sem AI & DS A-SEC   **A.Y.:** 2023-24

PREREQUISITE: Discrete Mathematics and Data structures

COURSE EDUCATIONAL OBJECTIVES (CEOs): The Objective of the course is to learn various algorithm and design techniques and analyze the computing resources of the algorithms, and motivate the students to design new algorithms for various problems

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

CO1	Identify the characteristics of an algorithm and analyze its time and space complexity.(Understand-L2)
CO2	Apply the divide-and-conquer method for solving problems like searching and sorting (Apply-L3)
CO3	Design Greedy algorithms for the optimization problems like knapsack problem, minimum cost spanning tree, single source shortest path problem. **(Apply - L3)**
CO4	Apply dynamic programming paradigm to solve optimization problems like travelling sales person problem,0/1 knapsack problem, Optimal binary search tree. **(Apply - L3)**
CO5	Analyze the backtracking and branch-and-bound search methods on optimization problems like N-queens, sum of subsets,0/1 knapsack, Hamiltonian circuit and so on. **(Apply - L3)**

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

TEXTBOOKS:

T1	Ellis Horowitz, Sartaj Sahni, ― Fundamentals of Computer Algorithms, Galgotia Publications [**Units – 1,2,3,4,5**]

REFERENCE BOOKS:

R1	Mark Allen Weiss - Data Structures and Algorithm Analysis in C++‖, Pearson,3/e, 2007
R2	Aho, Hopcroft Ullman – The design and Analysis of Computer Algorithms, Addison Wesley Publications.
R3	Thomas H. Cormanetai – Introduction to Algorithms, PHI
R4	Anany Levitin – Introduction to the Design and Analysis of Algorithms, PEA

R5 P.H. Dave, H.B. Dave – Design and Analysis of Algorithms, Pearson Education, 2008

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction & Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and COs and DAA syllabus discussion	1	02.01.24		1 & 2	
2.	Algorithm definition	1	03.01.24		1 & 2	
3.	Specifications	1	04.01.24		1 & 2	
4.	Performance Analysis- Time Complexity	1	05.01.24		1 & 2	
5.	Space Complexity.	1	09.01.24		1 & 2	
6.	Asymptotic Notations-Big-Oh	1	10.01.24		1 & 2	
7.	Omega, Theta.	1	11.01.24		1 & 2	
8.	**Divide and Conquer**: General Method	1	18.01.24		1 & 2	
9.	Binary Search	1	19.01.24		1 & 2	
10.	Finding Maximum and Minimum	1	23.01.24		1 & 2	
11.	Merge Sort	1	24.01.24		1 & 2	
12.	Quick sort	1	25.01.24		1 & 2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: The Greedy Method

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	**The Greedy Method**– General Method,	1	30.01.24		1 & 2	
14.	Knapsack Problem	1	31.01.24		1 & 2	
15.	Job sequencing with deadlines,	1	01.02.24		1 & 2	
16.	Minimum-cost spanning trees	2	02.02.24 06.02.24		1 & 2	
17.	Optimal storage on tapes	2	07.02.24 08.02.24		1 & 2	
18.	Single source shortest paths	1	09.02.24		1 & 2	
19.	Huffman coding	1	13.02.24		1 & 2	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Dynamic Programming

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.	**Dynamic Programming**- General method	1	14.02.24		1 & 2	
21.	Multistage graph,	2	15.02.24 16.02.24		1 & 2	
22.	All pairs shortest path	1	20.02.24		1 & 2	
23.	Single Source Shortest path	1	21.02.24		1 & 2	
24.	Optimal Binary search trees	1	22.02.24		1 & 2	
25.	0/1 Knapsack method	1	23.02.24		1 & 2	
26.	Reliability design,	1	05.03.24		1 & 2	
27.	The travelling salesman problem.	2	06.03.24 07.03.24		1 & 2	

No. of classes required to complete UNIT-III: 10	No. of classes taken:

UNIT-IV: Back tracking

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.	**Back tracking-** The General Method	1	12.03.24		1 & 2	
29.	The 8-Queens Problem	2	13.03.24 14.03.24		1 & 2	
30.	Sum of subsets	2	15.03.24 19.03.24		1 & 2	
31.	Graph Coloring	1	20.03.24		1 & 2	
32.	Hamiltonian cycles	2	21.03.24 22.03.24		1 & 2	
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

UNIT-V: Branch and Bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	**Branch and Bound–** General method	2	26.03.24 27.03.24		1 & 2	
34.	Job sequencing with deadlines – LC Branch and Bound,	2	28.03.24 02.04.24		1 & 2	
35.	FIFO Branch and Bound	1	03.04.24		1 & 2	
36.	LIFO Branch and Bound	1	04.04.24		1 & 2	
37.	0/1 Knapsack problem - LC Branch and Bound solution	2	10.04.24 12.04.24		1 & 2	
38.	FIFO Branch and Bound solution	2	16.04.24 18.04.24		1 & 2	
39.	travelling salesperson Problem – LC Branch and Bound solution	2	19.04.24 23.04.24		1 & 2	
No. of classes required to complete UNIT-V: 12				**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.
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. V Suryanarayana**	**Dr. V Suryanarayana**	**Mr. S. Siva Rama Krishna**	**Dr.O.Rama Devi**
Signature				

LAKIREDDY BALI REDDY 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, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLEGENCE & DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. V. Chandra Kumar
Course Name & Code : 20HS01: Univeral Human Values 2: Understanding Harmony
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech IV sem AI&DS-A **A.Y.:** 2023-24

PREREQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To become more aware of themselves and their surroundings (family, society, nature); they would become more responsible in life and in handling problems with sustainable solutions while keeping human relationships and human nature in mind.

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

CO1	Apply the value inputs in life and profession
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the self and the Body
CO3	Understand the role of a human being in ensuring harmony in society
CO4	Understand the role of a human being in ensuring harmony in the nature and existence
CO5	Distinguish between ethical and unethical practices

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

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

TEXTBOOKS:

T1 R R Gaur, r singal, G P Bagaria, "Human values and Professional Ethics", Excel Books, New Delhi,2010

REFERENCE BOOKS:

R1 Jeevan vidya: Ek Parichaya, A.Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999
R2 Human values, A N Tripathi, New Age Publishers, New Delhi, 2004
R3 The story of my experiments with Truth, Mohandas Karamchand Gandhi

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Need, Basic Guide lines, content and Process for value Education

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, COs	1	2-1-2024		TLM1	
2.	Process for self exploration: Natural Acceptance	1	3-1-2024		TLM1	
3.	Experiential validation	1	4-1-2024		TLM1	
4.	Continuous Happiness and prosperity	1	5-1-2024		TLM1	
5.	A look at basic human aspirations: Right understanding	1	6-1-2024		TLM1	
6.	Relationship	1	8-1-2024		TLM1	
7.	Physical facility	1	9-1-2022		TLM2	
8.	Understanding Happiness and prosperity	1	10-1-2024		TLM2	
9.	Understanding Happiness and prosperity	1	11-1-2024		TLM2	
No. of classes required to complete UNIT-I:			**No. of classes taken:**			

UNIT-II: Understanding Harmony in the Human Being-Harmony in myself

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.	Understanding Human being as a co-existence of sentient 'I' and the material 'Body'	1	18-1-2024		TLM2	
11.	Understanding the needs of self ('I') and 'Body'- Happiness and Physical facility	1	19-1-2024		TLM2	
12.	Understanding the Body as an instrument of 'I'	1	20-1-2024		TLM2	
13.	Understanding the characteristics and activities of 'I' and harmony in 'I'	1	22-1-2024		TLM2	
14.	Understanding the harmony of I with the Body	1	23-1-2024		TLM2	
15.	Sanyam and Health	1	24-1-2024		TLM2	
16.	Correct appraisal of Physical needs	1	25-1-2024		TLM2	
17.	Meaning of prosperity in detail	1	31-1-2024		TLM1	
No. of classes required to complete UNIT-II:			**No. of classes taken:**			

UNIT-III: Understanding Harmony in the Family and society-Harmony in Human-Human Relationship

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.	Understanding values in human-human relationship: meaning of justice	1	2-2-2024		TLM2	
19.	Program for fulfillment to ensure mutual happiness, Trust and Respect as	1	5-2-2024		TLM2	

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	the foundational values of relationship					
20.	Understanding Harmony in the society: Resolution	1	6-2-2024		TLM2	
21.	Prosperity, fearlessness and co-existence as comprehensive human goals	4	9-2-2024 15-2-2024			
22.	Visualizing a universal harmonious order in the society- undivided society	4	19-2-2024 23-2-2024		TLM2	
23.	1-mid examination	1	26-2-2024 T0 2-3-2024		TLM2	
24.	Universal order-from family to world family	1	4--3-2024		TLM2	
25.	Gratitude as a universal value in relationships	1	6-3-2024		TLM2	
No. of classes required to complete UNIT-III:				**No. of classes taken:**		

UNIT-IV: Understanding Harmony in the Nature and Existence- Whole existence as Coexistence

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Understanding Harmony in the Nature	1	11-3-2024		TLM2	
27.	Interconnectedness and mutual fulfillment among four orders of nature	1	12-3-2024		TLM2	
28.	Recyclability and self regulation in nature	1	13-3-2024		TLM2	
29.	Understanding Existence as co-existence of mutually interacting units in all pervasive space	1	18-3-2024		TLM2	
30.	Understanding Existence as co-existence of mutually interacting units in all pervasive space	1	20-3-2024		TLM2	
31.	Holistic perception of harmony at all levels of existence	1	26-3-2024		TLM2	
No. of classes required to complete UNIT-IV:				**No. of classes taken:**		

UNIT-V: Implications of the above Holistic understanding of Harmony on professional ethics

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Natural acceptance of human values	1	2-4-2024		TLM2	
33.	Definitiveness of ethical human conduct	1	8-4-2024		TLM2	
34.	Basis for humanistic education	1	10-4-2024		TLM2	
35.	Humanistic constitution and humanistic universal order	1	15-4-2024		TLM2	
36.	Competence in professional ethics	1	19-4-2024		TLM2	
37.	Strategy for transition from the present state to universal human order	1	23-4-2024		TLM2	
38.	Revision	1	24-4-2024		TLM2	
No. of classes required to complete UNIT-V:				**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 (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 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.

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.

Title	Course Instructor	Module Coordinator	Head of the Department
Name of the Faculty	**Mr .V. Chandra Kumar**		**Dr. O. Rama Devi**
Signature			

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.
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. P. GANDHI PRAKASH.
Course Name & Code　　　: INTRODUCTION TO AI&DS – 20AD03
L-T-P Structure　　　　　: 3-0-0　　　　　　　　　　　　**Credits:** 3
Program/Sem/Sec　　　　: II B.Tech/IV-Sem/A　　　　　**A.Y.:** 2022-23

PRE-REQUISITE: Knowledge of Computer fundamentals & Data structures& Algorithms

Course Educational Objective:

The objective of the course is to provide a strong foundation of fundamental concepts in Artificial Intelligence and a basic exposition to the goals and methods of Artificial Intelligence and provide fundamentals of Data Science.

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

- **CO1:** Enumerate the history and foundations of Artificial Intelligence. **(Understand-L2)**
- **CO2:** Apply the basic principles of AI in problem solving. **(Apply-L3)**.
- **CO3:** Choose the appropriate representation of Knowledge. **(Understand-L2)**.
- **CO4:** Enumerate the fundamentals of data science and NumPy. **(Understand-L2)**.
- **CO5:** Summarize and compute descriptive statistics using pandas. **(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	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	2	3	3	-	2	-	-	-	-	-	-	2	3	-	-

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

BOS APPROVED TEXT BOOKS:

- **T1** Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern

  Approach" , 3rd Edition, Prentice Hall
- **T2** Wes McKinney, "Python for Data Analysis",O'REILLY, ISBN:978-1-449-31979-3, 1st edition, October 2012.
- **T3** Rachel Schutt & O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449-35865-5,
  1st edition, October 2013

BOS APPROVED REFERENCE BOOKS:

R1 Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011

R2 Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill

R3 David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.

R4 Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.

R5 Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015

R6 Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2016.

Part-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Discussion of CEO's and CO's, Introduction to programming.	1	03-01-2024		TLM1	
2.	Introduction: What Is AI?, The Foundations of Artificial Intelligence.	1	04-01-2024		TLM1	
3.	The History of Artificial Intelligence, The State of the Art,	1	05-01-2024		TLM1	
4.	Agents and Environments	1	08-01-2024		TLM1	
5.	Agents and Environments	1	10-01-2024		TLM1	
6.	Good Behavior: The Concept of Rationality	1	11-01-2024		TLM1	
7.	The Nature of Environments	1	12-01-2024		TLM1	
8.	Types of agents	1	18-01-2024		TLM1	
9.	Types of agents	1	19-01-2024		TLM1	
10.	The Structure of Agents.	1	22-01-2024		TLM1	
No. of classes required to complete UNIT-I		10				

UNIT-II :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Problem-Solving Agents,	1	24-01-2024		TLM1	
2.	Uninformed Search Strategies	1	25-01-2024		TLM1	
3.	Uninformed Search Strategies	1	29-01-2024		TLM1	
4.	Informed (Heuristic) Search Strategies	1	31-01-2024		TLM1	
5.	Informed (Heuristic) Search Strategies	1	01-02-2024		TLM1	
6.	Local Search Algorithms and Optimization Problems	1	02-02-2024		TLM1	
7.	Local Search Algorithms and Optimization Problems	1	05-02-2024		TLM1	
8.	Searching with Nondeterministic Actions	1	07-02-2024		TLM1	
	No. of classes required to complete UNIT-II		08			

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
9.	Knowledge Representation	1	08-02-2024		TLM1	
10.	Knowledge-Based Agents	2	09-02-2024 & 12-02-2024		TLM1	
11.	Propositional Logic, A Very Simple Logic	2	14-02-2024 & 15-02-2024		TLM1	
12.	Ontological Engineering	2	16-02-2024		TLM1	
13.	Categories and Objects, Events, Mental Events	2	19-02-2024 & 21-02-2024		TLM1	
14.	Mental Objects	1	22-02-2024		TLM1	

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.	Reasoning Systems for Categories	1	23-02-2024		TLM1	
16.	Reasoning Systems for Categories	1	04-03-2024		TLM1	
17.	The Internet Shopping World.	1	06-03-2024		TLM1	
No. of classes required to complete UNIT-III			13			

UNIT-IV :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	What is Data science? Datafication	1	07-03-2024		TLM1	
19.	Exploratory Data Analysis,	1	11-03-2024		TLM1	
20.	The Data science process,	1	13-03-2024		TLM1	
21.	A data scientist role in this process.	1	14-03-2024		TLM1	
22.	The NumPyndarray: A Multidimensional Array Object	1	15-03-2024		TLM1	
23.	Creating ndarrays ,Data Types for ndarrays	1	18-03-2024		TLM1	
24.	Operations between Arrays and Scalars	1	20-03-2024		TLM1	
25.	Basic Indexing and Slicing,	1	21-03-2024		TLM1	
26.	Boolean Indexing, Fancy Indexing,	1	22-03-2024		TLM1	
27.	Data Processing Using Arrays	1	27-03-2024		TLM1	
28.	Expressing Conditional Logic as Array Operations,	1	28-03-2024		TLM1	
29.	Methods for Boolean Arrays ,	1	01-04-2024		TLM1	
30.	Sorting , Unique	1	03-04-2024		TLM1	
No. of classes required to complete UNIT-IV			13			

UNIT-V :

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Introduction to pandas, Library Architecture,	2	04-04-2024 & 08-04-2024		TLM1	
32.	Features, Applications,	1	10-04-2024		TLM1	
33.	Data Structures, Series, Data Frame	1	12-04-2024		TLM1	
34.	Index Objects, Essential Functionality Reindexing	1	15-04-2024		TLM1	
35.	Dropping entries from an axis	1	18-04-2024		TLM1	
36.	Sorting and ranking,	1	19-04-2024		TLM1	
37.	Summarizing and Computing Descriptive Statistics,	1	22-04-2024		TLM1	
38.	Unique Values, Value Counts,	1	24-04-2024		TLM1	
39.	Handling Missing Data, filtering out missing data.	1	25-04-2024		TLM1	
No. of classes required to complete UNIT-V			10			

Contents 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
40.	Turing test	1	26-04-2024		**TLM1**	
41.	Interview Questions	1	26-04-2024		**TLM1**	

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 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 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 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. P.GANDHI PRAKASH**	**Mr. P.GANDHI PRAKASH**	**Dr. V.Surya Narayana**	**Dr. O. RAMA DEVI**
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: **Ms.GARIKAPATI DIVYA**
Course Name & Code : **Data Warehousing and Data Mining (20CS10)**
L-T-P Structure : **3-0-0** **Credits: 3**
Program/Sem/Sec : **B.Tech / IV Sem** **A.Y.: 23-24**

PREREQUISITE: DBMS and Probability and Statistics

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The Objective of the course is to introduce the concepts of data warehouse and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

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

CO1	Summarize the architecture of data warehouse. **(Understand- L2)**
CO2	Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data. **(Apply – L3)**
CO3	Construct a decision tree and resolve the problem of model overfitting. **(Analyze – L4)**
CO4	Compare Apriori and FP-growth association rule mining algorithms for frequent item set Generation. **(Apply - L3)**
CO5	Apply suitable clustering algorithm for the given data set. **(Apply - L3)**

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

TEXTBOOKS:
T1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
T2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

REFERENCE BOOKS:
R1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010.
R2. Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
R3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008.
R4. Data Mining Techniques, Arun K Pujari, Universities Press, 2001

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Data Warehouse and OLAP Technology

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.	Discussion of CO'S and CEO'S	1	02-01-24		TLM1	
2.	An Overview: Data Warehouse	1	04-01-24		TLM1	
3.	Characteristics, Components	1	05-01-24		TLM1	
4.	A Multidimensional Data Model	1	08-01-24		TLM1	
5.	Schemas	1	09-01-24		TLM1	
6.	Data Warehouse Architecture	1	11-01-24		TLM1	
7.	Data Models	1	12-01-24		TLM1	
8.	Data Warehouse Implementation	1	18-01-24		TLM1	
9.	From Data Warehousing to Data Mining.	1	19-01-24		TLM1	
10.	Assignment-1	1	22-01-24		TLM1	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: Data Mining and Preprocessing.

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.	Introduction to **Data Mining**	1	23-01-24		TLM1	
12.	Motivating challenges	1	25-01-24		TLM1	
13.	The origins of Data Mining	1	29-01-24		TLM1	
14.	Data Mining Tasks	1	30-01-24			
15.	Types of Data	1	01-02-24		TLM1	
16.	Data Quality	1	02-02-24		TLM1	
17.	**Data Preprocessing:** Aggregation	1	05-02-24		TLM1	
18.	Sampling, Dimensionality Reduction	1	06-02-24		TLM1	
19.	Feature Subset Selection, Feature creation, Discretization and Binarization	1	08-02-24		TLM1	
20.	Variable Transformation, Measures of Similarity and Dissimilarity	1	09-02-24		TLM1	
21.	Assignment-2	1	12-02-24		TLM1	
No. of classes required to complete UNIT-II : 11				**No. of classes taken:**		

UNIT-III: Classification, Model Overfitting

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.	Basic Concepts, General Approach to solving a classification problem	1	13-02-24		TLM1	
23.	Decision Tree Induction: Working of Decision Tree, building a decision tree	1	15-02-24		TLM1	
24.	methods for expressing an attribute test conditions	1	16-02-24		TLM1	
25.	measures for selecting the best split	1	19-02-24		TLM1	
26.	Algorithm for decision tree induction	1	20-02-24		TLM1	
27.	Due to presence of noise, due to lack of representation samples	1	22-02-24		TLM1	

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.	evaluating the performance of classifier: holdout method	1	23-02-24		TLM1	
29.	random sub sampling	1	04-03-24		TLM1	
30.	cross-validation, bootstrap	1	05-03-24		TLM1	
31.	Bayes Theorem, Naïve Bayes Classifier	1	07-03-24		TLM1	
32.	Assignment-3	1	11-03-24		TLM1	
No. of classes required to complete UNIT-III : 10				**No. of classes taken:**		

UNIT-IV: Association 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
33.	Basic Concepts	1	12-03-24		TLM1	
34.	Algorithms: Problem Definition	1	14-03-24		TLM1	
35.	Frequent Item Set Generation	1	15-03-24		TLM1	
36.	Apriori Principle	1	18-03-24		TLM1	
37.	Apriori Algorithm	1	19-03-24		TLM1	
38.	Rule Generation	1	21-03-24		TLM1	
39.	Compact Representation of Frequent Itemsets	1	22-03-24		TLM1	
40.	FP Growth Algorithm	1	26-03-24		TLM1	
41.	Assignment-4	1	28-03-24		TLM1	
No. of classes required to complete UNIT-IV : 09				**No. of classes taken:**		

UNIT-V: Cluster 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
42.	Basic Concepts and Algorithms: Overview	1	01-04-24		TLM1	
43.	What Is Cluster Analysis? Different Types of Clustering	1	02-04-24		TLM1	
44.	Different Types of Clusters; K-means	1	04-04-24		TLM1	
45.	The Basic K-means Algorithm	1	08-04-24		TLM1	
46.	K-means Additional Issues, Bisecting K-means	1	12-04-24		TLM1	
47.	Strengths and Weaknesses	1	15-04-24		TLM1	
48.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	16-04-24		TLM1	
49.	DBSCAN: Traditional Density Center-Based Approach	1	18-04-24		TLM1	
50.	DBSCAN Algorithm	1	19-04-24		TLM1	
51.	Strengths and Weaknesses	1	22-04-24		TLM1	
52.	Assignment-5	1	23-04-24		TLM1	
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
56	Introduction to ML	1	25-04-24		TLM5	
57	Basics of ML	1	26-04-24		TLM5	

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 comprehend and write

| 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. |

(At top of page, continued cell:)

effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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
Ms.G.DIVYA	Mr.M.Kishore Kumar	Dr.V.Surya Narayana	Dr.O.Rama Devi

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC & ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK , Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., AP.-521 230.
http://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 Ch Rajendra Babu
Course Name & Code : Operating Systems -20CS11
L-T-P Structure :3-0-0 **Credits:** 3
Program/Sem/Sec : II B.tech/IV-sem /Sec A **A.Y.:** 2022-23

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 Silberschatz& Galvin, ―Operating System Concepts‖, Wiley, 7th edition, 2007.

REFERENCE BOOKS:
R1 William Stallings, ―Operating Systems‖, PHI, 5th Edition, 2004.
R2 B.A.Forounz & R.F. Giberg,---Unix and shell programming,Thomson,first Edition,New Delhi,2003

R3   http://codex.cs.yale.edu/avi/os-book/os9/slide-dir/index.html

R4   http://swayam.gov.in/ndl_noc19_cs50/preview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Operating 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.	Introduction to Operating systems	1	03-01-2024		TLM2	
2.	Operating-System Services	1	04-01-2024		TLM2	
3.	User Operating-System Interface	1	05-01-2024		TLM2	
4.	System Calls	1	08-01-2024		TLM2	
5.	Types of System Calls,	1	10-01-2024		TLM2	
6.	System Programs	1	11-01-2024		TLM2	
7.	Operating-System Design and Implementation	1	12-01-2024		TLM2	
8.	Operating-System Structure	1	18-01-2024		TLM2	
9.	Virtual Machines	1	19-01-2024		TLM2	
10.	Operating-System Generation, System Boot		22-01-2024		TLM2	
11.	Assignment-Quiz-1	1	24-01-2024		TLM6	
No. of classes required to complete UNIT-I: 11				**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
12.	**Processes:** Process concept, Inter-process Communication	1	25-01-2024		TLM2	
13.	Operations on process	1	29-01-2024		TLM2	
14.	IPC and examples on IPC	1	31-01-2024		TLM2	
15.	Communication in client server systems	1	01-02-2024		TLM2	
16.	Treads overview, Multithreading Models	1	02-02-2024		TLM2	
17.	Thread libraries and Thread issues	1	05-02-2024		TLM2	
18.	Scheduling Criteria	1	07-02-2024		TLM2	
19.	Scheduling algorithms	1	08-02-2024		TLM2	
20.	Scheduling algorithms	1	09-02-2024		TLM2	
21.	Multi-Processor Scheduling	1	12-02-2024		TLM2	
22.	Assignment-Quiz-2	1	14-02-2024		TLM6	
No. of classes required to complete UNIT-II: 11				**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
23.	The Critical section problem, Peterson's solutions	1	15-02-2024		TLM1	
24.	Synchronization hardware	1	16-02-2024		TLM1	
25.	Semaphores, Classic problems of Synchronization	1	19-02-2024		TLM1	
26.	Monitors, Synchronization examples	1	21-02-2024		TLM1	
27.	atomic transactions	1	22-02-2024		TLM1	
28.	System model and deadlock characterization	1	23-02-2024		TLM1	
29.	Methods for Handling deadlocks and deadlock prevention	1	04-03-2024		TLM1	
30.	Deadlock Avoidance	1	06-03-2024		TLM1	
31.	Deadlock detection	1	07-03-2024		TLM1	
32.	Recovery from deadlock	1	11-03-2024		TLM1	
33.	Assignment-Quiz-3	1	13-03-2024		TLM6	
No. of classes required to complete UNIT-III: 11				**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
34.	Swapping	1	14-03-2024		TLM1	
35.	Contiguous Memory Allocation	1	15-03-2024		TLM1	
36.	Paging and structure of a page table	1	18-03-2024		TLM1	
37.	Segmentation	1	20-03-2024		TLM1	
38.	Demand paging	1	21-03-2024		TLM1	
39.	Page replacement	1	22-03-2024		TLM1	
40.	Allocation of frames	1	27-03-2024		TLM1	
41.	Thrashing	1	28-03-2024		TLM1	
42.	Memory mapped files	1	01-04-2024		TLM1	
43.	Allocating kernel memory	1	03-04-2024		TLM1	
44.	Assignment-Quiz-4	1	04-04-2024		TLM6	
No. of classes required to complete UNIT-IV: 11				**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
45.	Overview of Mass storage structure	1	08-04-2024		TLM2	
46.	Disk structure	1	10-04-2024		TLM2	
47.	Disk Attachment	1	12-04-2024		TLM2	
48.	Disk Scheduling	1	15-04-2024		TLM2	
49.	Disk Management	1	18-04-2024		TLM2	
50.	The Concept of a file and access methods	1	19-04-2024		TLM2	
51.	File System structure	1	22-04-2024		TLM2	
52.	File system implementation	1	24-04-2024		TLM2	
53.	Directory implementation	1	25-04-2024		TLM2	
54.	Allocation methods	1	26-04-2024		TLM2	
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

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 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 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 toaddress 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 Ch Rajendra Babu		Dr O Rama Devi	Dr O Rama Devi
Signature				

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.
hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUTPART-A

NameofCourseInstructor: Mr. PGandhi Prakash.
CourseName &Code **:**INTRODUCTIONTO AI&DSLAB –20AD52
L-T-PStructure **:0-0-3** **Credits:**1.5
Program/Sem/Sec :IIB.tech/IV-sem/A **A.Y.:**2023-24

PRE-REQUISITE: KnowledgeofComputerfundamentals&Datastructures&Algorithms

Course Educational Objective: The objective of the course is to provide a strong foundationof fundamental concepts in Artificial Intelligence and a basic exposition to the goals andmethodsof ArtificialIntelligenceand alsoprovidefundamentalsof Data Science.

COURSEOUTCOMES(COs): Attheend ofthecourse, studentsareableto

CO1	Applythebasic principlesofAIinproblemsolvingusingLISP/PROLOG/Python **(Apply–L3)**
CO2	ImplementdifferentalgorithmsusingLISP/PROLOG/Python**(Apply–L3)**
CO3	Performvariousoperationsusingnumpyandpandas**(Understand-L2)**
CO4	Improveindividual/ teamworkskills, communication&reportwritingskillswith ethicalvalues.

COURSEARTICULATIONMATRIX (CorrelationbetweenCOs,POs &PSOs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	1	-		2	3	2	1
CO2	3	3	3	-	-	-	-	-	1	-		2	3	2	1
CO3	3	3	3	-	-	-	-	-	3	3		2	3	1	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).
BOSAPPROVEDWebReferences:
1. https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-science-beginners/
2. https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutes-guide-to-key- concepts/
3. https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formats-python/
4. https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-scikit-learn/
5. https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-data-visualization-explorationpython/

CPLABSCHEDULE(LESSONPLAN):Section-A

Expt. No	COs	Experiments to beconducted	No. ofClasses Required	TentativeDate ofCompletion	ActualDate ofCompletion	Teaching Learning Methods	HOD Sign Weekly
1	--	Introductionto Lab experiments	3	03.01.2024		TLM8	
2	CO1	ImplementationofDFSforwater jug problem usingLISP/PROLOG	3	10.01.2024		TLM8	
3	CO1	Implementation of BFS fortic-tac-toe problem usingLISP/PROLOG/Java	3	24.01.2024		TLM8	
4	CO1	Implementation of TSP usingheuristic approach usingJava/LISP/Prolog	3	31.01.2024		TLM8	
5	CO2	ImplementationofSimulated Annealing Algorithm usingLISP/PROLOG	3	07.02.2024		TLM8	
6	CO2	Implementation of Hill-climbing to solve 8-PuzzleProblem	3	14.02.2024		TLM8	
7	CO2	Implementation of MonkeyBanana Problem usingLISP/PROLOG	3	21.02.2024		TLM8	
8	CO2	CreatingaNumPyArray	3	06.03.2024		TLM8	
9	CO2	TheShapeandReshapingof NumPyArray	3	13.03.2024		TLM8	
10	CO3	Indexingand Slicingof NumPyArray	3	20.03.2024		TLM8	
11	CO3	Indexingand Slicingof NumPyArray	3	27.03.2024		TLM8	
12	CO3	Perform following operations using pandas • Creatingdataframe • concat() • Settingconditions Addinganew column	3	03.04.2024		TLM8	
13	CO3	Readthe followingfile formatsusingpandas	3	10.04.2024		TLM8	
14	CO3	Readthe followingfile formatsusingpandas	3	24.04.2024		TLM8	
15	CO3	InternalLabExamination	3	01.05.2024		TLM8	
No.ofclassesrequiredto complete Lab			42	No.ofclassesconducted:			

TeachingLearningMethods						
TLM1	ChalkandTalk	**TLM4**	ProblemSolving	**TLM7**	Seminarsor GD	
TLM2	PPT	**TLM5**	Programming	**TLM8**	LabDemo	
TLM3	Tutorial	**TLM6**	AssignmentorQuiz	**TLM9**	CaseStudy	

EVALUATIONPROCESS(R20Regulations):

According to Academic Regulations of R20 Distribution and Weightage of Marks ForLaboratoryCoursesis asfollows

(a) Continuous Internal Evaluation (CIE): The Continuous Internal Evaluation (CIE) is basedonthe followingparameters:

Parameter	Marks
DaytoDaywork	05
Record	05
InternalTest	05
Total	15

(b) Semester End Examinations (SEE: The Semester End examinations (SEE) for laboratorycourses shall be jointly conducted by internal and external examiners with 3 hours duration andevaluatedfor35marks.

Theperformanceofthestudentshallbeevaluatedaspertheparametersindicatedbelow:

Parameter	Marks
Procedure/Algorithm	05
Experimentation/Programexecution	10
Observations/Calculations/Validation	10
Result/Inference	05
Vivavoce	05
Total	35

PART-D

PROGRAMMEOUTCOMES(POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentals,andanengineeringspecializationtothesolutionofcomplexengineeringproblems.
PO 2	**Problemanalysis**:Identify,formulate,reviewresearchliterature,andanalyze complex engineeringproblemsreachingsubstantiatedconclusionsusingfirstprinciplesofmathematics, naturalsciences, andengineeringsciences.
PO 3	**Design/developmentofsolutions**:Designsolutionsforcomplexengineeringproblems and design system components or processes that meet the specified needswithappropriateconsiderationforthepublichealthandsafety,andthecultural, societal,andenvironmentalconsiderations.
PO 4	**Conductinvestigationsofcomplexproblems**:Useresearch-basedknowledgeandresearchmethodsincludingdesignofexperiments,analysisandinterpretationofdata, andsynthesisoftheinformation toprovidevalidconclusions.
PO 5	**Moderntoolusage**:Create,select,andapplyappropriatetechniques,resources,andmoderneengineeringandITtoolsincludingpredictionandmodellingtocomplex engineeringactivities withan understandingof thelimitations
PO 6	**Theengineerandsociety**:Applyreasoninginformedbythecontextualknowledgeto assess societal, health, safety, legal and cultural issues and the consequentresponsibilitiesrelevanttotheprofessionalengineeringpractice

PO 7	**Environmentandsustainability**:Understandtheimpactoftheprofessionalengineeringsol utionsinsocietalandenvironmentalcontexts,anddemonstratethe knowledgeof, andneedforsustainabledevelopment.
PO 8	**Ethic**s:Applyethicalprinciplesandcommittoprofessionalethicsandresponsibilities andnormsof theengineeringpractice.
PO 9	**Individualandteamwork**:Functioneffectivelyasanindividual,andasamemberor leaderindiverseteams,and inmultidisciplinarysettings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with theengineering community and with society at large, such as, being able tocomprehendandwriteeffectivereportsanddesigndocumentation,makeeffectivepresenta tions, andgiveand receiveclearinstructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as amemberandleaderinateam,tomanageprojectsandinmultidisciplinary environments.
PO 12	**Life- longlearning**:Recognizetheneedfor,andhavethepreparationandabilitytoengageinindepe ndentandlife-longlearninginthebroadestcontextoftechnological change.

PROGRAMMESPECIFICOUTCOMES(PSOs):

PSO1	Toapplythefundamentalengineeringknowledge,computationalprinciples,and methodsforextractingknowledgefromdatatoidentify,formulateandsolverealtimeproblems.
PSO2	Todevelopmultidisciplinaryprojectswithadvancedtechnologiesandtoolstoaddress socialandenvironmentalissues.
PSO3	Toprovideaconcretefoundationand enrichtheir abilities forEmploymentand HigherstudiesinArtificial Intelligence andDatasciencewithethicalvalues.

CourseInstructor	CourseCoordinator	ModuleCoordinator	HOD
Mr.P.GANDHI PRAKASH	Mr.P.GANDHI PRAKASH	Dr.V.Surya Narayana	Dr.O.RamaDevi

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.
hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PROGRAM	**:** B.Tech. IV-Sem.
ACADEMIC YEAR	**:** 2023-24
COURSE NAME & CODE	**: R Programming Lab– 20IT53**
L-T-P STRUCTURE	**: 0-0-3**
COURSE CREDITS	**: 1.5**
COURSE INSTRUCTOR	**: J. NAGA RAJU**
COURSE COORDINATOR	**: V.CHANDRA KUMAR**

1. Pre-requisite : Nil

2. Course Educational Objective: In this course student will learn about the fundamentals of R programming, standard R libraries, solid understanding of R functions, write programs using the R and gain skills in R Programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R.

3. Course Outcomes: At the end of this course, the student will be able to:

CO 1	Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming. **(Understand - L2)**
CO 2	Implement the concepts of R Script to extract the data from data frames and file operations. **(Apply – L3)**
CO 3	Implement the various statistical techniques with visualization using R add-on packages. **(Apply – L3)**
CO 4	Improve individual / teamwork skills, communication & report writing skills with ethical values

4.Course Articulation Matrix:

		PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
COURSE OUTCOME	CO1	2	1	3	1	3	-	-	-	-	-	-	-	1	-
	CO2	1	2	3	1	3	-	-	-	-	-	-	-	1	-
	CO3	1	2	3	1	3	-	-	-	-	-	-	-	1	-
	CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-

5. List of Experiments

S.No	Program to be executed
1	a) Installing R and RStudio b) Basic functionality of R, variable, data types in R
2	a) Implement R script to show the usage of various operators available in R language. b) Implement R script to read person's age from keyboard and display whether he is eligible for voting or not. c) Implement R script to find biggest number between two numbers. d) Implement R script to check the given year is leap year or not.
3	a) Implement R Script to create a list. b) Implement R Script to access elements in the list. c) Implement R Script to merge two or more lists. d) Implement R Script to perform matrix operation
4	Implement R script to perform following operations: a) various operations on vectors b) Finding the sum and average of given numbers using arrays. c) To display elements of list in reverse order. d) Finding the minimum and maximum elements in the array.
5	a) Implement R Script to perform various operations on matrices b) Implement R Script to extract the data from dataframes. c) Write R script to display file contents. d) Write R script to copy file contents from one file to another
6	a) Write an R script to find basic descriptive statistics using summary(), str(), quartile() function on mtcars datasets. b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset
7	a) Reading different types of data sets (.txt, .csv) from Web or disk and writing in file in specific disk location. b) Reading Excel data sheet in R. c) Reading XML dataset in R
8	a) Implement R Script to create a Pie chart, Bar Chart, Scatter Plot and Histogram (Introduction to ggplot2 graphics) b) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations
9	a) Implement R Script to perform Normal, and Binomial distributions. b) Implement R Script to perform correlation, Linear and multiple regression.

10	a) Introduction to Non-Tabular Data Types: Time series ,spatial data ,Network data. b) Data Transformations: Converting Numeric Variables into Factors, Date Operations, String Parsing, Geocoding
11	Introduction to Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates, outliers, spelling.
12	Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Google Spreadsheets, API and web scraping examples

6.Course Delivery Plan:

S No	Program to be executed	Tentative dates	Actual Dates	DM
1	a) Installing R and RStudio Basic functionality of R, variable, data types in R a) 4-0	4-1-2024		5
2	a) Implement R script to show the usage of various operators available in R language. b) Implement R script to read person's age from keyboard and display whether he is eligible for voting or not. c) Implement R script to find biggest number between two numbers. d) Implement R script to check the given year is leap year or not	11-1-2024		5
3	a) Implement R Script to create a list. b) Implement R Script to access elements in the list. c) Implement R Script to merge two or more lists. d) Implement R Script to perform matrix operation	18-1-2024		5
4	Implement R script to perform following operations: a) various operations on vectors b) Finding the sum and average of given numbers using arrays. c) To display elements of list in reverse order. d) Finding the minimum and maximum elements in the array.	25-1-2024		5
5	a) Implement R Script to perform various operations on matrices b) Implement R Script to extract the data from dataframes. c) Write R script to display file contents. d) Write R script to copy file contents from one file to another	01-2-2024		1,5

6	a) Write an R script to find basic descriptive statistics using summary(), str(), quartile() function on mtcars datasets. b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset	08-2-2024 15-2-2024		1,5
7	a) Reading different types of data sets (.txt, .csv) from Web or disk and writing in file in specific disk location. b) Reading Excel data sheet in R. c) Reading XML dataset in R	22-1-2024		5
8	a) Implement R Script to create a Pie chart, Bar Chart, Scatter Plot and Histogram (Introduction to ggplot2 graphics) b) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations	07-3-2024 14-3-2024		1,5
9	a) Implement R Script to perform Normal, and Binomial distributions. b) Implement R Script to perform correlation, Linear and multiple regression.	21-3-2024		5
10	a) Introduction to Non-Tabular Data Types: Time series ,spatial data ,Network data. b) Data Transformations: Converting Numeric Variables into Factors, Date Operations, String Parsing, Geocoding	28-3-2024		1,5
11	Introduction to Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates, outliers, spelling.	04-4-2024		5
12	Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Google Spreadsheets, API and web scraping examples	18-4-2024		5
13	Internal Lab	25-4-2024		

Delivery Methods (DM):
1. Chalk & Talk   2. ICT Tools 3. Tutorial 4. Assignment/Test/Quiz
5. Laboratory/Field Visit 6. Web based learning.

	Course Instructor	Course Coordinator	Module Coordinator	HOD
Name of the Faculty	**J. NAGA RAJU**	V.CHANDRA KUMAR	Dr. O. Rama Devi	Dr. O. Rama Devi
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

PROGRAM   : B.Tech. IV-Sem.

ACADEMIC YEAR   : 2023-24

COURSE NAME & CODE   : Data Mining Using Python Lab – 20CS58

L-T-P STRUCTURE   : 0-0-3

COURSE CREDITS   : 1.5

COURSE INSTRUCTOR   : Ms. G. DIVYA

COURSE COORDINATOR   : Mr.M.Kishore Kumar

PRE-REQUISITE: Python Programming.

Course Educational Objective:
The objective of this lab is to Practical exposure on implementation of well-known data mining algorithms and Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.

Course Outcomes (CO): At the end of this course, the student will be able to:
CO1: Apply preprocessing techniques on real world datasets.(Apply-L3)
CO2: Apply apriori algorithm to generate frequent itemsets. (Apply L3)
CO3: Apply Classification and clustering algorithms on different datasets. (Apply L3)

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									1	2	2	1
CO2	3	2		2									2	2	
CO3	2	3	2	2								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 TEXT BOOKS:

T1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
T2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

PART-B

DM LAB SCHEDULE (LESSON PLAN): Section-A

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	Introduction to Lab, Discussion of CO'S and CEO'S	1	02-01-24		TLM8	
2	Demonstrate the following data preprocessing tasks using python libraries. a) Loading the dataset b) Identifying the dependent and independent variables. c) Dealing with missing data.	1	09-01-24		TLM8	
3	Demonstrate the following data preprocessing tasks using python libraries. a) Dealing with categorical data. b) Scaling the features. c) Splitting dataset into Training and Testing Sets	1	23-01-24		TLM8	
4	Demonstrate the following Similarity and Dissimilarity Measures using python a) Pearson's Correlation b) Cosine Similarity	1	30-01-24		TLM8	
5	Demonstrate the following Similarity and Dissimilarity Measures using python a) Jaccard Similarity b) Euclidean Distance c) Manhattan Distance	1	06-02-24		TLM8	
6	Build a model using linear regression algorithm on any dataset.	1	13-02-24		TLM8	
7	Build a classification model using Decision Tree algorithm on iris dataset	1	20-02-24		TLM8	
8	Apply Naïve Bayes Classification algorithm on any dataset	1	05-03-24		TLM8	
9	Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	1	12-03-24		TLM8	
10	Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	1	19-03-24		TLM8	
11	Apply K- Means clustering algorithm on any dataset.	1	26-03-24		TLM8	
12	Apply Hierarchical Clustering algorithm on any dataset.	1	02-04-24		TLM8	
13	Apply DBSCAN clustering algorithm on any dataset.	1	16-04-24		TLM8	

14	Internal Lab		23-04-24			

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	05
Record	05
Internal Test	05
Total	15

(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	05
Experimentation/Program execution	10
Observations/Calculations/Validation	10
Result/Inference	05
Viva voce	05
Total	35

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 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
Ms.G.Divya	Mr.M.Kishore Kumar	Dr.V.Surya Narayana	Dr.O.Rama Devi

COURSEHANDOUT
PART-A

Name of Course Instructor: Dr. Ch Rajendra Babu

Course Name & Code : Web Application Development using Fullstack-Module-II

(Backenddevelopment)(20CSS2)

L-T-PStructure : 1-0-2   **Credits:** 2

Program/Sem/Sec : IIB.TechIVSemAI&DS-B   **A.Y.:** 2023-24

PRE-REQUISITE: Programming for Problem Solving using C, JAVA and DBMS Basics

COURSE EDUCATIONAL OBJECTIVES(CEOs): The objective of this course is to learn the importance of client server architecture in the web application development and able to developdynamic data driven web applications by using advanced java technologies (Servlets, JSP, Struts2andHibernateframework).

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

CO 1	Apply JDBC concepts to establish the communication between Java Applications and database. **(Apply–L3)**
CO 2	Develop Static and Dynamic Web Applications by using Servlets and Java Server Pages(JSP). **(ApplyL3)**
CO 3	Develop Dynamic Data Driven Web Applications by using Struts2and Hibernate frameworks. **(ApplyL3)**
CO 4	Improve individual/teamwork skills, communication & report writing skills with ethical values.

COURSEARTICULATIONMATRIX(CorrelationbetweenCOs,POs&PSOs):

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

Note: EnterCorrelationLevels**1**or**2**or **3.**Ifthereisnocorrelation, **put'-'**
1-Slight(Low),**2–**Moderate(Medium),**3-**Substantial (High).

REFERENCEBOOKS:

R1 HerbertSchildt,"Java:Thecompletereference",TMHPublications,7thedition,2006.

R2 Kathy Sierra&BertBates,"HeadfirstServletsandJSP:PassingtheSunCertifiedWebComponentDeveloper Exam",O'ReillyPublicationsSecondEdition.

R3 BudiKurniawan,"Struts2DesignandProgramming:ATutorial",BrainySoftware,2ndEdition,2008.

R4 ChristianBauer,GavinKing,GaryGregory"JavaPersistencewithHibernate:RevisedEditionofHibernatein ActionPaperback",ManningPublication,2ndEdition,2006.

R5 SantoshKumarK,"JDBC4.2,Servlet3.1,andJSP2.3IncludesJSF2.2andDesignPatterns,BlackBook", Dreamtechpublication,2ndEdition.

R6 Mahmud Parsian,"JDBCRecipes:A Problem-Solution Approach",Apresss.

R7 MadhusudhanKonda,"JustHibernate,ALightweightIntroductiontotheHibernateFramework",O'Reilly Media.

R8ChuckCavaness,"ProgrammingJakartaStruts",O'ReillyMedia,2ndEdition.

PART-B

COURSEDELIVERYPLAN(LESSONPLAN):Section-A

S.No.	Topicstobecovered	No.of Classes Required	Tentative Date ofCompletion	Actual Date ofCompletion	Teaching Learning Methods	HOD Sign Weekly
1	LabCycle -1	4	06-01-2024		DM4	
2	LabCycle – 1	4	20-01-2024		DM4	
3	LabCycle – 2	4	27-01-2024		DM4	
4	Lab Cycle – 2	4	03-02-2024		DM4	
5	LabCycle – 3	4	17-02-2024		DM4	
6	LabCycle – 3	4	24-02-2024		DM4	
7	LabCycle – 4	4	02-03-2024		DM4	
8	LabCycle – 4	4	16-03-2024		DM4	
9	LabCycle – 5	4	23-03-2024		DM4	
10	LabCycle – 5	4	30-03-2024		DM4	
11	LabCycle – 6	4	06-04-2024		DM4	
12	LabCycle – 7	4	20-04-2024		DM4	
13	LabCycle – 8	4	27-04-2024		DM4	

TeachingLearningMethods			
DM1	ChalkandTalk	DM4	Demonstration(Lab/FieldVisit)
DM2	PPT	DM5	ICT(NPTEL/Swayam Prabha/MOOCS)
DM3	Tutorial	DM6	GroupDiscussion/Project

PART-C

EVALUATION PROCESS (R20Regulations): According to Academic Regulations of R20
Distribution and Weight age of Marks for Laboratory Courses is as follows

EvaluationTask	Marks
Report	10
QualityofWork	10
Presentation	20
Interaction/Queries	10
Total	**50**

PART-D

PROGRAMMEOUTCOMES(POs):

PO1	**Engineeringknowledge**:Applytheknowledgeofmathematics,science,engineering fundamentals,andanengineeringspecializationtothesolutionofcomplexengineeringproblems.
PO2	**Problemanalysis**:Identify,formulate,reviewresearchliterature,andanalyzecomplexengineering problems reaching substantiated conclusions using first principles of mathematics,naturalsciences,andengineeringsciences.
PO3	**Design/ developmentofsolutions**:Designsolutionsforcomplexengineeringproblemsanddesignsystemcomponentsorprocessesthatmeetthespecifiedneedswithappropriate considerationforthepublichealthandsafety,andthecultural,societal,andenvironmentalconsiderations.
PO4	**Conductinvestigations ofcomplexproblems**: Useresearch-based knowledgeand researchmethodsincludingdesignofexperiments,analysisandinterpretationofdata,andsynthesis oftheinformationto providevalid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modernengineeringandITtoolsincludingpredictionandmodellingtocomplexengineering activitieswithanunderstandingof thelimitations
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevanttotheprofessional engineeringpractice
PO7	**Environmentandsustainability**:Understandtheimpactoftheprofessionalengineering solutionsinsocietalandenvironmentalcontexts,anddemonstratetheknowledgeof,andneedforsustainable development.
PO8	**Ethics**:Applyethicalprinciplesandcommittoprofessionalethicsandresponsibilitiesand normsoftheengineeringpractice.
PO9	**Individual andteamwork**:Function effectivelyas anindividual, andas a memberorleader indiverseteams, and inmultidisciplinarysettings.
PO10	**Communication**:Communicateeffectivelyoncomplexengineeringactivitieswiththeengineering community and with society at large, such as, being able to comprehend andwriteeffectivereports and design documentation,makeeffectivepresentations, and giveand receiveclearinstructions.
PO11	**Projectmanagementandfinance**:Demonstrateknowledgeandunderstandingoftheengineering andmanagementprinciplesandapplythesetoone'sownwork,asamember andleaderin ateam, tomanageprojectsandinmultidisciplinaryenvironments.
PO12	**Life-longlearning**:Recognizetheneedforandhavethepreparationandabilitytoengage inindependentand life-longlearningin thebroadestcontext oftechnologicalchange.

PROGRAMMESPECIFICOUTCOMES(PSOs):

PSO1	Toapplythe fundamentalengineeringknowledge,computationalprinciples,andmethodsforextractingknowledge fromdatatoidentify,formulateandsolverealtimeproblems.
PSO2	Todevelopmultidisciplinaryprojectswithadvancedtechnologies andtoolstoaddresssocialand environmental issues.
PSO3	Toprovideaconcretefoundationand enrichtheir abilitiesforEmployment andHigherstudiesinArtificialIntelligenceandDatasciencewithethicalvalues.

Title	CourseInstructor	CourseCoordinator	ModuleCoordinator	Head oftheDepartment
Name of theFaculty	Dr. Ch Rajendra Babu	Mr. S. Siva Ramakrishna	Mr. S. Siva Ramakrishna	Dr.O.RamaDevi
Signature				