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: Mrs. T.S.RAJARAJESWARI
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.:** 2022-23

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, SartajSahni, ―Fundamentals of Computer Algorithms, Galgotia Publications [**units – 1,2,3,4,5**]

REFERENCE BOOKS:

R1 MarkAllenWeiss, ―DataStructuresandAlgorithmAnalysisinC++‖, Pearson,3/e,2007

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	31-01-23		1 & 2	
2.	Algorithm definition	1	01-02-23		1 & 2	
3.	Specifications	1	02-02-23		1 & 2	
4.	Performance Analysis- Time Complexity	1	04-02-23		1 & 2	
5.	Space Complexity.	1	07-02-23		1 & 2	
6.	Asymptotic Notations-Big-Oh	1	08-02-23		1 & 2	
7.	Omega, Theta.	1	09-02-23		1 & 2	
8.	**Divide and Conquer**: General Method	1	11-02-23		1 & 2	
9.	Binary Search	1	14-02-23		1 & 2	
10.	Finding Maximum and Minimum	1	15-02-23		1 & 2	
11.	Merge Sort	1	16-02-23			
12.	Quick sort	1	21-02-23			
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	22-02-23		1 & 2	
14.	Knapsack Problem	1	23-02-23		1 & 2	
15.	Job sequencing with deadlines,	1	25-02-23		1 & 2	
16.	Minimum-cost spanning trees	2	28-02-23 01-03-23		1 & 2	
17.	Optimal storage on tapes	2	02-03-23 04-03-23		1 & 2	
18.	Single source shortest paths	1	06-03-23		1 & 2	
19.	Huffman coding	1	07-03-23		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	09-03-23		1 & 2	
21.	Multistage graph,	2	11-03-23 14-03-23		1 & 2	
22.	All pairs shortest path	1	15-03-23		1 & 2	
23.	Single Source Shortest path	1	16-03-23		1 & 2	

24.	Optimal Binary search trees	1	18-03-23		1 & 2	
25.	0/1 Knapsack method	1	21-03-23		1 & 2	
26.	Reliability design,	1	23-03-23		1 & 2	
27.	The travelling salesman problem.	2	25-03-23 05-04-23		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	06-04-23		1 & 2	
29.	The 8-Queens Problem	2	08-04-23 11-04-23		1 & 2	
30.	Sum of subsets	2	12-04-23 13-04-23		1 & 2	
31.	Graph Coloring	1	15-04-23		1 & 2	
32.	Hamiltonian cycles	2	18-04-23 19-04-23		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	20-04-23 25-04-23		1 & 2	
34.	Job sequencing with deadlines – LC Branch and Bound,	2	26-04-23 27-04-23		1 & 2	
35.	FIFO Branch and Bound	1	29-04-23		1 & 2	
36.	LIFO Branch and Bound	1	02-05-23		1 & 2	
37.	0/1 Knapsack problem - LC Branch and Bound solution	2	03-05-23 04-05-23		1 & 2	
38.	FIFO Branch and Bound solution	2	06-05-23 09-05-23		1 & 2	
39.	travelling salesperson Problem – LC Branch and Bound solution	2	10-05-23 11-05-23		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				
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. V Sowjanya
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 B-SEC **A.Y.:** 2022-23

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, SartajSahni, ―Fundamentals of Computer Algorithms, Galgotia Publications [**units – 1,2,3,4,5**]

REFERENCE BOOKS:

R1 MarkAllenWeiss, ―DataStructuresandAlgorithmAnalysisinC++‖, Pearson,3/e,2007

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	01.02.23		1 & 2	
2.	Algorithm definition	1	02.02.23		1 & 2	
3.	Specifications	1	03.02.23		1 & 2	
4.	Performance Analysis- Time Complexity	1	04.02.23		1 & 2	
5.	Space Complexity.	1	08.02.23		1 & 2	
6.	Asymptotic Notations-Big-Oh	1	09.02.23		1 & 2	
7.	Omega, Theta.	1	10.02.23		1 & 2	
8.	**Divide and Conquer**: General Method	1	15.02.23		1 & 2	
9.	Binary Search	1	16.02.23		1 & 2	
10.	Finding Maximum and Minimum	1	17.02.23		1 & 2	
11.	Merge Sort	1	22.02.23		1 & 2	
12.	Quick sort	1	23.02.23		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	24.02.23		1 & 2	
14.	Knapsack Problem	1	25.02.23		1 & 2	
15.	Job sequencing with deadlines,	1	01.03.23		1 & 2	
16.	Minimum-cost spanning trees	2	02.03.23 03.03.23		1 & 2	
17.	Optimal storage on tapes	2	04.03.23 09.3.23		1 & 2	
18.	Single source shortest paths	1	10.03.23		1 & 2	
19.	Huffman coding	1	11.03.23		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	15.03.23		1 & 2	
21.	Multistage graph,	2	16.03.23 17.03.23		1 & 2	

22.	All pairs shortest path	1	18.03.23		1 & 2	
23.	Single Source Shortest path	1	23.03.23		1 & 2	
24.	Optimal Binary search trees	1	24.03.23		1 & 2	
25.	0/1 Knapsack method	1	25.03.23		1 & 2	
26.	Reliability design,	1	06.04.23		1 & 2	
27.	The travelling salesman problem.	2	08.04.23 12.04.23		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	13.04.23		1 & 2	
29.	The 8-Queens Problem	2	15.04.23 19.14.23		1 & 2	
30.	Sum of subsets	2	20.04.23 21.04.23		1 & 2	
31.	Graph Coloring	1	26.04.23		1 & 2	
32.	Hamiltonian cycles	2	27.04.23 28.04.23		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	03.05.23 04.05.23		1 & 2	
34.	Job sequencing with deadlines – LC Branch and Bound,	2	05.05.23 06.05.23		1 & 2	
35.	FIFO Branch and Bound	1	10.05.23		1 & 2	
36.	LIFO Branch and Bound	1	11.05.23		1 & 2	
37.	0/1 Knapsack problem - LC Branch and Bound solution	2	12.05.23 13.05.23		1 & 2	
38.	FIFO Branch and Bound solution	2	17.05.23 18.05.23		1 & 2	
39.	travelling salesperson Problem – LC Branch and Bound solution	2	19.05.23 20.05.23		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	**V. Sowjanya**	**Dr. M. Sitha Ram**	**Dr.K.Naga Prasanthi**	**Dr.O.Rama Devi**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

Part-A

Name of Course Instructor: Mr. K. VENKATESH.
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 also 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	31-01-2023		TLM1	
2.	Introduction: What Is AI?, The Foundations of Artificial Intelligence.	1	01-02-2023		TLM2	
3.	The History of Artificial Intelligence, The State of the Art,	1	02-02-2023		TLM2	
4.	Agents and Environments	1	03-02-2023		TLM2	
5.	Agents and Environments	1	07-02-2023		TLM2	
6.	Good Behavior: The Concept of Rationality	1	08-02-2023		TLM2	
7.	The Nature of Environments	1	09-02-2023		TLM2	
8.	Types of agents	1	10-02-2023		TLM1	
9.	Types of agents	1	14-02-2023		TLM1	
10.	The Structure of Agents.	1	15-02-2023		TLM2	
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	16-02-2023		TLM2	
2.	Uninformed Search Strategies	1	17-02-2023		TLM2	
3.	Uninformed Search Strategies	1	21-02-2023		TLM2	
4.	Informed (Heuristic) Search Strategies	1	22-02-2023		TLM2	
5.	Informed (Heuristic) Search Strategies	1	23-02-2023		TLM2	
6.	Local Search Algorithms and Optimization Problems	1	24-02-2023		TLM2	
7.	Local Search Algorithms and Optimization Problems	1	28-02-2023		TLM2	
8.	Searching with Nondeterministic Actions	1	01-03-2023		TLM2	
	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	02-03-2023		TLM1	
10.	Knowledge-Based Agents	2	03-03-2023 & 07-03-2023		TLM1	
11.	Propositional Logic, A Very Simple Logic	2	08-03-2023 & 09-03-2023		TLM1	
12.	Ontological Engineering	2	14-03-2023 & 15-03-2023		TLM1	
13.	Categories and Objects, Events, Mental Events	3	16-03-2023 & 17-03-2023 & 21-03-2023		TLM1	
14.	Mental Objects	2	23-03-2023 & 24-03-2023		TLM1	

15.	Reasoning Systems for Categories	1	04-04-2023		TLM1	
16.	Reasoning Systems for Categories	1	05-04-2023		TLM1	
17.	The Internet Shopping World.	1	06-04-2023		TLM1	
No. of classes required to complete UNIT-III			15			

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	11-04-2023		TLM1	
19.	Exploratory Data Analysis,	1	12-04-2023		TLM1	
20.	The Data science process,	1	13-04-2023		TLM1	
21.	A data scientist role in this process.	1	18-04-2023		TLM1	
22.	The NumPyndarray: A Multidimensional Array Object	1	19-04-2023		TLM1	
23.	Creating ndarrays ,Data Types for ndarrays	1	20-04-2023		TLM1	
24.	Operations between Arrays and Scalars	1	21-04-2023		TLM1	
25.	Basic Indexing and Slicing,	1	25-04-2023		TLM1	
26.	Boolean Indexing, Fancy Indexing,	1	26-04-2023		TLM1	
27.	Data Processing Using Arrays	1	27-04-2023		TLM1	
28.	Expressing Conditional Logic as Array Operations,	1	28-04-2023		TLM1	
29.	Methods for Boolean Arrays ,	1	02-05-2023		TLM1	
30.	Sorting , Unique	1	03-05-2023		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	04-05-2023 & 05-05-2023		TLM1	
32.	Features, Applications,	1	09-05-2023		TLM1	
33.	Data Structures, Series, DataFrame	2	10-05-2023 & 11-05-2023		TLM1	
34.	Index Objects, Essential Functionality Reindexing	2	12-05-2023 & 16-05-2023		TLM1	
35.	Dropping entries from an axis	1	17-05-2023		TLM1	
36.	Sorting and ranking,	2	18-05-2023 & 19-05-2023		TLM1	
37.	Summarizing and Computing Descriptive Statistics,	2	23-05-2023 & 24-05-2023		TLM1	
38.	Unique Values, Value Counts,	2	25-05-2023 & 26-05-2023		TLM1	
39.	Handling Missing Data, filtering out missing data.	2	30-05-2023 & 31-05-2023		TLM1	
No. of classes required to complete UNIT-V			16			

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	01-06-2023		**TLM1**	
41.	Interview Questions	1	02-06-2023		**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 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	Mr. K.VENKATESH	Mr. K.VENKATESH	Dr. O. RAMA DEVI	Dr. O. RAMA DEVI
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

Part-A

Name of Course Instructor: Mr. K. VENKATESH.
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/B **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 also 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	02-02-2023		TLM1	
2.	Introduction: What Is AI?, The Foundations of Artificial Intelligence.	1	03-02-2023		TLM2	
3.	The History of Artificial Intelligence, The State of the Art,	1	04-02-2023		TLM2	
4.	Agents and Environments	1	06-02-2023		TLM2	
5.	Agents and Environments	1	09-02-2023		TLM2	
6.	Good Behavior: The Concept of Rationality	1	10-02-2023		TLM2	
7.	The Nature of Environments	1	11-02-2023		TLM2	
8.	Types of agents	1	13-02-2023		TLM1	
9.	Types of agents	1	16-02-2023		TLM1	
10.	The Structure of Agents.	1	17-02-2023		TLM2	
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	20-02-2023		TLM2	
2.	Uninformed Search Strategies	1	23-02-2023		TLM2	
3.	Uninformed Search Strategies	1	24-02-2023		TLM2	
4.	Informed (Heuristic) Search Strategies	1	25-02-2023		TLM2	
5.	Informed (Heuristic) Search Strategies	1	27-02-2023		TLM2	
6.	Local Search Algorithms and Optimization Problems	1	02-03-2023		TLM2	
7.	Local Search Algorithms and Optimization Problems	1	03-03-2023		TLM2	
8.	Searching with Nondeterministic Actions	1	04-03-2023		TLM2	
	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	06-03-2023		TLM1	
10.	Knowledge-Based Agents	2	09-03-2023 & 10-03-2023		TLM1	
11.	Propositional Logic, A Very Simple Logic	2	11-03-2023 & 13-03-2023		TLM1	
12.	Ontological Engineering	2	16-03-2023 & 17-03-2023		TLM1	
13.	Categories and Objects, Events, Mental Events	3	16-03-2023 & 18-03-2023 & 20-03-2023		TLM1	
14.	Mental Objects	2	23-03-2023 & 24-03-2023		TLM1	

15.	Reasoning Systems for Categories	1	25-04-2023		TLM1	
16.	Reasoning Systems for Categories	1	03-04-2023		TLM1	
17.	The Internet Shopping World.	1	06-04-2023		TLM1	
No. of classes required to complete UNIT-III			15			

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	08-04-2023		TLM1	
19.	Exploratory Data Analysis,	1	10-04-2023		TLM1	
20.	The Data science process,	1	13-04-2023		TLM1	
21.	A data scientist role in this process.	1	15-04-2023		TLM1	
22.	The NumPyndarray: A Multidimensional Array Object	1	17-04-2023		TLM1	
23.	Creating ndarrays ,Data Types for ndarrays	1	20-04-2023		TLM1	
24.	Operations between Arrays and Scalars	1	21-04-2023		TLM1	
25.	Basic Indexing and Slicing,	1	24-04-2023		TLM1	
26.	Boolean Indexing, Fancy Indexing,	1	27-04-2023		TLM1	
27.	Data Processing Using Arrays	1	28-04-2023		TLM1	
28.	Expressing Conditional Logic as Array Operations,	1	29-04-2023		TLM1	
29.	Methods for Boolean Arrays ,	1	01-05-2023		TLM1	
30.	Sorting , Unique	1	04-05-2023		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	05-05-2023 & 06-05-2023		TLM1	
32.	Features, Applications,	1	08-05-2023		TLM1	
33.	Data Structures, Series, Data Frame	2	11-05-2023 & 12-05-2023		TLM1	
34.	Index Objects, Essential Functionality Reindexing	2	13-05-2023 & 15-05-2023		TLM1	
35.	Dropping entries from an axis	1	18-05-2023		TLM1	
36.	Sorting and ranking,	2	19-05-2023 & 20-05-2023		TLM1	
37.	Summarizing and Computing Descriptive Statistics,	2	22-05-2023 & 25-05-2023		TLM1	
38.	Unique Values, Value Counts,	2	26-05-2023 & 27-05-2023		TLM1	
39.	Handling Missing Data, filtering out missing data.	2	29-05-2023 & 01-06-2023		TLM1	
No. of classes required to complete UNIT-V			16			

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	02-06-2023		**TLM1**	
41.	Interview Questions	1	03-06-2023		**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 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	Mr. K.VENKATESH	Mr. K.VENKATESH	Dr. O. RAMA DEVI	Dr. O. RAMA DEVI
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : **Mr. S. Siva Rama Krishna**

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.: 2021-22**

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): Python Programming (20CS10)

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	08-03-22		TLM1	
2.	An Overview: Data Warehouse	1	10-03-22		TLM1	
3.	Characteristics	1	12-03-22		TLM1	
4.	Components	1	15-03-22		TLM1	
5.	A Multidimensional Data Model	1	17-03-22		TLM1	
6.	Schemas	1	19-03-22		TLM1	
7.	Data Warehouse Architecture	1	22-03-22		TLM1	
8.	Data Models	1	24-03-22		TLM1	
9.	Data Warehouse Implementation	1	25-03-22		TLM1	
10.	From Data Warehousing to Data Mining.	1	26-03-22		TLM1	
11.	Assignment-1	1	26-03-22		TLM1	
No. of classes required to complete UNIT-I: 11				**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
12.	Introduction to **Data Mining**	1	29-03-22		TLM1	
13.	Motivating challenges	1	29-03-22		TLM1	
14.	The origins of Data Mining	1	31-03-22		TLM1	
15.	Data Mining Tasks	1	01-04-22		TLM1	
16.	Types of Data	1	05-04-22		TLM1	
17.	Data Quality	1	07-04-22		TLM1	
18.	**Data Preprocessing:** Aggregation	1	08-04-22		TLM1	
19.	Sampling, Dimensionality Reduction	1	09-04-22		TLM1	
20.	Feature Subset Selection, Feature creation, Discretization and Binarization	1	12-04-22		TLM1	
21.	Variable Transformation, Measures of Similarity and Dissimilarity	1	16-04-22		TLM1	
22.	Assignment-2	1	16-04-22		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
23.	Basic Concepts, General Approach to solving a classification problem	1	19-04-22		TLM1	
24.	Decision Tree Induction: Working of Decision Tree	1	21-04-22		TLM1	
25.	building a decision tree	1	22-04-22		TLM1	
26.	methods for expressing an attribute test conditions	1	23-04-22		TLM1	
27.	measures for selecting the best split	1	23-04-22		TLM1	

28.	Algorithm for decision tree induction	1	30-04-22		TLM1	
29.	Due to presence of noise, due to lack of representation samples	1	05-05-22		TLM1	
30.	evaluating the performance of classifier: holdout method	1	06-05-22		TLM1	
31.	random sub sampling	1	07-05-22		TLM1	
32.	cross-validation, bootstrap	1	10-05-22		TLM1	
33.	Bayes Theorem, Naïve Bayes Classifier	1	12-05-22		TLM1	
34.	Assignment-3	1	13-05-22		TLM1	
No. of classes required to complete UNIT-III : 12				**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
35.	Basic Concepts	1	14-05-22		TLM1	
36.	Algorithms: Problem Definition	1	17-05-22		TLM1	
37.	Frequent Item Set Generation	1	19-05-22		TLM1	
38.	Apriori Principle	1	20-05-22		TLM1	
39.	Apriori Algorithm	1	21-05-22		TLM1	
40.	Rule Generation	1	24-05-22		TLM1	
41.	Compact Representation of Frequent Itemsets	1	26-05-22		TLM1	
42.	FP Growth Algorithm	1	27-05-22		TLM1	
43.	FP Growth Algorithm	1	28-05-22		TLM1	
44.	Assignment-4	1	31-05-22		TLM1	
No. of classes required to complete UNIT-IV : 10				**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
45.	Basic Concepts and Algorithms: Overview	1	02-06-22		TLM1	
46.	What Is Cluster Analysis? Different Types of Clustering	1	02-06-22		TLM1	
47.	Different Types of Clusters; K-means	1	03-06-22		TLM1	
48.	The Basic K-means Algorithm	1	04-06-22		TLM1	
49.	K-means Additional Issues, Bisecting K-means	1	07-06-22		TLM1	
50.	Strengths and Weaknesses	1	09-06-22		TLM1	
51.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	10-06-22		TLM1	
52.	DBSCAN: Traditional Density Center-Based Approach	1	11-06-22		TLM1	
53.	DBSCAN Algorithm	1	14-06-22		TLM1	
54.	Strengths and Weaknesses	1	16-06-22		TLM1	
55.	Assignment-5	1	17-06-22		TLM1	
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	HOD Sign Weekly
50		1	18-06-22		TLM5	

51		1	18-06-22		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 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. S. Siva Ramakrishna	Mr. S. Siva Ramakrishna	Dr O. Rama Devi	Dr O. Rama Devi

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : **Mr. P. Sunil Kumar**

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.: 2022-23**

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): Python Programming (20CS10)

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	30-01-23		TLM1	
2.	An Overview: Data Warehouse	1	01-02-23		TLM1	
3.	Characteristics	1	03-02-23		TLM1	
4.	Components	1	04-02-23		TLM1	
5.	A Multidimensional Data Model	1	06-02-23		TLM1	
6.	Schemas	1	08-02-23		TLM1	
7.	Data Warehouse Architecture	1	10-02-23		TLM1	
8.	Data Models	1	11-02-23		TLM1	
9.	Data Warehouse Implementation	1	13-02-23		TLM1	
10.	From Data Warehousing to Data Mining.	1	15-02-23		TLM1	
11.	Assignment-1	1	17-02-23		TLM1	
No. of classes required to complete UNIT-I: 11				**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
12.	Introduction to **Data Mining**	1	20-02-23		TLM1	
13.	Motivating challenges	1	22-02-23		TLM1	
14.	The origins of Data Mining	1	24-02-23		TLM1	
15.	Data Mining Tasks	1	25-02-23		TLM1	
16.	Types of Data	1	27-02-23		TLM1	
17.	Data Quality	1	01-03-23		TLM1	
18.	**Data Preprocessing:** Aggregation	1	03-03-23		TLM1	
19.	Sampling, Dimensionality Reduction	1	04-03-23		TLM1	
20.	Feature Subset Selection, Feature creation, Discretization and Binarization	1	06-03-23		TLM1	
21.	Variable Transformation, Measures of Similarity and Dissimilarity	1	10-03-23		TLM1	
22.	Assignment-2	1	11-03-23		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
23.	Basic Concepts, General Approach to solving a classification problem	1	13-03-23		TLM1	
24.	Decision Tree Induction: Working of Decision Tree	1	15-03-23		TLM1	
25.	building a decision tree	1	17-03-23		TLM1	
26.	methods for expressing an attribute test conditions	1	18-03-23		TLM1	
27.	measures for selecting the best split	1	20-03-23		TLM1	

28.	Algorithm for decision tree induction	1	24-03-23		TLM1	
29.	Due to presence of noise, due to lack of representation samples	1	25-03-23		TLM1	
30.	evaluating the performance of classifier: holdout method	1	03-04-23		TLM1	
31.	random sub sampling	1	08-04-23		TLM1	
32.	cross-validation, bootstrap	1	10-04-23		TLM1	
33.	Bayes Theorem, Naïve Bayes Classifier	1	12-04-23		TLM1	
34.	Assignment-3	1	15-04-23		TLM1	
No. of classes required to complete UNIT-III : 12				**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
35.	Basic Concepts	1	17-04-23		TLM1	
36.	Algorithms: Problem Definition	1	19-04-23		TLM1	
37.	Frequent Item Set Generation	1	21-04-23		TLM1	
38.	Apriori Principle	1	24-04-23		TLM1	
39.	Apriori Algorithm	1	26-04-23		TLM1	
40.	Rule Generation	1	28-04-23		TLM1	
41.	Compact Representation of Frequent Itemsets	1	29-04-23		TLM1	
42.	FP Growth Algorithm	1	01-05-23		TLM1	
43.	FP Growth Algorithm	1	03-05-23		TLM1	
44.	Assignment-4	1	05-05-23		TLM1	
No. of classes required to complete UNIT-IV : 10				**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
45.	Basic Concepts and Algorithms: Overview	1	06-05-23		TLM1	
46.	What Is Cluster Analysis? Different Types of Clustering	1	08-05-23		TLM1	
47.	Different Types of Clusters; K-means	1	10-05-23		TLM1	
48.	The Basic K-means Algorithm	1	12-05-23		TLM1	
49.	K-means Additional Issues, Bisecting K-means	1	13-05-23		TLM1	
50.	Strengths and Weaknesses	1	15-05-23		TLM1	
51.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	17-05-23		TLM1	
52.	DBSCAN: Traditional Density Center-Based Approach	1	19-05-23		TLM1	
53.	DBSCAN Algorithm	1	20-05-23		TLM1	
54.	Strengths and Weaknesses	1	22-05-23		TLM1	
55.	Assignment-5	1	24-05-23		TLM1	
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	HOD Sign Weekly
50		1	26-05-23		TLM5	

51		1	27-05-23		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 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. P. Sunil Kumar	Mr. S. Siva Ramakrishna	Dr O. Rama Devi	Dr O. Rama Devi

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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.O.Rama Devi
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	31-01-2023		TLM2	
2.	Introduction to Operating systems	1	01-02-2023		TLM2	
3.	Introduction to Operating systems	1	04-02-2023		TLM2	
4.	Introduction to Operating systems	1	06-02-2023		TLM2	
5.	Operating system services and user operating system interfaces	1	07-02-2023		TLM2	
6.	System calls and types of system calls	1	08-02-2023		TLM2	
7.	System programs, OS design and implementation	1	11-02-2023		TLM2	
8.	OS structure and Virtual Machine	1	13-02-2023		TLM2	
9.	OS generation and System Boot	1	14-02-2023		TLM2	
10.	Assignment/Quiz-1	1	15-02-2023		TLM6	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: Process Management

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Concepts and process scheduling	1	20-02-2023		TLM2	
12.	Operations on process	1	21-02-2023		TLM2	
13.	IPC and examples on IPC	1	22-02-2023		TLM2	
14.	Communication in client server systems	1	25-02-2023		TLM2	
15.	Treads overview, Multithreading Models	1	27-02-2023		TLM2	
16.	Thread libraries and Thread issues	1	28-02-2023		TLM2	
17.	Scheduling Criteria	1	01-03-2023		TLM2	
18.	Scheduling algorithms	1	04-03-2023		TLM2	
19.	Scheduling algorithms	1	06-03-2023		TLM2	
20.	Multi-Processor Scheduling	1	07-03-2023		TLM2	
21.	Assignment/Quiz-2	1	11-03-2023		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	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign

		Required	Completion	Completion	Methods	Weekly
22.	The Critical section problem, Peterson's solutions	1	13-03-2023		TLM1	
23.	Synchronization hardware	1	14-03-2023		TLM1	
24.	Semaphores, Classic problems of Synchronization	1	15-03-2023		TLM1	
25.	Monitors, Synchronization examples	1	18-03-2023		TLM1	
26.	atomic transactions	2	20-03-2023 21-03-2023		TLM1	
27.	System model and deadlock characterization	1	25-03-2023		TLM1	
28.	Methods for Handling deadlocks and deadlock prevention	1	03-04-2023		TLM1	
29.	Deadlock Avoidance	1	04-04-2023		TLM1	
30.	Deadlock detection	1	08-04-2023		TLM1	
31.	Recovery from deadlock	1	10-04-2023		TLM1	
32.	Assignment/Quiz-3	1	11-04-2023		TLM6	
No. of classes required to complete UNIT-III: 11						

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
33.	Swapping	1	12-04-2023		TLM1	
34.	Contiguous Memory Allocation	1	15-04-2023		TLM1	
35.	Paging and structure of a page table	1	17-04-2023		TLM1	
36.	Segmentation	1	18-04-2023		TLM1	
37.	Demand paging	1	19-04-2023		TLM1	
38.	Page replacement	1	24-04-2023		TLM1	
39.	Allocation of frames	1	25-04-2023		TLM1	
40.	Thrashing	1	26-04-2023		TLM1	
41.	Memory mapped files	1	29-04-2023		TLM1	
42.	Allocating kernel memory	1	01-05-2023		TLM1	
43.	Assignment/Quiz-4	1	02-05-2023		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
44.	Overview of Mass storage structure	1	03-05-2023		TLM2	
45.	Disk structure	1	06-05-2023		TLM2	
46.	Disk Attachment	1	08-05-2023		TLM2	
47.	Disk Scheduling	1	09-05-2023		TLM2	
48.	Disk Management	1	10-05-2023		TLM2	

49.	The Concept of a file and access methods	1	13-05-2023		TLM2	
50.	File System structure	1	15-05-2023		TLM2	
51.	File system implementation	1	16-05-2023		TLM2	
52.	Directory implementation	1	17-05-2023		TLM2	
53.	Allocation methods	1	20-05-2023		TLM2	
54.	Free space management	1	22-05-2023		TLM2	
55.	Efficiency and performance, recovery	1	23-05-2023		TLM2	
56.	Assignment/Quiz-5	1	24-05-2023		TLM6	
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 (R19 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	**P Gandhi Prakash**	**P Gandhi Prakash**	**Dr O Rama Devi**	**Dr O Rama Devi**
Signature				

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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. M.Srinivasa Rao
Course Name & Code **:** Operating Systems -20CS11
L-T-P Structure **:3-0-0** **Credits:** 3
Program/Sem/Sec : II B.tech/IV-sem /Sec B **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	31-01-2023		TLM2	
2.	Introduction to Operating systems	1	01-02-2023		TLM2	
3.	Introduction to Operating systems	1	04-02-2023		TLM2	
4.	Introduction to Operating systems	1	06-02-2023		TLM2	
5.	Operating system services and user operating system interfaces	1	07-02-2023		TLM2	
6.	System calls and types of system calls	1	08-02-2023		TLM2	
7.	System programs, OS design and implementation	1	11-02-2023		TLM2	
8.	OS structure and Virtual Machine	1	13-02-2023		TLM2	
9.	OS generation and System Boot	1	14-02-2023		TLM2	
10.	Assignment/Quiz-1	1	15-02-2023		TLM6	
No. of classes required to complete UNIT-I: 10				**No. of classes taken:**		

UNIT-II: Process Management

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Concepts and process scheduling	1	20-02-2023		TLM2	
12.	Operations on process	1	21-02-2023		TLM2	
13.	IPC and examples on IPC	1	22-02-2023		TLM2	
14.	Communication in client server systems	1	25-02-2023		TLM2	
15.	Treads overview, Multithreading Models	1	27-02-2023		TLM2	
16.	Thread libraries and Thread issues	1	28-02-2023		TLM2	
17.	Scheduling Criteria	1	01-03-2023		TLM2	
18.	Scheduling algorithms	1	04-03-2023		TLM2	
19.	Scheduling algorithms	1	06-03-2023		TLM2	
20.	Multi-Processor Scheduling	1	07-03-2023		TLM2	
21.	Assignment/Quiz-2	1	11-03-2023		TLM6	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III: Synchronization and Deadlocks

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.	The Critical section problem, Peterson's solutions	1	13-03-2023		TLM1	
23.	Synchronization hardware	1	14-03-2023		TLM1	
24.	Semaphores, Classic problems of Synchronization	1	15-03-2023		TLM1	
25.	Monitors, Synchronization examples	1	18-03-2023		TLM1	
26.	atomic transactions	2	20-03-2023 21-03-2023		TLM1	
27.	System model and deadlock characterization	1	25-03-2023		TLM1	
28.	Methods for Handling deadlocks and deadlock prevention	1	03-04-2023		TLM1	
29.	Deadlock Avoidance	1	04-04-2023		TLM1	
30.	Deadlock detection	1	08-04-2023		TLM1	
31.	Recovery from deadlock	1	10-04-2023		TLM1	
32.	Assignment/Quiz-3	1	11-04-2023		TLM6	
No. of classes required to complete UNIT-III: 11						

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
33.	Swapping	1	12-04-2023		TLM1	
34.	Contiguous Memory Allocation	1	15-04-2023		TLM1	
35.	Paging and structure of a page table	1	17-04-2023		TLM1	
36.	Segmentation	1	18-04-2023		TLM1	
37.	Demand paging	1	19-04-2023		TLM1	
38.	Page replacement	1	24-04-2023		TLM1	
39.	Allocation of frames	1	25-04-2023		TLM1	
40.	Thrashing	1	26-04-2023		TLM1	
41.	Memory mapped files	1	29-04-2023		TLM1	
42.	Allocating kernel memory	1	01-05-2023		TLM1	
43.	Assignment/Quiz-4	1	02-05-2023		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
44.	Overview of Mass storage structure	1	03-05-2023		TLM2	
45.	Disk structure	1	06-05-2023		TLM2	
46.	Disk Attachment	1	08-05-2023		TLM2	
47.	Disk Scheduling	1	09-05-2023		TLM2	
48.	Disk Management	1	10-05-2023		TLM2	
49.	The Concept of a file and access methods	1	13-05-2023		TLM2	
50.	File System structure	1	15-05-2023		TLM2	
51.	File system implementation	1	16-05-2023		TLM2	
52.	Directory implementation	1	17-05-2023		TLM2	
53.	Allocation methods	1	20-05-2023		TLM2	
54.	Free space management	1	22-05-2023		TLM2	
55.	Efficiency and performance, recovery	1	23-05-2023		TLM2	
56.	Assignment/Quiz-5	1	24-05-2023		TLM6	
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 (R19 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.
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PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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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	**P Gandhi Prakash**	**P Gandhi Prakash**	**Dr O Rama Devi**	**Dr O Rama Devi**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT
PART-A

Name of Course Instructor : Mr. K Venkatesh, P Gandhi Prakash
Course Name & Code : INTRODUCTION TO AI & DS LAB – 20AD52
L-T-P Structure : **0-0-3** **Credits:** 1.5
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 also provide fundamentals of Data Science.

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

CO 1	Apply the basic principles of AI in problem solving using LISP/PROLOG/Python **(Apply – L3)**
CO 2	Implement different algorithms using LISP/PROLOG/ Python**(Apply – L3)**
CO 3	Perform various operations using numpy and pandas **(Understand - L2)**
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	-	-	-	-	-	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).

BOS APPROVED Web References:

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/

CP LAB SCHEDULE (LESSON PLAN): Section-A

Expt. No	COs	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 experiments	3	01.02.2023		TLM8	
2	CO1	Implementation of DFS for water jug problem using LISP/PROLOG	3	08.02.2023		TLM8	
3	CO1	Implementation of BFS for tic-tac-toe problem using LISP/PROLOG/Java	3	15.02.2023		TLM8	
4	CO1	Implementation of TSP using heuristic approach using Java/LISP/Prolog	3	22.02.2023		TLM8	
5	CO2	Implementation of Simulated Annealing Algorithm using LISP/PROLOG	3	01.03.2023		TLM8	
6	CO2	Implementation of Hill-climbing to solve 8- Puzzle Problem	3	15.03.2023		TLM8	
7	CO2	Implementation of Monkey Banana Problem using LISP/PROLOG	3	05.04.2023		TLM8	
8	CO2	Creating a NumPy Array	3	12.04.2023		TLM8	
9	CO2	The Shape and Reshaping of NumPy Array	3	19.04.2023		TLM8	
10	CO3	Indexing and Slicing of NumPy Array	3	26.04.2023		TLM8	
11	CO3	Indexing and Slicing of NumPy Array	3	03.05.2023		TLM8	
12	CO3	Perform following operationsusing pandas • Creating dataframe • concat() • Setting conditions Adding a new column	3	10.05.2023		TLM8	
13	CO3	Read the following file formats using pandas	3	17.05.2023		TLM8	
14	CO3	Read the following file formats using pandas	3	24.05.2023		TLM8	
15	CO3	Internal Lab Examination	3	31.05.2023		TLM8	
No. of classes required to complete Lab			42	No. of classes conducted:			

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.
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	responsibilities relevant to the professional engineering practice
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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. K. Venkatesh	**Mr. K. Venkatesh**	**Dr. O. Rama Devi**	**Dr. O. Rama Devi**

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT
PART-A

Name of Course Instructor : Mr. K Venkatesh, P Gandhi Prakash
Course Name & Code : INTRODUCTION TO AI & DS LAB – 20AD52
L-T-P Structure : **0-0-3** **Credits:** 1.5
Program/Sem/Sec : II B.tech/IV-sem/B **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 also provide fundamentals of Data Science.

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

CO 1	Apply the basic principles of AI in problem solving using LISP/PROLOG/Python **(Apply – L3)**
CO 2	Implement different algorithms using LISP/PROLOG/ Python**(Apply – L3)**
CO 3	Perform various operations using numpy and pandas **(Understand - L2)**
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	-	-	-	-	-	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).

BOS APPROVED Web References:

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/

CP LAB SCHEDULE (LESSON PLAN): Section-A

Expt. No	COs	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 experiments	3	06.02.2023		TLM8	
2	CO1	Implementation of DFS for water jug problem using LISP/PROLOG	3	13.02.2023		TLM8	
3	CO1	Implementation of BFS for tic-tac-toe problem using LISP/PROLOG/Java	3	20.02.2023		TLM8	
4	CO1	Implementation of TSP using heuristic approach using Java/LISP/Prolog	3	27.02.2023		TLM8	
5	CO2	Implementation of Simulated Annealing Algorithm using LISP/PROLOG	3	06.03.2023		TLM8	
6	CO2	Implementation of Hill-climbing to solve 8- Puzzle Problem	3	13.03.2023		TLM8	
7	CO2	Implementation of Monkey Banana Problem using LISP/PROLOG	3	20.03.2023		TLM8	
8	CO2	Creating a NumPy Array	3	03.04.2023		TLM8	
9	CO2	The Shape and Reshaping of NumPy Array	3	10.04.2023		TLM8	
10	CO3	Indexing and Slicing of NumPy Array	3	17.04.2023		TLM8	
11	CO3	Indexing and Slicing of NumPy Array	3	24.04.2023		TLM8	
12	CO3	Perform following operationsusing pandas • Creating dataframe • concat() • Setting conditions Adding a new column	3	01.05.2023		TLM8	
13	CO3	Read the following file formats using pandas	3	08.05.2023		TLM8	
14	CO3	Read the following file formats using pandas	3	15.05.2023		TLM8	
15	CO3	Revision	3	22.05.2023		TLM8	
16	CO3	Internal Lab Examination	3	29.05.2023		TLM8	
No. of classes required to complete Lab			42	No. of classes conducted:			

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	**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. K. Venkatesh	**Mr. K. Venkatesh**	**Dr. O. Rama Devi**	**Dr. O. Rama Devi**

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PROGRAM : B.Tech. IV-Sem.

ACADEMIC YEAR : 2022-23
COURSE NAME & CODE : **R Programming Lab– 20IT53**
L-T-P STRUCTURE : **0-0-3**
COURSE CREDITS : **1.5**

COURSE INSTRUCTOR : **B. Rajendra Prasad**

COURSE COORDINATOR : **B. Rajendra Prasad**

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 OUTCOMES	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 b) Basic functionality of R, variable, data types in R	02-02-23		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	09-02-23		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	16-02-23		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.	23-02-23		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	02-03-23		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	09-03-23 16-03-23		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	23-03-23		1,5
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	06-04-23 13-04-23		1,5
9	a) Implement R Script to perform Normal, and Binomial distributions. b) Implement R Script to perform correlation, Linear and multiple regression.	20-04-23		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	27-04-23		1,5
11	Introduction to Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates, outliers, spelling.	04-05-23		5
12	Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Google Spreadsheets, API and web scraping examples	11-05-23		5
13	Internal Lab	18-05-23		

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	B.Rajendra Prasad	B.Rajendra Prasad	Dr.O.Rama Devi	Dr.O.RamaDevi
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

PROGRAM : B.Tech. IV-Sem.

ACADEMIC YEAR : 2021-22

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

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

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Mr. S. Siva Rama Krishna

COURSE COORDINATOR : Mr. S. Siva Rama Krishna

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	11-03-22		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	25-03-22		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	01-04-22		TLM8	
4	Demonstrate the following Similarity and Dissimilarity Measures using python a) Pearson's Correlation b) Cosine Similarity c) Jaccard Similarity d) Euclidean Distance e) Manhattan Distance	1	08-04-22		TLM8	
5	Build a model using linear regression algorithm on any dataset.	1	22-04-22		TLM8	
6	Build a classification model using Decision Tree algorithm on iris dataset	1	06-05-22		TLM8	
7	Apply Naïve Bayes Classification algorithm on any dataset	1	13-05-22		TLM8	
8	Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	1	20-05-22		TLM8	
9	Apply K- Means clustering algorithm on any dataset.	1	27-05-22		TLM8	
10	Apply Hierarchical Clustering algorithm on any dataset.	1	03-06-22		TLM8	
11	Apply DBSCAN clustering algorithm on any dataset.	1	10-06-22		TLM8	
12	Internal Lab	1	17-06-22		TLM8	

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
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	clear instructions.
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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. S. Siva Ramakrishna	Mr. S. Siva Ramakrishna	Dr. O. Rama Devi	Dr. O. Rama Devi

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

PROGRAM : B.Tech. IV-Sem.

ACADEMIC YEAR : 2022-23

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

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

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Mr. P.Sunil Kumar

COURSE COORDINATOR : Mr. S. Siva Rama Krishna

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

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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 '-'**
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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	01-02-2023		TLM8	
2	Demonstrate the various data preprocessing tasks using python libraries.	1	08-02-2023		TLM8	
3	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	15-02-2023		TLM8	
4	Demonstrate the following data preprocessing tasks using python libraries. a) Dealing with categorical data. b) Scaling the features.	1	22-02-2023		TLM8	
5	Demonstrate the following data preprocessing tasks using python libraries. a) Splitting dataset into Training and Testing Sets	1	01-03-2023		TLM8	
6	Demonstrate the following Similarity and Dissimilarity Measures using python a) Pearson's Correlation b) Cosine Similarity	1	15-03-2023		TLM8	
7	Demonstrate the following Similarity and Dissimilarity Measures using python a) Jaccard Similarity b) Euclidean Distance c) Manhattan Distance	1	29-03-2023		TLM8	
8	Build a model using linear regression algorithm on any dataset.	1	05-04-2023		TLM8	
9	Build a classification model using Decision Tree algorithm on iris dataset	1	12-04-2023		TLM8	
10	Apply Naïve Bayes Classification algorithm on any dataset	1	19-04-2023		TLM8	
11	Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	1	26-04-2023		TLM8	
12	Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	1	03-05-2023		TLM8	
13	Apply K- Means clustering algorithm on any dataset.		10-05-2023			

14	Apply Hierarchical Clustering algorithm on any dataset.		17-05-2023			
15	Apply DBSCAN clustering algorithm on any dataset.		17-05-2023			
16	Internal Lab		24-05-2023			

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

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Parameter	**Marks**
Procedure/Algorithm	05
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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.
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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. P. Sunil Kumar	Mr. S. Siva Ramakrishna	Dr. O. Rama Devi	Dr. O. Rama Devi

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: Ms. K. VINAYA SREE BAI
Course Name & Code : WEB APPLICATION DEVELOPMENT USING FULL STACK - MODULE - II (BACKEND DEVELOPMENT) (20CSS2)
L-T-P Structure : 1-0-2 **Credits: 2**
Program/Sem/Sec : II B.Tech IV Sem AI & DS - A **A.Y.: 2022-23**

PRE-REQUISITE: Programming for Problem Solving using C and Data structures

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 develop dynamic data driven web applications by using advanced java technologies (Servlets, JSP, Struts2 and Hibernate framework).

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). **(Apply L3)**
CO 3	Develop Dynamic Data Driven Web Applications by using Struts2 and Hibernate frameworks. **(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	-	-	2	-	2	-	-	-	-	-	-	-	-	1	3
CO2	-	-	2	-	2	-	-	-	-	-	-	-	-	3	-
CO3	-	-	2	-	2	-	-	-	-	-	-	-	-	3	-
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).

REFERENCE BOOKS:

R1 Herbert Schildt, "Java: The complete reference", TMH Publications, 7th edition, 2006.

R2 Kathy Sierra & Bert Bates, "Headfirst Servlets and JSP: Passing the Sun Certified Web Component Developer Exam", O'Reilly Publications Second Edition.

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

R7 Madhusudhan Konda, "Just Hibernate, A Lightweight Introduction to the Hibernate Framework", O'Reilly Media.

R8 Chuck Cavaness, "Programming Jakarta Struts", O'Reilly Media, 2nd Edition.

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	Lab Cycle - 1	4	6-2-2023 & 13-2-2023		**DM4**	
2	Lab Cycle – 1	4	20-2-2023		**DM4**	
3	Lab Cycle – 2	4	27-2-2023		**DM4**	
4	Lab Cycle – 2	4	27-2-2023 & 6-3-2023		**DM4**	
5	Lab Cycle – 3	4	13-3-2023		**DM4**	
6	Lab Cycle – 3	4	20-3-2023		**DM4**	
7	Lab Cycle – 4	4	3-4-2023		**DM4**	
8	Lab Cycle – 4	4	10-4-2023		**DM4**	
9	Lab Cycle – 5	4	17-4-2023		**DM4**	
10	Lab Cycle – 5	4	24-4-2023		**DM4**	
11	Lab Cycle – 6	4	1-5-2023		**DM4**	
12	Lab Cycle – 7	4	8-5-2023		**DM4**	
13	Lab Cycle – 8	4	15-5-2023		**DM4**	
14	Revision	4	22-5-2023		**DM4**	

Teaching Learning Methods			
DM1	Chalk and Talk	**DM4**	Demonstration (Lab/Field Visit)
DM2	PPT	**DM5**	ICT (NPTEL/Swayam Prabha/MOOCS)
DM3	Tutorial	**DM6**	Group Discussion/Project

PART-C

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

Evaluation Task	Marks
Report	10
Quality of Work	10
Presentation	20
Interaction / Queries	10
Total	**50**

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.
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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms. K. Vinaya Sree Bai**	**Dr. K. Devi Priya**	**Dr. O. Rama Devi**	**Dr. O. Rama Devi**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT
PART-A

Name of Course Instructor: Mr. K VENKATESH, Mrs. V SOWJANYA
Course Name & Code :WEB APPLICATION DEVELOPMENT USING FULL STACK - MODULE - II (BACKEND DEVELOPMENT) (20CSS2)
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CO3	-	-	2	-	2	-	-	-	-	-	-	-	-	3	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

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4	Lab Cycle – 2	4	02-3-2023 & 09-3-2023		**DM4**	
5	Lab Cycle – 3	4	16-3-2023		**DM4**	
6	Lab Cycle – 3	4	23-3-2023		**DM4**	
7	Lab Cycle – 4	4	06-4-2023		**DM4**	
8	Lab Cycle – 4	4	13-4-2023		**DM4**	
9	Lab Cycle – 5	4	20-4-2023		**DM4**	
10	Lab Cycle – 5	4	27-4-2023		**DM4**	
11	Lab Cycle – 6	4	04-5-2023		**DM4**	
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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. K Venkatesh**	**Dr. K Devi Priya**	**Dr. K Naga Prasanthi**	**Dr. O. Rama Devi**
Signature				