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: Mr. J Naga Raju
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.:** 2023-24
PREREQUISITE: Discrete Mathematics and Data structures

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

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

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

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

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

TEXTBOOKS:

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

REFERENCE BOOKS:

R1 Mark Allen Weiss - Data Structures and Algorithm Analysis in C++‖, Pearson,3/e, 2007
R2 Aho, Hopcroft Ullman – The design and Analysis of Computer Algorithms, Addison Wesley Publications.
R3 Thomas H. Cormanetai – Introduction to Algorithms, PHI
R4 Anany Levitin – Introduction to the Design and Analysis of Algorithms, PEA
R5

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction & Divide and Conquer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and COs and DAA syllabus discussion	1	02.01.24		1 & 2	
2.	Algorithm definition	1	04.01.24		1 & 2	
3.	Specifications	1	05.01.24		1 & 2	
4.	Performance Analysis- Time Complexity	1	06.01.24		1 & 2	
5.	Space Complexity.	1	09.01.24		1 & 2	
6.	Asymptotic Notations-Big-Oh	1	11.01.24		1 & 2	
7.	Omega, Theta.	1	12.01.24		1 & 2	
8.	**Divide and Conquer**: General Method	1	18.01.24		1 & 2	
9.	Binary Search	1	19.01.24		1 & 2	
10.	Finding Maximum and Minimum	1	20.01.24		1 & 2	
11.	Merge Sort	1	23.01.24		1 & 2	
12.	Quick sort	1	25.01.24		1 & 2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: The Greedy Method

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	**The Greedy Method**– General Method,	1	27.01.24		1 & 2	
14.	Knapsack Problem	1	30.01.24		1 & 2	
15.	Job sequencing with deadlines,	1	01.02.24		1 & 2	
16.	Minimum-cost spanning trees	2	02.02.24 03.02.24		1 & 2	
17.	Optimal storage on tapes	2	06.02.24 08.02.24		1 & 2	
18.	Single source shortest paths	1	09.02.24		1 & 2	
19.	Huffman coding	1	13.02.24		1 & 2	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	**Dynamic Programming**-General method	1	15.02.24		1 & 2	
21.	Multistage graph,	2	16.02.24 17.02.24		1 & 2	
22.	All pairs shortest path	1	20.02.24		1 & 2	
23.	Single Source Shortest path	1	22.02.24		1 & 2	
24.	Optimal Binary search trees	1	23.02.24		1 & 2	
25.	0/1 Knapsack method	1	24.02.24		1 & 2	
26.	Reliability design,	1	05.03.24		1 & 2	
27.	The travelling salesman problem.	2	07.03.24 09.03.24		1 & 2	

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

UNIT-IV: Back tracking

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	**Back tracking-** The General Method	1	12.03.24		1 & 2	
29.	The 8-Queens Problem	2	14.03.24 15.03.24		1 & 2	
30.	Sum of subsets	2	16.03.24 19.03.24		1 & 2	
31.	Graph Coloring	1	21.03.24		1 & 2	
32.	Hamiltonian cycles	2	22.03.24 23.03.24		1 & 2	
No. of classes required to complete UNIT-IV: 8				**No. of classes taken:**		

UNIT-V: Branch and Bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	**Branch and Bound–** General method	2	26.03.24 28.03.24		1 & 2	
34.	Job sequencing with deadlines – LC Branch and Bound,	2	30.03.24 02.04.24		1 & 2	
35.	FIFO Branch and Bound	1	04.04.24		1 & 2	
36.	LIFO Branch and Bound	1	06.04.24		1 & 2	
37.	0/1 Knapsack problem - LC Branch and Bound solution	2	12.04.24 16.04.24		1 & 2	
38.	FIFO Branch and Bound solution	2	16.04.24 18.04.24		1 & 2	
39.	travelling salesperson Problem – LC Branch and Bound solution	2	19.04.24 20.04.24		1 & 2	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. J Naga Raju**	**Dr. V Suryanarayana**	**Mr. S. Siva Rama Krishna**	**Dr.O.Rama Devi**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLEGENCE & DATA SCIENCE

COURSE HANDOUT

PART-A

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

PREREQUISITE: Nil

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

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

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

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

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

TEXTBOOKS:

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

REFERENCE BOOKS:

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

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

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, COs	1	2-1-2024		TLM1	
2.	Process for self exploration: Natural Acceptance	1	3-1-2024		TLM1	
3.	Experiential validation	1	4-1-2024		TLM1	
4.	Continuous Happiness and prosperity	1	5-1-2024		TLM1	
5.	A look at basic human aspirations: Right understanding	1	6-1-2024		TLM1	
6.	Relationship	1	8-1-2024		TLM1	
7.	Physical facility	1	9-1-2022		TLM2	
8.	Understanding Happiness and prosperity	1	10-1-2024		TLM2	
9.	Understanding Happiness and prosperity	1	11-1-2024		TLM2	
No. of classes required to complete UNIT-I:				**No. of classes taken:**		

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

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Understanding Human being as a co-existence of sentient 'I' and the material 'Body'	1	18-1-2024		TLM2	
11.	Understanding the needs of self ('I') and 'Body'- Happiness and Physical facility	1	19-1-2024		TLM2	
12.	Understanding the Body as an instrument of 'I'	1	20-1-2024		TLM2	
13.	Understanding the characteristics and activities of 'I' and harmony in 'I'	1	22-1-2024		TLM2	
14.	Understanding the harmony of I with the Body	1	23-1-2024		TLM2	
15.	Sanyam and Health	1	24-1-2024		TLM2	
16.	Correct appraisal of Physical needs	1	25-1-2024		TLM2	
17.	Meaning of prosperity in detail	1	31-1-2024		TLM1	
No. of classes required to complete UNIT-II:				**No. of classes taken:**		

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

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Understanding values in human-human relationship: meaning of justice	1	2-2-2024		TLM2	
19.	Program for fulfillment to ensure mutual happiness, Trust and Respect as	1	5-2-2024		TLM2	

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

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

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

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

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

Teaching Learning Methods

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**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.

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution

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

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

hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSEHANDOUT

Part-A

NameofCourseInstructor: Mr.P. GANDHI PRAKASH.
CourseName&Code :INTRODUCTIONTOAI&DS-20AD03
L-T-PStructure **:3-0-0** **Credits:**3
Program/Sem/Sec :IIB.Tech/IV-Sem/B **A.Y.:**2023-24

PRE-REQUISITE: KnowledgeofComputerfundamentals &Datastructures&Algorithms

CourseEducationalObjective:

The objective of the course is to provide a strong foundation of fundamental concepts in ArtificialIntelligence and a basic exposition to the goals and methods of Artificial Intelligence andprovidefundamentals ofDataScience.

CourseOutcomes: Atthe end ofthis course, thestudent willbeable to

CO1: Enumeratethehistoryandfoundationsof ArtificialIntelligence.**(Understand-L2)**

CO2: Applythebasicprinciples ofAIin problemsolving.**(Apply-L3)**.

CO3: Choosetheappropriaterepresentationof Knowledge.**(Understand-L2)**.

CO4: Enumeratethefundamentals ofdatascienceandNumPy.**(Understand-L2)**.

CO5: Summarizeandcomputedescriptivestatisticsusingpandas.**(Understand-L2)**.

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

BOSAPPROVEDTEXTBOOKS:

T1StuartRussellandPeterNorvig,"Artificial Intelligence:AModern

Approach" ,3rdEdition, PrenticeHall

T2Wes McKinney, "Python for Data Analysis",O'REILLY, ISBN:978-1-449-31979-3,1st edition, October 2012.

T3RachelSchutt&O'neil,"DoingDataScience",O'REILLY, ISBN:978-1-449-35865-5, 1st edition,October2013

BOSAPPROVEDREFERENCEBOOKS:

R1 SarojKaushik,"Artificial Intelligence",CengageLearningIndia,2011

R2 ElaineRichandKevinKnight,"Artificial Intelligence",TataMcGrawHill

R3DavidPooleandAlanMackworth,"Artificial Intelligence:FoundationsforComputationalAgents", Cambridge UniversityPress2010.

R4Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna PublishingHouse,Delhi.

R5 JoelGrus,"DataSciencefromScratch:FirstPrinciples with Python", O'ReillyMedia, 2015

R6Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging,Analysis,andVisualization , O'Reilly, 2016.

Part-B

COURSEDELIVERYPLAN(LESSONPLAN):Section-A

UNIT-I:

S.No.	Topicstobecovered	No. ofClasses Required	TentativeDate ofCompletion	ActualDate ofCompletion	Teaching Learning Methods	HOD Sign Weekly
1.	Discussion of CEO's andCO's,Introductionto programming.	1	02-01-2024		TLM1	
2.	Introduction:What Is AI?, The Foundations ofArtificialIntelligence.	1	04-01-2024		TLM1	
3.	The History of ArtificialIntelligence, The State oftheArt,	1	05-01-2024		TLM1	
4.	Agentsand Environments	1	06-01-2024		TLM1	
5.	Agentsand Environments	1	09-01-2024		TLM1	
6.	GoodBehavior:The ConceptofRationality	1	11-01-2024		TLM1	
7.	TheNature of Environments	1	12-01-2024		TLM1	
8.	Typesofagents	1	18-01-2024		TLM1	
9.	Typesofagents	1	19-01-2024		TLM1	
10.	TheStructureof Agents.	1	20-01-2024		TLM1	
No.of classesrequiredtocomplete UNIT-I			10			

UNIT-II:

S.No.	Topicstobecovered	No. ofClasses Required	TentativeDate ofCompletion	ActualDate ofCompletion	Teaching Learning Methods	HOD Sign Weekly
1.	Problem-Solving Agents,	1	23-01-2024		TLM1	
2.	UninformedSearch Strategies	1	25-01-2024		TLM1	
3.	Uninformed SearchStrategies	1	27-01-2024		TLM1	
4.	Informed(Heuristic) SearchStrategies	1	30-01-2024		TLM1	
5.	Informed(Heuristic) SearchStrategies	1	01-02-2024		TLM1	
6.	Local SearchAlgorithms andOptimizationProblems	1	02-02-2024		TLM1	
7.	Local SearchAlgorithmsand OptimizationProblems	1	03-02-2024		TLM1	
8.	Searchingwith Nondeterministic Actions	1	06-02-2024		TLM1	
	No.ofclassesrequiredtocompleteUNIT-II			08		

UNIT-III:

S.No.	Topicsto becovered	No. ofClasses Required	Tentative Dateof Completion	Actual Dateof Completion	Teaching Learning Methods	HOD Sign Weekly
9.	KnowledgeRepresentation	1	08-02-2024		TLM1	
10.	Knowledge-BasedAgents	2	09-02-2024 & 10-02-2024		TLM1	
11.	Propositional Logic,AVerySimple Logic	2	13-02-2024 & 15-02-2024		TLM1	
12.	OntologicalEngineering	1	16-02-2024		TLM1	
13.	Categories and Objects,Events,Mental Events	2	17-02-2024 & 20-02-2024		TLM1	
14.	MentalObjects	1	22-02-2024		TLM1	

15.	ReasoningSystems for Categories	1	23-02-2024		TLM1	
16.	ReasoningSystems for Categories	1	24-02-2024		TLM1	
17.	The Internet ShoppingWorld.	1	05-03-2024		TLM1	
No.ofclassesrequiredtocompleteUNIT-III			12			

UNIT-IV:

S.No.	Topicstobecovered	No.of Classes Required	Tentative Date ofCompletion	Actual Date ofCompletion	Teaching Learning Methods	HOD Sign Weekly
18.	What is Data science? Datafication	1	07-03-2024		TLM1	
19.	Exploratory DataAnalysis,	1	09-03-2024		TLM1	
20.	TheDatascience process,	1	12-03-2024		TLM1	
21.	Adatascientistrolein thisprocess.	1	14-03-2024		TLM1	
22.	The NumPyndarray: AMultidimensional ArrayObject	1	15-03-2024		TLM1	
23.	Creating ndarrays ,DataTypesfor ndarrays	1	16-03-2024		TLM1	
24.	Operations betweenArraysandScalars	1	19-03-2024		TLM1	
25.	Basic Indexing andSlicing,	1	21-03-2024		TLM1	
26.	Boolean Indexing,FancyIndexing,	1	22-03-2024		TLM1	
27.	Data Processing UsingArrays	1	23-03-2024		TLM1	
28.	Expressing ConditionalLogic as ArrayOperations,	1	26-03-2024		TLM1	
29.	Methods for BooleanArrays,	1	28-03-2024		TLM1	
30.	Sorting,Unique	1	30-03-2024		TLM1	
No.ofclassesrequiredtocompleteUNIT-IV				13		

UNIT-V:

S.No.	Topicstobecovered	No.of Classes Required	Tentative Date ofCompletion	Actual Date ofCompletion	Teaching Learning Methods	HOD Sign Weekly
31.	Introductionto pandas,Library Architecture,	2	02-04-2024 & 04-04-2024		TLM1	
32.	Features, Applications,	1	06-04-2024		TLM1	
33.	Data Structures,Series, DataFrame	1	12-04-2024		TLM1	
34.	Index Objects,Essential Functionality Reindexing	1	13-04-2024		TLM1	
35.	Droppingentriesfromaxis	1	16-04-2024		TLM1	
36.	Sortingandranking,	1	18-04-2024		TLM1	
37.	Summarizing andComputingDescriptive Statistics,	1	19-04-2024		TLM1	
38.	Unique Values,Value Counts,	1	20-04-2024		TLM1	
39.	HandlingMissing Data,filteringout missingdata.	2	23-04-2024 & 25-04-2024		TLM1	
No.ofclassesrequiredtocompleteUNIT-V			10			

ContentsbeyondtheSyllabus

S.No.	Topicstobecovered	No. ofClasses Required	Tentative Dateof Completion	Actual Dateof Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Turingtest	1	26-04-2024		**TLM1**	
41.	InterviewQuestions	1	27-04-2024		**TLM1**	

TeachingLearningMethods			
TLM1	ChalkandTalk	**TLM4**	Demonstration(Lab/FieldVisit)
TLM2	PPT	**TLM5**	ICT(NPTEL/Swayam Prabha/MOOCS)
TLM3	Tutorial	**TLM6**	GroupDiscussion/Project

PART-C

EVALUATIONPROCESS(R20Regulation):

EvaluationTask	**Marks**
Assignment-I(Units-I,II&UNIT-III(Halfofthe Syllabus))	A1=5
I-DescriptiveExamination(Units-I,II&UNIT-III(HalfoftheSyllabus))	M1=15
I-QuizExamination(Units-I,II&UNIT-III(HalfoftheSyllabus))	Q1=10
Assignment-II(Unit-III(RemainingHalfoftheSyllabus),IV &V)	A2=5
II- DescriptiveExamination (UNIT-III(RemainingHalfofthe Syllabus), IV&V)	M2=15
II-QuizExamination(UNIT-III(RemainingHalf oftheSyllabus),IV&V)	Q2=10
MidMarks=80%ofMax((M1+Q1+A1),(M2+Q2+A2)) +20%ofMin((M1+Q1+A1), (M2+Q2+A2))	M=30
CumulativeInternalExamination(CIE):M	30
SemesterEndExamination(SEE)	70
TotalMarks =CIE +SEE	100

PART-D

PROGRAMMEOUTCOMES(POs):

PO1	**Engineeringknowledge**:Applytheknowledgeofmathematics,science,engineeringfundamentals,andanengineeringspecializationtothesolutionofcomplexengineering. problems.
PO2	**Problemanalysis**:Identify,formulate,reviewresearchliterature,andanalyzecomplexengineeringproblems reachingsubstantiated conclusionsusingfirstprinciplesofmathematics, naturalsciences,and engineeringsciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems anddesignsystemcomponentsorprocessesthatmeetthespecifiedneedswithappropriateconsiderationforthepublichealthandsafety,andthecultural,societal,andenvironmental. considerations.
PO4	**Conductinvestigationsofcomplexproblems**:Useresearch-basedknowledgeandresearch methodsincludingdesignofexperiments,analysisandinterpretationofdata,andsynthesisoftheinformationto providevalid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modeling to complex engineering activitieswithan understandingofthe limitations.
PO6	**Theengineerandsociety**:Applyreasoninginformedbythecontextualknowledgetoassesssocietal,health,safety,legalandculturalissuesandtheconsequentresponsibilitiesrelevantto theprofessionalengineeringpractice
PO7	**Environmentandsustainability**: Understandtheimpactoftheprofessional engineering solutionsinsocietalandenvironmentalcontexts,anddemonstratetheknowledgeof,andneedforsustainable development.
PO8	**Ethics**:Applyethicalprinciplesandcommittoprofessionalethicsandresponsibilitiesand normsof theengineeringpractice.
PO9	**Individualandteamwork**:Functioneffectivelyasanindividual,andasamemberorleader indiverseteams,andinmultidisciplinarysettings.
PO10	**Communication**:Communicateeffectivelyoncomplexengineeringactivitieswiththeengineering community and with society at large, such as, being able to comprehend and writeeffective reportsanddesigndocumentation, make effective presentations,andgive andreceive clearinstructions.
PO11	**Projectmanagementandfinance**:Demonstrateknowledgeandunderstandingoftheengineering and management principles and apply these to one's own work, as a member andleaderin ateam, tomanage projectsand inmultidisciplinaryenvironments.
PO12	**Life-longlearning**:Recognizetheneedfor,andhavethepreparationandabilitytoengagein independentandlife-longlearninginthebroadestcontextoftechnologicalchange.

PROGRAMMESPECIFICOUTCOMES(PSOs):

PSO1	Toapplyfundamentalengineeringknowledge,computationalprinciples,andmethodsforextractingknowledgefromdatatoidentify,formulateandsolverealtime. problems.
PSO2	Todevelopmultidisciplinaryprojects withadvancedtechnologies andtoolstoaddresssocialand environmentalissues.
PSO3	ToprovideaconcretefoundationandenrichtheirabilitiesforEmploymentandHigher studiesinArtificialIntelligenceandDatasciencewithethicalvalues.

Title	CourseInstructor	CourseCoordinator	ModuleCoordinator	Head of theDepartment
Nameofthe Faculty	Mr.P.GANDHI PRAKASH	Mr.P.GANDHI PRAKASH	Dr.V.Surya Narayana	Dr.O.RAMADEVI
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution

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

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

hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : **Mr. M. Kishore 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.: 2023-24**

PREREQUISITE: DBMS, 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	03-01-2024		TLM1	
2.	An Overview: Data Warehouse	1	04-01-2024		TLM1	
3.	Characteristics	1	05-01-2024		TLM1	
4.	Components	1	08-01-2024		TLM1	
5.	A Multidimensional Data Model	2	10-01-2024		TLM1	
6.	Schemas	1	11-01-2024		TLM1	
7.	Data Warehouse Architecture	1	12-01-2024		TLM1	
8.	Data Models	1	18-01-2024		TLM1	
9.	Data Warehouse Implementation	1	19-01-2024		TLM1	
10.	From Data Warehousing to Data Mining.	1	22-01-2024		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
11.	Introduction to **Data Mining**	1	24-01-2024		TLM1	
12.	Motivating challenges	1	25-01-2024		TLM1	
13.	The origins of Data Mining	1	29-01-2024		TLM1	
14.	Data Mining Tasks	1	31-01-2024		TLM1	
15.	Types of Data	1	01-02-2024		TLM1	
16.	Data Quality	1	02-02-2024		TLM1	
17.	**Data Preprocessing:** Aggregation	1	05-02-2024		TLM1	
18.	Sampling, Dimensionality Reduction	1	07-02-2024		TLM1	
19.	Feature Subset Selection, Feature creation, Discretization and Binarization	2	08-02-2024 09-02-2024		TLM1	
20.	Variable Transformation, Measures of Similarity and Dissimilarity	2	12-02-2024 14-02-2024		TLM1	
No. of classes required to complete UNIT-II : 12				**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
21.	Basic Concepts, General Approach to solving a classification problem	1	15-02-2024		TLM1	
22.	Decision Tree Induction: Working of Decision Tree	1	16-02-2024		TLM1	
23.	building a decision tree	1	19-02-2024		TLM1	
24.	methods for expressing an attribute test conditions	1	21-02-2024		TLM1	
25.	measures for selecting the best split	1	22-02-2024		TLM1	
26.	Algorithm for decision tree induction	1	23-02-2024		TLM1	
27.	Due to presence of noise, due to lack of representation samples	1	04-03-2024		TLM1	
28.	evaluating the performance of	1	06-03-2024		TLM1	

	classifier: holdout method					
29.	random sub sampling	1	07-03-2024		TLM1	
30.	cross-validation, bootstrap	1	11-03-2024		TLM1	
31.	Bayes Theorem, Naïve Bayes Classifier	1	13-03-2024		TLM1	
No. of classes required to complete UNIT-III : 11				**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
32.	Basic Concepts	1	14-03-2024		TLM1	
33.	Algorithms: Problem Definition	1	15-03-2024		TLM1	
34.	Frequent Item Set Generation	1	18-03-2024		TLM1	
35.	Apriori Principle	1	20-03-2024		TLM1	
36.	Apriori Algorithm	1	21-03-2024		TLM1	
37.	Rule Generation	1	22-03-2024		TLM1	
38.	Compact Representation of Frequent Item sets	1	27-03-2024		TLM1	
39.	FP Growth Algorithm	1	28-03-2024		TLM1	
40.	FP Growth Algorithm	1	01-04-2024		TLM1	
No. of classes required to complete UNIT-IV : 09				**No. of classes taken:**		

UNIT-V: Cluster Analysis

S No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Basic Concepts and Algorithms: Overview	1	03-04-2024		TLM1	
42.	What Is Cluster Analysis? Different Types of Clustering	1	04-04-2024		TLM1	
43.	Different Types of Clusters; K-means	1	08-04-2024		TLM1	
44.	The Basic K-means Algorithm	1	10-04-2024		TLM1	
45.	K-means Additional Issues, Bisecting K-means	1	12-04-2024		TLM1	
46.	Strengths and Weaknesses	1	15-04-2024		TLM1	
47.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	18-04-2024		TLM1	
48.	DBSCAN: Traditional Density Center-Based Approach	1	19-04-2024		TLM1	
49.	DBSCAN Algorithm	1	22-04-2024		TLM1	
50.	Strengths and Weaknesses	1	24-04-2024		TLM1	
51.	Assignment-5	1	25-04-2024		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	26-04-24		TLM5	

Teaching Learning Methods

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

	engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. M. Kishore Kumar	**Mr. M. Kishore Kumar**	**Dr V. Surya Narayana**	**Dr O. Rama Devi**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC & ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK , Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., AP.-521 230.
http://lbrce.ac.in , Phone 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr Ch Rajendra Babu
Course Name & Code : Operating Systems -20CS11
L-T-P Structure :3-0-0 **Credits:** 3
Program/Sem/Sec : II B.tech/IV-sem /Sec 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	03-01-2024		TLM2	
2.	Operating-System Services	1	04-01-2024		TLM2	
3.	User Operating-System Interface	1	06-01-2024		TLM2	
4.	System Calls	1	08-01-2024		TLM2	
5.	Types of System Calls,	1	10-01-2024		TLM2	
6.	System Programs	1	11-01-2024		TLM2	
7.	Operating-System Design and Implementation	1	13-01-2024		TLM2	
8.	Operating-System Structure	1	18-01-2024		TLM2	
9.	Virtual Machines	1	20-01-2024		TLM2	
10.	Operating-System Generation		22-01-2024		TLM2	
11.	System Boot	1	24-01-2024		TLM2	
12.	Assignment-Quiz-1	1	25-01-2024		TLM6	
No. of classes required to complete UNIT-I: 12				**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
13.	**Processes:** Process concept, Inter-process Communication	1	27-01-2024		TLM2	
14.	Operations on process	1	29-01-2024		TLM2	
15.	IPC and examples on IPC	1	31-01-2024		TLM2	
16.	Communication in client server systems	1	01-02-2024		TLM2	
17.	Treads overview, Multithreading Models	1	03-02-2024		TLM2	
18.	Thread libraries and Thread issues	1	05-02-2024		TLM2	
19.	Scheduling Criteria	1	07-02-2024		TLM2	
20.	Scheduling algorithms	1	08-02-2024		TLM2	
21.	Scheduling algorithms	1	10-02-2024		TLM2	
22.	Multi-Processor Scheduling	1	12-02-2024		TLM2	
23.	Assignment-Quiz-2	1	14-02-2024		TLM6	
No. of classes required to complete UNIT-II: 11				**No. of classes taken:**		

UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	The Critical section problem, Peterson's solutions	1	15-02-2024		TLM1	
25.	Synchronization hardware	1	17-02-2024		TLM1	
26.	Semaphores, Classic problems of Synchronization	1	19-02-2024		TLM1	
27.	Monitors, Synchronization examples	1	21-02-2024		TLM1	
28.	atomic transactions	1	22-02-2024		TLM1	
29.	System model and deadlock characterization	1	24-02-2024		TLM1	
30.	Methods for Handling deadlocks	1	04-03-2024		TLM1	
31.	Deadlock prevention	1	06-03-2024		TLM1	
32.	Deadlock Avoidance	1	07-03-2024		TLM1	
33.	Deadlock detection	1	09-03-2024		TLM1	
34.	Recovery from deadlock	1	11-03-2024		TLM1	
35.	Assignment-Quiz-3	1	13-03-2024		TLM6	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Memory management

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Swapping	1	14-03-2024		TLM1	
37.	Contiguous Memory Allocation	1	16-03-2024		TLM1	
38.	Paging	1	18-03-2024		TLM1	
39.	Structure of Page table	1	20-03-2024		TLM1	
40.	Segmentation	1	21-03-2024		TLM1	
41.	Demand paging	1	23-03-2024		TLM1	
42.	Page replacement	1	27-03-2024		TLM1	
43.	Allocation of frames	1	28-03-2024		TLM1	
44.	Thrashing	1	30-03-2024		TLM1	
45.	Memory mapped files	1	01-04-2024		TLM1	
46.	Allocating kernel memory	1	03-04-2024		TLM1	
47.	Assignment-Quiz-4	1	04-04-2024		TLM6	
No. of classes required to complete UNIT-IV: 12				**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
48.	Overview of Mass storage structure	1	06-04-2024		TLM2	
49.	Disk structure	1	08-04-2024		TLM2	
50.	Disk Attachment	1	10-04-2024		TLM2	
51.	Disk Scheduling	1	13-04-2024		TLM2	
52.	Disk Management	1	15-04-2024		TLM2	
53.	The Concept of a file and access methods	1	18-04-2024		TLM2	
54.	File System structure	1	20-04-2024		TLM2	
55.	File system implementation	1	22-04-2024		TLM2	
56.	Directory implementation	1	24-04-2024		TLM2	
57.	Allocation methods	1	25-04-2024		TLM2	
58.	Assignment-Quiz-5	1	26-04-2024		TLM6	
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Dr Ch Rajendra Babu**		**Dr O Rama Devi**	**Dr O Rama Devi**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution

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

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

hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUTPART-A

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

PRE-REQUISITE: KnowledgeofComputerfundamentals&Datastructures&Algorithms

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

COURSEOUTCOMES(COs): Attheend ofthecourse, studentsareableto

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

COURSEARTICULATIONMATRIX (CorrelationbetweenCOs,POs &PSOs):

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

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

BOSAPPROVEDWebReferences:

1. https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-science-beginners/
2. https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutes-guide-to-key- concepts/
3. https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formats-python/
4. https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-scikit-learn/
5. https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-data-visualization-explorationpython/

CPLABSCHEDULE(LESSONPLAN):Section-A

Expt. No	COs	Experiments to beconducted	No. ofClasses Required	TentativeDate ofCompletion	ActualDate ofCompletion	Teaching Learning Methods	HOD Sign Weekly
1	--	Introductionto Lab experiments	3	02.01.2024		TLM8	
2	CO1	ImplementationofDFSforwater jug problem usingLISP/PROLOG	3	09.01.2024		TLM8	
3	CO1	Implementation of BFS fortic-tac-toe problem usingLISP/PROLOG/Java	3	23.01.2024		TLM8	
4	CO1	Implementation of TSP usingheuristic approach usingJava/LISP/Prolog	3	30.01.2024		TLM8	
5	CO2	ImplementationofSimulated Annealing Algorithm usingLISP/PROLOG	3	06.02.2024		TLM8	
6	CO2	Implementation of Hill-climbing to solve 8-PuzzleProblem	3	13.02.2024		TLM8	
7	CO2	Implementation of MonkeyBanana Problem usingLISP/PROLOG	3	20.02.2024		TLM8	
8	CO2	CreatingaNumPyArray	3	05.03.2024		TLM8	
9	CO2	TheShapeandReshapingof NumPyArray	3	12.03.2024		TLM8	
10	CO3	Indexingand Slicingof NumPyArray	3	19.03.2024		TLM8	
11	CO3	Indexingand Slicingof NumPyArray	3	26.03.2024		TLM8	
12	CO3	Perform followingoperationsusingpandas • Creatingdataframe • concat() • Settingconditions Addinganew column	3	02.04.2024		TLM8	
13	CO3	Readthe followingfile formatsusingpandas	3	16.04.2024		TLM8	
14	CO3	Readthe followingfile formatsusingpandas	3	23.04.2024		TLM8	
15	CO3	InternalLabExamination	3	07.05.2024		TLM8	
No.ofclassesrequiredto complete Lab			42	No.ofclassesconducted:			

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

PART-C

EVALUATIONPROCESS(R20Regulations):

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

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

Parameter	Marks
DaytoDaywork	05
Record	05
InternalTest	05
Total	15

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

Theperformanceofthestudentshallbeevaluatedasperttheparametersindicatedbelow:

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

PART-D

PROGRAMMEOUTCOMES(POs):

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

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

PROGRAMMESPECIFICOUTCOMES(PSOs):

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

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521 230.
hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PROGRAM : B.Tech. IV-Sem.

ACADEMIC YEAR : 2023-24
COURSE NAME & CODE : **R Programming Lab– 20IT53**
L-T-P STRUCTURE : **0-0-3**
COURSE CREDITS : **1.5**

COURSE INSTRUCTOR : **V. CHANDRA KUMAR**

COURSE COORDINATOR : **V.CHANDRA KUMAR**

1. **Pre-requisite :** Nil

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

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

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

4.Course Articulation Matrix:

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

5. List of Experiments

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

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

6.Course Delivery Plan:

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

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

Delivery Methods (DM):

1. Chalk & Talk 2. ICT Tools 3. Tutorial 4. Assignment/Test/Quiz
5. Laboratory/Field Visit 6. Web based learning.

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified Institution

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

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

hodads@lbrce.ac.in , ads@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

PROGRAM : B.Tech. IV-Sem.

ACADEMIC YEAR : 2023-24

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

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

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Mr. M. Kishore Kumar

COURSE COORDINATOR : Mr. M. Kishore Kumar

PRE-REQUISITE: Python Programming.

Course Educational Objective:

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

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

CO1: Apply preprocessing techniques on real world datasets.(Apply-L3)

CO2: Apply apriori algorithm to generate frequent item sets. (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	Demonstrate the various data preprocessing tasks using python libraries.	1	05-01-2024		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	05-01-2024		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	12-01-2024		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	19-01-2024		TLM8	
5	Build a model using linear regression algorithm on any dataset.	1	02-02-2024		TLM8	
6	Build a classification model using Decision Tree algorithm on iris dataset	1	09-02-2024		TLM8	
7	Apply Naïve Bayes Classification algorithm on any dataset	1	16-02-2024		TLM8	
8	Generate frequent item sets using Apriori Algorithm in python and generate association rules for any market basket data.	1	23-02-2024		TLM8	
9	Generate frequent item sets using Apriori Algorithm in python and generate association rules for any market basket data.	1	15-03-2024		TLM8	
10	Apply K- Means clustering algorithm on any dataset.	1	22-03-2024		TLM8	
11	Apply Hierarchical Clustering algorithm on any dataset.	1	12-04-2024		TLM8	
12	Apply DBSCAN clustering algorithm on any dataset.	1	19-04-2024		TLM8	
13	Internal Lab	1	26-04-2023		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
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need

	for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. M. Kishore Kumar	**Mr. M. Kishore Kumar**	**Dr. V.Surya Narayana**	**Dr. O. Rama Devi**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC with 'A' Grade,
ISO 21001:2018, 50001:2018, 14001:2015 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada.
L.B.REDDY NAGAR, MYLAVARAM. NTR District, AP, India. 521230.
hodads@lbrce.ac.in , ads@lbrce.ac.in , Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT
PART-A

Name of Course Instructor: Mr. S. Siva Ramakrishna

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 - B **A.Y.:** 2023-24

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

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to learn the importance of client server architecture in the web application development and able to 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.

R3 Budi Kurniawan, "Struts 2 Design and Programming: A Tutorial", BrainySoftware, 2nd Edition, 2008.

R4 Christian Bauer, Gavin King, Gary Gregory "Java Persistence with Hibernate: Revised Edition of Hibernate in Action Paperback", Manning Publication, 2nd Edition, 2006.

R5 Santosh Kumar K, "JDBC 4.2, Servlet 3.1, and JSP 2.3 Includes JSF 2.2 and Design Patterns, Black Book", Dreamtech publication, 2ndEdition.

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	08-01-2024		**DM4**	
2	Lab Cycle – 1	4	22-01-2024		**DM4**	
3	Lab Cycle – 2	4	29-01-2024		**DM4**	
4	Lab Cycle – 2	4	05-02-2024		**DM4**	
5	Lab Cycle – 3	4	12-02-2024		**DM4**	
6	Lab Cycle – 3	4	19-02-2024		**DM4**	
7	Lab Cycle – 4	4	04-03-2024		**DM4**	
8	Lab Cycle – 4	4	11-03-2024		**DM4**	
9	Lab Cycle – 5	4	18-03-2024		**DM4**	
10	Lab Cycle – 5	4	01-04-2024		**DM4**	
11	Lab Cycle – 6	4	08-04-2024		**DM4**	
12	Lab Cycle – 7	4	15-04-2024		**DM4**	
13	Lab Cycle – 8	4	22-04-2024		**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.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr. S. Siva Ramakrishna**	**Mr. S. Siva Ramakrishna**	**Mr. S. Siva Ramakrishna**	**Dr. O. Rama Devi**
Signature				