

# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

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

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

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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr. M. Sitha Ram  
Course Name & Code : DAA (20CS06)  
L-T-P Structure : 3-0-0 Credits : 3  
Program/Sem/Sec : B.Tech., CSE (AI & ML) IV-A A.Y: 2022-23

**PRE-REQUISITE: Data structures and DMS**

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course is to learn various algorithm 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, students are able to

CO 1	Identify the characteristic of an algorithm and analyses its time and space complexity. (UnderstandL2)
CO 2	Apply the divide-and-conquer method for solving problems like searching and sorting. (Apply - L3)
CO 3	Design Greedy algorithms for the optimization problems like knapsack problem, minimum cost spanning tree, single source shortest path problem. (Apply - L3)
CO 4	Apply dynamic programming paradigm to solve optimization problems like travelling salesperson problem, 0/1 knapsack problem, Optimal binary search tree (Apply- L3)
CO 5	Analyze the backtracking and branch and bound search methods on optimization problems like N-queen, 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	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	2	2	-	1	-	-	-	-	-	-	-	-	-	-	3
CO4	2	3	-	1	-	-	-	-	-	-	-	-	-	-	1
CO5	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).

#### **TEXT BOOKS:**

T1: Ellis Horowitz, Sartaj Sahni, 'Fundamentals of Computer Algorithms', Galgotia Publications.

T2: Data Structures and Algorithm Analysis in C++, 3/e, Mark Allen Weiss, Pearson, 2007.

**REFERENCE BOOKS:**

R1: Aho, Hopcroft& Ullman, ‘The Design and Analysis of Computer Algorithms’,  
Addison Wesley publications

R2: Thomas H. Cormen et al, ‘Introduction to Algorithms’, PHI.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN): Section C****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.	Introduction	1	30.01.2023		TLM1	
2.	Algorithm definition and Specifications	1	31.01.2023		TLM1	
3.	Performance Analysis	1	01.02.2023		TLM1	
4.	Time Complexity and space complexity	2	02.02.2023 & 06.02.2023		TLM1	
5.	Asymptotic Notations- Big-Oh, Omega and Theta	1	07.02.2023		TLM1	
6.	Divide & Conquer Technique: General Method	1	08.02.2023		TLM1	
7.	Binary Search and its analysis	1	09.02.2023		TLM1	
8.	Finding Maximum and Minimum and its Analysis	1	13.02.2023		TLM1	
9.	Merge sort and its Analysis	1	14.02.2023		TLM1	
10.	Quick Sort algorithm and its analysis	1	15.02.2023		TLM1	
11.	Closest pair of points	1	16.02.2023		TLM1	
12.	Tutorial - 1	1	20.02.2023		TLM3	
<b>No. of classes required to complete UNIT-I</b>		<b>13</b>		<b>No of classes taken</b>		

**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
14.	Greedy Method – Introduction, General method	1	21.02.2023		TLM1	
15.	Knapsack problem, Example problem	2	22.02.2023 &		TLM1	

			23.02.2023			
16.	Job sequencing with deadlines, Example problem	1	27.02.2023		TLM1	
17.	Minimum cost spanning trees, example problem	2	28.02.2023 & 01.03.2023		TLM1	
18.	Optimal storage on tapes, Example problem	1	02.03.2023		TLM1	
19.	Single source shortest path problem	2	06.03.2023 & 07.03.2023		TLM1	
20.	Huffman coding	1	09.03.2023		TLM1	
21.	Tutorial – II / Quiz - II	1	13.03.2023		TLM3	
<b>No. of classes required to complete UNIT-II</b>		<b>11</b>		<b>No of classes taken</b>		

### 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
22.	Dynamic Programming-General method	1	14.03.2023		TLM1	
23.	Multistage Graph, Example problem	2	15.03.2023 & 16.03.2023		TLM1	
24.	All pairs shortest path, Example problem	2	20.03.2023 & 21.03.2023		TLM1	
25.	Optimal Binary Search Tree, Example problem	2	03.04.2023 & 04.04.2023		TLM1	
26.	0/1 Knapsack Problem	1	23.03.2023		TLM1	
27.	Travelling Salesperson Problem	2	06.04.2023 & 10.04.2023		TLM1	
28.	Single source shortest path problem, Example Problem	1	11.04.2023		TLM1	
29.	Reliability design, Example Problem	2	12.04.2023 & 13.04.2023		TLM1	
30.	Tutorial – III / Quiz - III	1	17.04.2023		TLM3	
<b>No. of classes required to complete UNIT-III</b>		<b>14</b>		<b>No of classes taken</b>		

**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
31.	General Method	1	18.04.2023		TLM1	
32.	The 8-Queens problem	2	19.04.2023 & 20.04.2023		TLM1	
33.	Sum of subsets problem	2	24.04.2023 & 25.04.2023		TLM1	
34.	Graph coloring problem	2	26.05.2023 & 27.05.2023		TLM1	
35.	Hamiltonian cycles	1	01.05.2023		TLM1	
36.	Tutorial – IV / Quiz - IV	1	02.05.2023		TLM3	
<b>No. of classes required to complete UNIT-IV</b>		<b>09</b>		<b>No of classes taken</b>		

**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
43.	Branch and Bound- General method-job sequencing with deadlines	2	08.05.2023 & 09.05.2023		TLM1	
44.	LC Branch and bound solution for Travelling Salesperson Problem	2	10.05.2023 & 11.05.2023		TLM2	
45.	LC Branch and bound solution 0/1 Knapsack problem	1	15.05.2023		TLM2	
46.	FIFO Branch and bound solution for Travelling Sales Person Problem	2	16.05.2023 & 17.05.2023		TLM2	
47.	FIFO Branch and bound solution 0/1 Knapsack problem	1	18.05.2023		TLM2	
48.	LIFO Branch and Bound	1	23.05.2023		TLM2	
49.	Tutorial – V / Quiz - V	1	24.05.2023		TLM3	
50.	Discussion about SEE paper	1	25.05.2023		TLM3	
<b>No. of classes required to complete UNIT-V</b>		<b>11</b>		<b>No of classes taken</b>		

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

### **PART-C**

#### **EVALUATION PROCESS (R20 Regulations):**

<b>Evaluation Task</b>	<b>Marks</b>
Assignment-I (Unit-I , Unit-II , Unit-III)	A1=5
Assignment-II (Unit-III , Unit-IV , Unit-V)	A2=5
I-Mid Examination (Units-I & II)	M1=20
I-Quiz Examination (Units-I & II)	Q1=10
Assignment-III (Unit-III)	A3=5
Assignment-IV (Unit-IV)	A4=5
Assignment-V (Unit-V)	A5=5
II-Mid Examination (Units-III, IV & V)	M2=20
II-Quiz Examination (Units-III, IV & V)	Q2=10
Attendance	B=5
Assignment Marks = Best Four Average of A1, A2, A3, A4, A5	A=5
Mid Marks =75% of Max(M1,M2)+25% of Min(M1,M2)	M=20
Quiz Marks =75% of Max(Q1,Q2)+25% of Min(Q1,Q2)	B=10
Cumulative Internal Examination (CIE) : A+B+M+Q	40
Semester End Examination (SEE)	60
Total Marks = CIE + SEE	100

## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

Course Instructor  
Dr. M. Sitha Ram

Course Coordinator  
Dr. M. Sitha Ram

Module Coordinator  
Dr.D V Subbaiah

HOD  
Dr.D.Veeraiah



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## DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Dr. K. Naga Prasanthi

**Course Name & Code** : Data Warehousing and Data mining & 20CS10

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

**Credits:** 3

**Program/Sem/Sec** : B.Tech/IV

**A.Y.:** 2022-23

**PREREQUISITES** : 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 warehousing concepts.

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

C01	Summarize the architecture of data warehouse. ( <b>Understand- L2</b> )
C02	Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data. ( <b>Apply - L3</b> )
C03	Construct a decision tree and resolve the problem of model over fitting. ( <b>Analyze- L4</b> )
C04	Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation. ( <b>Apply - L3</b> )
C05	Apply suitable clustering algorithm for the given data set. ( <b>Apply - L3</b> )

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	-	3	-	-	-	-	-	-	-	-	-	-	2	-	-
C02	3	1	-	-	-	-	-	-	-	-	-	-	3	-	-
C03	-	-	3	2	-	-	-	-	-	-	-	-	-	3	-
C04	-	-	3	2	-	-	-	-	-	-	-	-	-	-	2
C05	-	-	3	2	-	-	-	-	-	-	-	-	-	2	-
<b>1 - Low    2 -Medium    3 - High</b>															

#### **TEXTBOOKS:**

**T1** Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011.

**T2** Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.

#### **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.

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

#### UNIT-I: Data Warehouse and OLAP Technology

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	1	30-1-2023		TLM1, 2	
2.	Introduction to Unit-I	1	1-2-2023			
3.	<b>Data Warehouse and OLAP Technology:</b> An Overview: Data Warehouse	1	3-2-2023		TLM1, 2	
4.	<b>Data Warehouse and OLAP Technology:</b> Multidimensional Data Model	2	4-2-2023 6-2-2023		TLM1, 2	
5.	<b>Data Warehouse and OLAP Technology:</b> Data Warehouse Architecture	2	8-2-2023 10-2-2023		TLM1, 2	
6.	<b>Data Warehouse and OLAP Technology:</b> Data Warehouse Implementation	1	13-2-2023		TLM1, 2	
7.	<b>Data Warehouse and OLAP Technology:</b> From Data Warehousing to Data Mining.	1	15-2-2023		TLM1, 2	
<b>No. of classes required to complete UNIT-I: 09</b>				<b>No. of classes taken:</b>		

#### UNIT-II: Data Mining & Data 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
1.	<b>Data Mining:</b> Introduction to Data Mining	1	17-2-2023		TLM1,2	
2.	Motivating challenges, The origins of Data Mining,	1	20-2-2023		TLM1,2	
3.	Data Mining Tasks, Types of Data, Data Quality.	2	22-2-2023 24-2-2023		TLM1,2	
4.	<b>Data Preprocessing:</b> Aggregation	1	25-2-2023		TLM1,2	
5.	<b>Data Preprocessing:</b> Sampling, Dimensionality Reduction, Feature Subset Selection	3	27-2-2023 1-3-2023 3-3-2023		TLM1,2	
6.	<b>Data Preprocessing:</b> Feature creation	1	4-3-2023		TLM1,2	
7.	<b>Data Preprocessing:</b> Discretization and Binarization	1	6-3-2023		TLM1,2	
8.	<b>Data Preprocessing:</b> Variable Transformation	1	10-3-2023		TLM1,2	
9.	<b>Data Preprocessing:</b> Measures of Similarity and Dissimilarity	1	11-3-2023		TLM1,2	
<b>No. of classes required to complete UNIT-II: 12</b>				<b>No. of classes taken:</b>		



**UNIT-III: Classification & Model Over fitting**

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.	<b>Classification:</b> Basic Concepts, General Approach to solving a classification problem	1	13-3-2023		TLM1,2	
2.	<b>Decision Tree Induction:</b> Working of Decision Tree, building a decision tree	2	15-3-2023 17-3-2023		TLM1,2	
3.	methods for expressing an attribute test conditions, measures for selecting the best split	2	18-3-2023 20-3-2023		TLM1,2	
4.	Algorithm for decision tree induction.	1	24-3-2023		TLM1,2	
5.	<b>Model Overfitting:</b> Due to presence of noise, due to lack of representation samples,	1	25-3-2023		TLM1,2	
6.	<b>Evaluating the performance of classifier:</b> holdout method, random sub sampling, cross-validation, bootstrap.	2	3-4-2023 8-4-2023		TLM1,2	
7.	Bayes Theorem	2	10-4-2023 12-4-2023		TLM1,2	
8.	Naïve Bayes Classifier	2	15-4-2023 17-4-2023		TLM1,2	
<b>No. of classes required to complete UNIT-III: 13</b>				<b>No. of classes taken:</b>		

**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
1.	<b>Association Analysis:</b> Basic Concepts	1	19-4-2023		TLM1,2	
2.	Algorithms: Problem Definition, Frequent Item Set Generation	2	21-4-2023 24-4-2023		TLM1,2	
3.	Apriori Principle, Apriori Algorithm	2	26-4-2023 28-4-2023		TLM1,2	
4.	Rule Generation, Compact Representation of Frequent Itemsets	2	29-4-2023 03-5-2023		TLM1,2	
5.	FPGrowth Algorithm	2	05-5-2023 06-5-2023		TLM1,2	
<b>No. of classes required to complete UNIT-IV: 09</b>				<b>No. of classes taken:</b>		

**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
1.	<b>Cluster Analysis:</b> Basic Concepts and Algorithms: Preliminaries	1	08-5-2023		TLM1,2	
2.	Different Types of Clustering, Different Types of Clusters;	1	10-5-2023		TLM1,2	
3.	<b>K-means:</b> The Basic K-means Algorithm	1	12-5-2023		TLM1,2	
4.	K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses;	1	13-5-2023		TLM1,2	
5.	Exercise problems on K-means	1	15-5-2023		TLM1,2	
6.	<b>Agglomerative Hierarchical Clustering:</b> Basic Agglomerative Hierarchical Clustering Algorithm	1	17-5-2023		TLM1,2	
7.	Exercise problems on Agglomerative Hierarchical Clustering Algorithm	1	19-5-2023		TLM1,2	
8.	DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.	1	20-5-2023		TLM1,2	
9.	Exercise problems on DBSCAN Algorithm	1	22-5-2023		TLM1,2	
<b>No. of classes required to complete UNIT-V: 09</b>				<b>No. of classes taken:</b>		

**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
1.	Regression Analysis - I (Linear Regression)	1	24-5-2023		TLM1,2	
2.	Regression Analysis - II (Logistic Regression)	2	26-5-2023 27-5-2023		TLM1,2	

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

## PART-C

### PEVALUATION 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	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> 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	<b>Design/development of solutions:</b> 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	<b>Conduct investigations of complex problems:</b> 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	<b>Modern tool usage:</b> 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	<b>The engineer and society:</b> 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	<b>Environment and sustainability:</b> 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	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

### PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. K Naga Prasanthi	Dr. S Jayaprada	Dr K Naga Prasanthi	Dr. D. Veeraiah
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, NTR DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Mr. JAGADEESWARA RAO P

**Course Name & Code** : Operating Systems -20CS11

**L-T-P Structure** : 4-0-0

**Credits:** 3

**Program/Sem/Sec** : II B.tech/IV-sem/AI&ML

**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

<b>CO1</b>	Demonstrate the underlying principles and techniques of operating system (Understand-L2)
<b>CO2</b>	Interpret scheduling and communication methods of processes handled by operating systems (Understand-L2)
<b>CO3</b>	Distinguish the process synchronization methods and deadlock handling approaches employed in operating systems (Understand-L2)
<b>CO4</b>	Classify memory management techniques and virtual memory mechanisms (Understand-L2)
<b>CO5</b>	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
<b>CO1</b>	2														
<b>CO2</b>		2	1												
<b>CO3</b>		2	1												
<b>CO4</b>		2	1												
<b>CO5</b>		2	1												
		1 - Low			2 - Medium				3 - High						

#### **TEXTBOOKS:**

**T1** Silberchatz & 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>

## 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	1-2-2023		TLM2	
2.	Introduction to Operating systems	1	3-2-2023		TLM2	
3.	Introduction to Operating systems	1	4-2-2023		TLM2	
4.	Introduction to Operating systems	1	6-2-2023		TLM2	
5.	Operating system services and user operating system interfaces	1	8-2-2023		TLM2	
6.	System calls and types of system calls	1	10-2-2023		TLM2	
7.	System programs, OS design and implementation	1	13-2-2023		TLM2	
8.	OS structure and Virtual Machine	1	15-2-2023		TLM2	
9.	OS generation and System Boot	1	17-2-2023		TLM2	
<b>No. of classes required to complete UNIT-I: 9</b>				<b>No. of classes taken:</b>		

#### 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
10.	Concepts and process scheduling	1	20-2-2023		TLM2	
11.	Operations on process	1	22-2-2023		TLM2	
12.	IPC and examples on IPC	1	24-2-2023		TLM2	
13.	Communication in client server systems	1	25-2-2023		TLM2	
14.	Treads overview, Multithreading Models,	1	27-2-2023		TLM2	
15.	Thread libraries and Thread issues	1	1-3-2023		TLM2	
16.	Scheduling Criteria	1	3-3-2023		TLM2	
17.	Scheduling algorithms	1	4-3-2023		TLM2	
18.	Scheduling algorithms	1	6-3-2023		TLM2	
19.	Multi-Processor Scheduling	1	10-3-2023		TLM2	
<b>No. of classes required to complete UNIT-II: 10</b>				<b>No. of classes taken:</b>		

#### 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
20.	The Critical section problem, Peterson's solutions	1	13-3-2023		TLM1	
21.	Synchronization hardware	1	15-3-2023		TLM1	
22.	Semaphores, Classic problems of Synchronization	1	17-3-2023		TLM1	
23.	Monitors, Synchronization examples	1	18-3-2023		TLM1	
24.	atomic transactions	1	20-3-2023		TLM1	
25.	System model and deadlock characterization	1	24-3-2022		TLM1	
26.	Methods for Handling deadlocks and deadlock prevention	1	25-3-2022		TLM1	

27.	Deadlock Avoidance	1	3-4-2023		TLM1	
28.	Deadlock detection	1	10-4-2023		TLM1	
29.	Recovery from deadlock	1	12-4-2023		TLM1	
<b>No. of classes required to complete UNIT-III: 10</b>						

#### 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
30.	Swapping	1	15-4-2023		TLM1	
31.	Contiguous Memory Allocation	1	17-4-2023		TLM1	
32.	Paging and structure of a page table	1	19-4-2023		TLM1	
33.	Segmentation	1	21-4-2023		TLM1	
34.	Demand paging	1	24-4-2023		TLM1	
35.	Page replacement	1	26-4-2023		TLM1	
36.	Allocation of frames	1	28-4-2023		TLM1	
37.	Thrashing	1	29-4-2023		TLM1	
38.	Memory mapped files	1	1-5-2023		TLM1	
39.	Allocating kernel memory	1	3-5-2023		TLM1	
<b>No. of classes required to complete UNIT-IV: 10</b>				<b>No. of classes taken:</b>		

#### 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
40.	Overview of Mass storage structure	1	5-5-2023		TLM2	
41.	Disk structure	1	6-5-2023		TLM2	
42.	Disk Attachment	1	8-5-2023		TLM2	
43.	Disk Scheduling	1	10-5-2023		TLM2	
44.	Disk Management	1	12-5-2023		TLM2	
45.	The Concept of a file and access methods	1	15-5-2023		TLM2	
46.	File System structure	1	17-5-2023		TLM2	
47.	File system implementation	1	19-5-2023		TLM2	
48.	Directory implementation	1	20-5-2023		TLM2	
49.	Allocation methods	1	22-5-2023		TLM2	
50.	Free space management	1	24-5-2023		TLM2	
51.	Efficiency and performance, recovery	2	26-5-2023 27-5-2023		TLM2	
<b>No. of classes required to complete UNIT-V: 13</b>				<b>No. of classes taken:</b>		

#### Teaching Learning Methods

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

## **PART-C**

### **EVALUATION PROCESS (R20 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
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))	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>



## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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.
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	Mr. P. Jagadeeswara Rao	Dr. O. Rama Devi	Dr. D. Venkata Subbaiah	Dr. D. Veeraiah
<b>Signature</b>				

# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (A)

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(Autonomous & Affiliated to JNTUK, Kakinada & Approved by AICTE, New Delhi,

Accredited by NAAC and NBA, Certified by ISO 9001:2015)

L B Reddy Nagar, Mylavaram-521 0, Krishna District, Andhra Pradesh.

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### COURSE HANDOUT

**PROGRAM** : B.Tech. IV-Sem., AI&ML-A sec  
**ACADEMIC YEAR** : 2022 - 23  
**COURSE NAME & CODE** : UNIVERSAL HUMAN VALUES -20HS01  
**L-T-P STRUCTURE** : 3-0-0  
**COURSE CREDITS** : 3  
**COURSE INSTRUCTOR** : Dr.CH V NARAYANA  
**COURSE COORDINATOR** : Dr CH V NARAYANA  
**MODULE COORDINATOR**: Dr. CH V NARAYANA  
**PRE-REQUISITE**: Nil

**COURSE OBJECTIVE:** The objective of the course is 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 this course,

**CO1:** Apply the value inputs in life and profession (Apply – L3)

**CO2:** Distinguish between values and skills, happiness and accumulation of physical facility, the self, and the Body (Understand – L2)

**CO3:** Understand the role of a human being in ensuring harmony in society (Understand-L2)

**CO4:** Understand the role of a human being in ensuring harmony in the nature and coexistence (Understand-L2)

**CO5:** Distinguish between ethical and unethical practices (Apply – L3)

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

COs	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	PSO 2	PSO 3
CO1						1	1	2							
CO2						2	1	2	1						
CO3						1	3	1	3						
CO4							3	1	2						
CO5						1	1	3	2						

**Note:** 1- Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High)

**TEXT BOOK/S:**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

**REFERENCES:**

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

**COURSE DELIVERY PLAN (LESSON PLAN): Section-A****UNIT – 1**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
1.	Introduction and need of Value Education.	1	31/01/23		TLM1	CO1	T1	
2.	Basic guide lines, Content of Value Education	1	02/02/23		TLM1	CO1	T1	
3.	Process for Value Education	1	03/02/23		TLM1	CO1	T1	
4.	The process for self-exploration	1	04/02/23		TLM1	CO1	T1, R1	
5.	The process for self-exploration- NA, EV	1	07/02/23		TLM1	CO1	T1, R1	
6.	Continuous Happiness and Prosperity- A look at basic Human Aspirations	1	09/02/23		TLM1	CO1	T1, R1	
7.	Right understanding of Relationship and Physical Facility	1	10/02/23		TLM1	CO1	T1	
8.	Understanding Happiness and Prosperity	1	14/02/23		TLM1	CO1	T1	
<b>No. of classes required to complete UNIT-I:</b>		<b>08</b>	<b>No. of classes taken:</b>					

**UNIT – 2**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
9.	Understanding human being	1	16/02/23		TLM1	CO2	T1	
10.	Understanding the needs & activities of Self ('I') and 'Body'	1	17/02/23		TLM1	CO2	T1	
11.	Understanding the Body as an instrument of Self	1	21/02/23		TLM1	CO2	T1	
12.	Understanding the characteristics and activities of 'I' and	1	24/02/23		TLM1	CO2	T1	

	harmony in 'I';							
13.	Understanding the harmony of I with the Body	1	25/02/23		TLM1	CO2	T1, R1	
14.	Indications of Body Health	1	28/02/23		TLM1	CO2	T1, R1	
15.	correct appraisal of Physical needs, meaning of Prosperity in detail	1	02/03/23		TLM1	CO2	T1, R1	
<b>No. of classes required to complete UNIT-II:</b>		<b>07</b>	<b>No. of classes taken:</b>					

### UNIT - 3

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
16.	Understanding values in human-human relationship	1	03/03/23		TLM1	CO3	T1	
17.	meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness	1	04/03/23		TLM1	CO3	T1	
18.	Trust and Respect as the foundational values of relationship	1	9/03/23		TLM1	CO3	T1	
19.	Respect in the relationship	1	10/03/23		TLM1	CO3	T1, R1	
20.	Respect in the relationship	1	11/03/23		TLM1	CO3	T1, R1	
21.	Other feelings in the relationship	1	14/03/23		TLM1	CO3	T1	
22.	Other feelings in the relationship	1	16/03/23		TLM1	CO3	T1	
23.	Reverence in the relationship	1	17/03/23		TLM1	CO3	T1	
24.	Justice in the relationship	1	18/03/23		TLM1	CO3	T1, R1	
<b>No. of classes required to complete UNIT-III</b>		<b>09</b>	<b>No. of classes taken:</b>					

### UNIT - 4

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
25.	Understanding harmony in the Nature	1	21/03/23		TLM1	CO4	T1	
26.	Understanding existence as coexistence	2	23/03/23 & 24/03/23		TLM1	CO4	T1	
27.	Understanding existence as coexistence	1	25/03/23		TLM1	CO4	T1	
28.	Understanding existence as coexistence	2	06,08/04/23		TLM1	CO4	T1	
29.	Holistic perception of harmony at all levels of existence.	2	11/04/23 & 12/04/23		TLM1	CO4	T1	
<b>No. of classes required to</b>		<b>08</b>	<b>No. of classes taken:</b>					

<b>complete UNIT-IV</b>		
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### UNIT - 5

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	Text Book followed	HOD Sign Weekly
30.	Natural acceptance of human values;	2	13/04/23 & 18/04/23		TLM1	CO5	T2, R4	
31.	Definitiveness of Ethical Human Conduct	2	20/04/23 & 21/04/23		TLM1	CO5	T2, R4	
32.	Basis for Humanistic Education,	1	25/04/23 & 27/04/23		TLM1	CO5	T2, R4	
33.	Humanistic Constitution and Humanistic Universal Order;	1	28/04/23 29/04/23		TLM1	CO5	T2, R4	
34.	Competence in professional ethics,	1	02/05/23		TLM1	CO5	T2, R4	
35.	Strategy for transition from the present state to Universal Human Order	2	04/05/23 & 06/04/23		TLM1	CO5	T2, R4	
36.	Present state	2	11/05/23 & 16/05/23					
37.	Revision	3	18/05/23 & 19/05/23 & 20/05/23					
<b>No. of classes required to complete UNIT-V</b>		<b>09 +5</b>	<b>No. of classes taken:</b>					

### 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	Learning Outcome COs	Text Book followed	HOD Sign Weekly
38.	Pollution-Human Role	2	23/05/23 & 25/05/23					
39.	Mutual-Enrichment	2	26,27/05/23					

### Teaching Learning Methods

<b>TLM1</b>	Chalk and Talk	<b>TLM4</b>	Problem Solving	<b>TLM7</b>	Seminars or GD
<b>TLM2</b>	PPT	<b>TLM5</b>	Programming	<b>TLM8</b>	Lab Demo
<b>TLM3</b>	Tutorial	<b>TLM6</b>	Assignment or Quiz	<b>TLM9</b>	Case Study

### EVALUATION PROCESS:

<b>Evaluation Task</b>	<b>COs</b>	<b>Marks</b>
Assignment/Quiz – 1	1	A1=5
Assignment/Quiz – 2	2	A2=5
I-Mid Descriptive Examination	1, 2	B1=15
I-Mid Online Quiz Examination	1, 2	C1 = 10
Assignment/Quiz – 3	3	A3=5
Assignment/Quiz – 4	4	A4=5
Assignment/Quiz – 5	5	A5=5
II-Mid Descriptive Examination	3, 4, 5	B2=15
II-Mid Online Quiz Examination	3, 4, 5	C2 = 10
<b>Evaluation of Assignment/Quiz Marks: <math>A = (A1+A2+A3+A4+A5)/5</math></b>	<b>1,2,3,4,5</b>	<b>A=5</b>
<b>Evaluation of Mid Descriptive Marks: <math>B = 75\% \text{ of Max}(B1,B2) + 25\% \text{ of Min}(B1,B2)</math></b>	<b>1,2,3,4,5</b>	<b>B=15</b>
<b>Evaluation of Mid Online Quiz Marks: <math>C = \text{Average}(C1, C2)</math></b>	<b>1,2,3,4,5</b>	<b>C=10</b>
<b>Cumulative Internal Examination : <math>A+B+C</math></b>	<b>1,2,3,4,5</b>	<b>A+B+C=30</b>
<b>Semester End Examinations</b>	<b>1,2,3,4,5</b>	<b>D=70</b>
<b>Total Marks: <math>A+B+C+D</math></b>	<b>1,2,3,4,5</b>	<b>100</b>

### PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

**PEO I:** Pursue higher education, entrepreneurship, and research to compete at global level.

**PEO II:** Design and develop products innovatively in the area of computer science and engineering and in other allied fields.

**PEO III:** Function effectively as individuals and as members of a team in the conduct of interdisciplinary projects; and even at all the levels with ethics and necessary attitude.

**PEO IV:** Serve ever-changing needs of the society with a pragmatic perception.

### PROGRAMME OUTCOMES (POs):

**Engineering Graduates will be able to:**

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 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.

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.
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.
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.
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.
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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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):**

##### **1. Programming Paradigms:**

To inculcate algorithmic thinking, formulation techniques and visualization, leading to problem solving skills using different programming paradigms.

##### **2. Data Engineering:**

To inculcate an ability to Analyze, Design and implement data driven applications into the students.

##### **3. Software Engineering:**

Develop an ability to implement various processes / methodologies /practices employed in design, validation, testing and maintenance of software products.

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	Dr.CH V NARAYANA	Dr.CH V NARAYANA	Dr.CH V NARAYANA	Dr. D Veeraiah
<b>Signature</b>				



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I), ISO 9001:2015 Certified Institution

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

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

[hodcse@lbrce.ac.in](mailto:hodcse@lbrce.ac.in), [cseoffice@lbrce.ac.in](mailto:cseoffice@lbrce.ac.in), Phone: 08659-222 933, Fax: 08659-222931

## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Dr. K. Devi Priya

**Course Name & Code** : Introduction to Artificial Intelligence and Machine Learning-20AM01 –

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

**Credits:**3

**Program/Sem/Sec** : B.Tech/IV-sem/AI&ML/A-Sec

**A.Y.:**2021-22

**PREREQUISITE:** Probability and Statistics

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course is to provide a strong foundation of fundamental concepts in Artificial Intelligence, a basic exposition to the goals and methods of Artificial Intelligence, and fundamentals of machine learning

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

<b>CO1</b>	Enumerate the history and foundations of Artificial Intelligence. (Understand-L2)
<b>CO2</b>	Apply the basic principles of AI in problem solving. (Apply-L3)
<b>CO3</b>	Choose the appropriate representation of Knowledge. (Apply-L3)
<b>CO4</b>	Enumerate the Perspectives and Issues in Machine Learning. (Understand-L2)
<b>CO5</b>	Identify issues in Decision Tree Learning.(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
<b>CO1</b>	1														
<b>CO2</b>	1		2												
<b>CO3</b>			2	1									2		
<b>CO4</b>			2	2										2	2
<b>CO5</b>			2	2											
	1 - Low			2 -Medium					3 - High						

#### **TEXTBOOKS:**

- T1** Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Pearson
- T2** Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013

#### **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 Artificial Intelligence", Khanna Publishing House, Delhi.



**R5** Christopher Bishop, Pattern Recognition and Machine Learning (PRML) , Springer, 2007.

**R6** ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML) , Cambridge University Press, 2014.

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN):**

#### **UNIT-I Introduction**

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	What Is AI?,	1	31-1-2023		TLM1/TLM2	
2.	What Is AI?,	1	1-2-2023		TLM1/TLM2	
3.	The Foundations of Artificial Intelligence	1	3-2-2023		TLM2	
4.	The History of Artificial Intelligence	1	7-2-2023		TLM2	
5.	The State of the Art	1	8-2-2023		TLM2	
6.	Agents and Environments	1	10-2-2023		TLM2	
7.	Good Behavior: The Concept of Rationality	1	13-2-2023		TLM2	
8.	The Nature of Environments	1	15-2-2023		TLM2	
9.	The Structure of Agents.	1	17-2-2023		TLM2	
<b>No. of classes required to complete UNIT-I: 9</b>				<b>No. of classes taken:</b>		

#### **UNIT-II: Problem Solving**

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.	Problem-Solving Agents	1	20-2-2023		TLM1/TLM2	
11.	Problem-Solving Agents	1	22-2-2023		TLM2	
12.	Searching for Solutions	1	24-2-2023		TLM2	
13.	Searching for Solutions	1	25-2-2023		TLM2	
14.	Uninformed Search Strategies	1	27-2-2023		TLM2	
15.	Informed (Heuristic) Search Strategies	1	1-3-2023		TLM2	
16.	Informed (Heuristic) Search Strategies	1	3-3-2023		TLM2	
17.	Local Search Algorithms and Optimization Problems	1	4-3-2023		TLM2	
18.	Local Search Algorithms and Optimization Problems	1	6-3-2023		TLM2	
19.	Searching with Nondeterministic Actions.	1	10-3-2023		TLM2	
20.	Searching with Nondeterministic Actions	1	10-3-2023			
<b>No. of classes required to complete UNIT-II: 10</b>				<b>No. of classes taken:</b>		

#### **UNIT-III: Knowledge Representation:**

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.	Knowledge-Based Agents, Logic,	1	13-3-2023		TLM2	
22.	Propositional Logic: A Very Simple Logic		15-3-2023		TLM2	

23.	Ontological Engineering	1	17-3-2023		TLM2	
24.	Categories and Objects	1	18-3-2023		TLM2	
25.	Events	1	20-3-2023		TLM2	
26.	Mental Events and Mental Objects	1	24-3-2022		TLM2	
27.	Reasoning Systems for Categories	1	25-3-2022		TLM2	
28.	Reasoning Systems for Categories	1	3-4-2023		TLM2	
29.	The Internet Shopping World	1	10-4-2023		TLM2	
30.	The Internet Shopping World	1	12-4-2023		TLM2	
<b>No. of classes required to complete UNIT-III: 10</b>						

#### UNIT-IV: Introduction to Machine Learning:

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.	Well-Posed Learning Problem,	1	15-4-2023		TLM1/TLM2	
32.	Designing a Learning system	1	17-4-2023		TLM1	
33.	Designing a Learning system	1	19-4-2023		TLM1	
34.	Perspectives and Issues in Machine Learning	1	21-4-2023		TLM1	
35.	Perspectives and Issues in Machine Learning	1	24-4-2023		TLM1	
36.	A Concept Learning Task	1	26-4-2023		TLM1	
37.	Concept Learning as Search	1	28-4-2023		TLM1	
38.	FIND-S	1	29-4-2023		TLM1	
39.	: Finding a Maximally Specific Hypothesis, Version Spaces	1	1-5-2023		TLM1	
40.	Candidate Elimination Algorithm,	1	3-5-2023		TLM1	
41.	Remarks on Version spaces and Candidate Elimination, Inductive Bias	1	3-5-2023		TLM1	
42.	Inductive Bias	1	6-5-2023		TLM1	
43.	Inductive Bias	1	8-5-2023		TLM1	
<b>No. of classes required to complete UNIT-IV: 13</b>				<b>No. of classes taken:</b>		

#### UNIT-V: Decision Tree Learning:

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.	Introduction, Decision Tree Representation	1	10-5-2023		TLM2	
45.	Appropriate Problems for Decision Tree Learning	1	12-5-2023		TLM2	
46.	The Basic Decision Tree Learning Algorithm	1	15-5-2023		TLM2	
47.	The Basic Decision Tree Learning Algorithm	1	17-5-2023			
48.	The Basic Decision	1	19-5-2023			

	Tree Learning Algorithm				
49.	Hypothesis Space Search in Decision Tree Learning	1	20-5-2023		
50.	Hypothesis Space Search in Decision Tree Learning	1	22-5-2023		
51.	Hypothesis Space Search in Decision Tree Learning	1	24-5-2023		
52.	Issues in Decision Tree Learning	1	26-5-2023 27-5-2023		
<b>No. of classes required to complete UNIT-V: 9</b>				<b>No. of classes taken:</b>	

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

### **PART-C**

#### **EVALUATION PROCESS (R17 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
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
<b>Mid Marks =80% of Max((M1+Q1+A1),(M2+Q2+A2))+20% of Min((M1+Q1+A1), (M2+Q2+A2))</b>	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
<b>Total Marks = CIE + SEE</b>	<b>100</b>

## PART-D

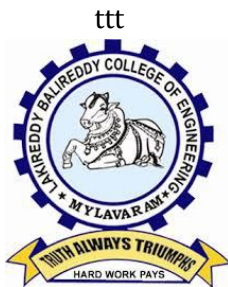
### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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.
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	DR.K DEVIPRIYA	Dr. K DEVIPRIYA	D Venkat Subbiah	Dr.V.VEERAAH
Signature				



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## DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

### COURSE HANDOUT

#### PART-A

Name of Course Instructor : Dr. L. Bhagya Lakshmi  
 Course Name & Code : Environmental Science & 20MC03  
 L-T-P Structure : 2-0-0 Credits : 0  
 Program/Sem/Sec : B.Tech., CSE-(AI&ML), IV-Sem. A.Y : 2022-23

#### PRE-REQUISITE:

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** The purpose of this course is to provide a general background on developing an understanding of systems and cycles on the earth and how individual organisms live together in complex communities and how human activities influence our air, water and soil. It also helps in developing an understanding about our use of fossil fuels and effect on climate and sustainable management of natural resources.

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

CO 1	Identify environmental problems arising due to engineering and technological activities that help to be the part of sustainable solutions.
CO 2	Evaluate local, regional, and global environmental issues related to resources and their sustainable management.
CO 3	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO 4	Acknowledge and prevent the problems related to pollution of air, water and soil.
CO5	Identify the significance of implementing environmental laws and abatement devices for environmental management.

**COURSE ARTICULATION MATRIX (Correlation between COs, POs & PSO)s):**

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

**Note:** Enter Correlation Levels 1 or 2 or 3. If there is no correlation, put '-'

1- Slight (Low), 2 – Moderate (Medium), 3 - Substantial (High).

#### TEXT BOOKS:

- T1** Anubha Kaushik, C.P.Kaushik, "Perspectives in Environmental Studies", New age international publishers, 5<sup>th</sup> Edition, Delhi, 2016.
- T2** Mahua Basu, S. Xavier, "Fundamentals of Environmental Studies", Cambridge University Press, 1<sup>st</sup> Edition, Delhi, 2016.

**REFERENCE BOOKS:**

- R1** S. Deswal, A. Deswal, "A Basic course in Environmental Studies", Educational & Technical Publishers, 2<sup>nd</sup> Edition, Delhi, 2014.
- R2** R. Rajagopalan, "Environmental Studies (From Crisis to Cure)", Oxford University Press, 2<sup>nd</sup> Edition, New Delhi, 2012.
- R3** De, A.K, "Environmental Chemistry", New Age International (P) Limited, 5<sup>th</sup> Edition, New Delhi, 2003.
- R4** Dr.K.V.S.G. Murali Krishna, "Environmental Studies", VGS Techno Series, 1<sup>st</sup> Edition, Vijayawada, 2010.
- R5** G. Tyler Miller, Scott Spoolman, "Introduction to Environmental Studies", Cengage Learning, 13<sup>th</sup> Edition, New Delhi, 2009.

**PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: NATURE AND SCOPE OF ENVIRONMENTAL PROBLEMS**

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 of course and course objectives. Introduction of components of Environment	1	04-02-2023		2	
2.	Population explosion and variations among Nations.	1	06-02-2023		2	
3.	Resettlement and Rehabilitation - Issues and possible solutions	1	13-02-2023		2	
4.	Environmental Hazards	1	13-02-2023		2	
5.	Role of Information Technology in environmental management and human health.	1	20-02-2023		2	
No. of classes required to complete UNIT-I: 5				No. of classes taken:		

**UNIT-II: NATURAL RESOURCES AND CONSERVATION**

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 and classification of Natural resources, Forest Resources,	1	25-02-2023		2	
2.	Water Resources	1	27-02-2023		2	
3.	Mineral Resources	1	04-03-2023		2	
4.	Food Resources	1	04-03-2023		2	
5.	Food Resources	1	06-03-2023		2	
6.	Food Resources	1	13-03-2023		2	
7.	Energy Resources	1	18-03-2023		2	
No. of classes required to complete UNIT-II: 6				No. of classes taken:		

**UNIT-III: ECOLOGY AND BIODIVERSITY**

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.	Definition, structure and functions of an ecosystem	1	18-03-2023		2	
2.	Food chains and Food webs, Ecological succession, Ecological pyramids,	1	20-03-2023		2	

3.	Major Types of Ecosystems – Forest, Grassland, Desert Land & aquatic Ecosystem, Ecological Niche and Keystone Species, Bio-geographical classification of India. India as a mega diversity nation	1	25-03-2023		2	
4.	Bio-geo-chemical cycles	1	25-03-2023			
5.	<b>I MID EXAMINATION</b>	1	27-03-2023			
6.	<b>I MID EXAMINATION</b>	1	01-04-2023			
7.	Values of biodiversity- Direct and Indirect values. Threats to biodiversity; Assignment in Unit II	1	10-04-2023		2	
8.	Man and wild life conflicts. Endangered and endemic species of India	1	10-04-2023		2,3	
9.	Conservation of biodiversity: In-situ and Ex-situ conservation methods	1	17-04-2023		2	
No. of classes required to complete UNIT-III: 7				No. of classes taken:		

#### UNIT-IV : ENVIRONMENTAL POLLUTION

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.	Air Pollution	1	24-04-2023		2	
2.	Causes, effects and control measures of: Water Pollution	1	24-04-2023		2	
3.	Causes, effects and control measures of: Soil Pollution,	1	29-04-2023			
4.	Noise Pollution		01-05-2023			
5.	Solid Waste Management	1	01-05-2023		2,3	
6.	Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.	1	06-05-2023		2	
No. of classes required to complete UNIT-IV: 6				No. of classes taken:		

#### UNIT-V : ENVIRONMENTAL 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
1.	Sustainable Development	1	06-05-2023		2	
2.	Climate disruption- Greenhouse effect, ozone layer depletion and acid rain.	1	08-05-2023		2,3	
3.	Stockholm conference	1	08-05-2023		2	
4.	Environmental Impact Assessment (EIA)		15-05-2023		2	
5.	Green building	1	20-05-2023		2	
6.	Environmental Law	1	22-05-2023		2	
7.	Revision	1	27-05-2023		2,3	
8.	II MID EXAMINATIONS	1	05-06-2023			
9.	II MID EXAMINATIONS	1	10-06-2023			
No. of classes required to complete UNIT-V: 07				No. of classes taken:		

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

### **PART-C**

#### **EVALUATION PROCESS (R17 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
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))	<b>M=30</b>
<b>Cumulative Internal Examination (CIE): M</b>	<b>30</b>
<b>Semester End Examination (SEE)</b>	<b>70</b>
Total Marks = CIE + SEE	<b>100</b>



## PART-D

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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.
<b>PO 6</b>	<b>The engineer and society:</b> 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.
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. L. Bhagya Lakshmi	Dr. Shaheda Niloufer	Dr. Shaheda Niloufer	Dr. A. Rami Reddy
Signature				



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Phone: 08659-222 933, Fax: 08659-222931

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

## COURSE HANDOUT

### PART-A

Name of Course Instructor : Dr K Naga Prasanthi  
Course Name & Code : Data Mining using Python Lab (20CS58)  
L-T-P Structure : 0-0-3 Credits: 1.5  
Program/Sem/Sec : B.Tech., CSE(AI&ML)., IV-Sem. A.Y : 2022-23

**PRE-REQUISITE : Python Programming.**

**COURSE EDUCATIONAL OBJECTIVES (CEOs):** 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 (COs):** At the end of the course, students are able to

<b>CO 1</b>	Apply preprocessing techniques on real world datasets. ( <b>Apply-L3</b> )
<b>CO 2</b>	Apply Apriori algorithm to generate frequent item sets ( <b>Apply L3</b> )
<b>CO 3</b>	Apply Classification and clustering algorithms on different data sets ( <b>Apply L3</b> )

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

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

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

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN): Section-A

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	Introduction- Practice on Python Programming	3	2-2-2023			
1	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	9-2-2023		TLM4	
2	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	16-2-2023		TLM4	
3	Similarity and Dissimilarity Measures using python	3	23-2-2023		TLM4	
4	Build a model using linear regression algorithm on any dataset.	3	2-3-2023		TLM4	
5	Build a classification model using Decision Tree algorithm on iris dataset	3	9-3-2023		TLM4	
6	Apply Naïve Bayes Classification algorithm on any dataset	3	16-3-2023		TLM4	
7	Generate frequent item sets using Apriori Algorithm in python	3	23-3-2023		TLM4	
8	Generate association rules for any market basket data.	3	6-4-2023		TLM4	
9	Apply K- Means clustering algorithm on any dataset.	3	13-4-2023		TLM4	
10	Apply Hierarchical Clustering algorithm on any dataset.	3	20-4-2023		TLM4	
11	Apply DBSCAN clustering algorithm on any dataset.	3	27-4-2023		TLM4	
12	Practise Session	3	4-5-2023		TLM4	
13	Practise Session	3	11-5-2023		TLM4	
14	Practise Session	3	18-5-2023		TLM4	
15	Internal Examination	3	25-5-2023		TLM4	

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

## PART-C

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> 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.
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. K Naga Prasanthi	Dr.S.Jayaprada	Dr. K Naga Prasanthi	Dr.D.Veeraiah
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, NTR DIST., A.P.-521 230.

Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Mr. JAGADEESWARA RAO P

**Course Name & Code** : OPERATING SYSTEMS Lab & 20CS59

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

**Credits:** 1.5

**Program/Sem/Sec** : II B.tech/IV-sem/AI&ML

**A.Y.:** 2022-23

**PREREQUISITE:** Knowledge of basic Computer hardware & software.

#### **COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of this lab is to provide the various UNIX/Linux operating system commands, importance of System calls, Scheduling algorithms and Memory Management techniques.

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

<b>CO1</b>	Experiment with Unix commands and shell programming ( <b>Understand- L2</b> )
<b>CO2</b>	Implement CPU scheduling algorithms and memory management techniques ( <b>Apply-L3</b> ).
<b>CO3</b>	Simulate process synchronization and file system management using system calls ( <b>Apply -L3</b> ).
<b>CO4</b>	Improve individual / teamwork skills, communication & report writing skills with ethical values. ( <b>Apply -L3</b> ).

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO2</b>	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO3</b>	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
<b>CO4</b>	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-
	<b>1 - Low</b>			<b>2 -Medium</b>						<b>3 - High</b>					

#### **REFERENCE BOOKS:**

<b>R1</b>	Silberchatz & Galvin, "Operating System Concepts", Wiley, 7th edition, 2007.
<b>R2</b>	William Stallings, "Operating Systems", PHI, 5th Edition, 2004.
<b>R3</b>	Operating Systems Design and Implementation 3rd Edition by Andrew Tanenbaum (Author), Albert Woodhull (Author)

## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Basic Unix Commands	3+3	31-01-2023 07-02-2023		DM5	
2.	Lab Cycle-1	3	14-02-2023		DM5	
3.	Lab Cycle -1	3	21-02-2023		DM5	
4.	Lab Cycle-2	3	28-02-2023		DM5	
5.	Lab Cycle-2	3	07-03-2023		DM5	
6.	Lab Cycle-2	3	14-03-2023		DM5	
7.	Lab Cycle-3	3	21-03-2023		DM5	
8.	Lab Cycle-3	3	04-04-2023		DM5	
9.	Lab Cycle-4	3	11-04-2023		DM5	
10.	Lab Cycle-5	3	18-04-2023		DM5	
11.	Lab Cycle-6	3	25-04-2023		DM5	
12.	Lab Cycle-6	3	02-05-2023		DM5	
13.	Lab Cycle-7	3	09-05-2023		DM5	
14.	Lab Cycle-8	3	16-05-2023		DM5	
15.	Internal exam	3	23-05-2023		DM4	

Teaching Learning Methods			
<b>DM1</b>	Chalk and Talk	<b>DM4</b>	Assignment/Test/Quiz
<b>DM2</b>	ICT Tools	<b>DM5</b>	Laboratory/Field Visit
<b>DM3</b>	Tutorial	<b>DM6</b>	Web-based Learning

## PART-C

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and teamwork:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

<b>Title</b>	<b>Course Instructor</b>	<b>Course Coordinator</b>	<b>Module Coordinator</b>	<b>Head of the Department</b>
<b>Name of the Faculty</b>	Mr. P. Jagadeeswara Rao	Dr. O. Rama Devi	Dr. D. Venkata Subbaiah	Dr. D. Veeraiah
<b>Signature</b>				



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Phone: 08659-222933, Fax: 08659-222931

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### COURSE HANDOUT

#### PART-A

**Name of Course Instructor:** Dr. K DEVI PRIYA

**Course Name & Code** : - 20AM51 –INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

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

**Credits:** 1.5

**Program/Sem/Sec** : B.Tech. - CSE/IV/A

**A.Y.:** 2022-23

**PREREQUISITE:** Python Programming

**COURSE EDUCATIONAL OBJECTIVES (CEOs):**

The objective of the course is to provide a strong foundation of fundamental concepts in Artificial Intelligence, a basic exposition to the goals and methods of Artificial Intelligence, and fundamentals of machine learning

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

<b>CO1</b>	Apply the basic principles of AI in problem solving using LISP/PROLOG. (Apply – L3)
<b>CO2</b>	Implement different algorithms using LISP/PROLOG.(Apply – L3)
<b>CO3</b>	Develop an Expert System using JESS/PROLOG(Apply – L3)
<b>CO4</b>	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	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-
			1 - Low			2 -Medium			3 - High						

**REFERENCE BOOKS:**

<b>R1</b>	Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.
<b>R2</b>	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
<b>R3</b>	David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010. )



## PART-B

### COURSE DELIVERY PLAN (LESSON PLAN):

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Implementation of DFS for water jug problem	3	06-02-2023		DM5	
2.	Implementation of BFS for tic-tac-toe problem	3	13-02-2023		DM5	
3.	Implementation of TSP using heuristic approach	3	20-02-2023		DM5	
4.	Implementation of Simulated Annealing Algorithm	3	27-02-2023		DM5	
5.	Implementation of Hill-climbing to solve 8- Puzzle Problem	3	06-03-2023		DM5	
6.	Implementation of Monkey Banana Problem	3	13-03-2023		DM5	
7.	FIND-S algorithm	3	20-03-2023		DM5	
8.	candidate elimination algorithm	3	03-04-2023		DM5	
9.	decision tree classifier	3	10-04-2023		DM5	
10.	Decision tree regressor	3	17-04-2023		DM5	
11.	Random Forest classifier	3	24-04-2023		DM5	
12.	Random Forest classifier	3	01-05-2023		DM5	
13.	Logistic Regression	3	08-05-2023		DM5	
14.	Logistic Regression	3	15-05-2023		DM5	
15.	Internal exam	3	22-05-2023			

Teaching Learning Methods			
DM1	Chalk and Talk	DM4	Assignment/Test/Quiz
DM2	ICT Tools	DM5	Laboratory/Field Visit
DM3	Tutorial	DM6	Web-based Learning

## PART-C

### PROGRAMME OUTCOMES (POs):

<b>PO 1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO 2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>PO 3</b>	<b>Design/development of solutions:</b> 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.
<b>PO 4</b>	<b>Conduct investigations of complex problems:</b> 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.
<b>PO 5</b>	<b>Modern tool usage:</b> 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
<b>PO 6</b>	<b>The engineer and society:</b> 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
<b>PO 7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO 8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO 9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO 10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
<b>PO 11</b>	<b>Project management and finance:</b> 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.
<b>PO 12</b>	<b>Life-long learning:</b> 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):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	(Dr. K DeviPriya)	(Dr. K. Devi Priya)	(Dr.D Venakat Subbiah)	(Dr. D. Veeraiah)
Signature				



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**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

## COURSE HANDOUT

### PART-A

**Name of Course Instructor:** Dr.S.Nagarjuna Reddy

**Course Name & Code** : Web Application Development using Full Stack - Module-II  
(Backend Development) & 20CSS1

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

**Credits:** 2

**Program/Sem/Sec** : B.Tech. – CSE(AI&ML)/IV

**A.Y.:** 2022-23

**PREREQUISITE:** Object Oriented Programming and Data Base Management Systems.

**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 the course, student will be able to

<b>CO1</b>	Apply JDBC concepts to establish the communication between Java Applications and database. ( <b>Apply-L3</b> )
<b>CO2</b>	Develop Static and Dynamic Web Applications by using Servlets and Java Server Pages (JSP). ( <b>Apply L3</b> )
<b>CO3</b>	Develop Dynamic Data Driven Web Applications by using Struts2 and Hibernate frameworks. ( <b>Apply L3</b> )
<b>CO4</b>	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
<b>CO1</b>	-	-	2	-	2	-	-	-	-	-	-	-	-	1	3
<b>CO2</b>	-	-	2	-	2	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	-	-	2	-	2	-	-	-	-	-	-	-	-	3	-
<b>CO4</b>	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-
	1 - Low			2 -Medium				3 - High							

**REFERENCE BOOKS:**

<b>R1</b>	Herbert Schildt, "Java: The complete reference", TMH Publications, 7th edition, 2006.
<b>R2</b>	Kathy Sierra & Bert Bates, "Headfirst Servlets and JSP: Passing the Sun Certified Web Component Developer Exam", O'Reilly Publications Second Edition.
<b>R3</b>	Budi Kurniawan, "Struts 2 Design and Programming: A Tutorial", BrainySoftware, 2nd Edition, 2008.
<b>R4</b>	Christian Bauer, Gavin King, Gary Gregory "Java Persistence with Hibernate: Revised Edition of Hibernate in Action Paperback", Manning Publication, 2nd Edition, 2006.

<b>R5</b>	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.
<b>R6</b>	Mahmoud Parsian, "JDBC Recipes: A Problem-Solution Approach", Apress.
<b>R7</b>	Madhusudhan Konda, "Just Hibernate, A Lightweight Introduction to the Hibernate Framework", O'Reilly Media.
<b>R8</b>	Chuck Cavaness, "Programming Jakarta Struts", O'Reilly Media, 2nd Edition.

## **PART-B**

### **COURSE DELIVERY PLAN (LESSON PLAN):**

<b>S.No.</b>	<b>Topics to be covered</b>	<b>No. of Classes Required</b>	<b>Tentative Date of Completion</b>	<b>Actual Date of Completion</b>	<b>Teaching Learning Methods</b>	<b>HOD Sign Weekly</b>
1.	Lab Cycle-1	3	01-02-2023		<b>DM5</b>	
2.	Lab Cycle-1	1	02-02-2023		<b>DM2</b>	
3.	Lab Cycle-1	3	08-02-2023		<b>DM5</b>	
4.	Lab Cycle-1	1	09-02-2023		<b>DM2</b>	
5.	Lab Cycle-1	3	15-02-2023		<b>DM5</b>	
6.	Lab Cycle-1	1	16-02-2023		<b>DM2</b>	
7.	Lab Cycle-2	3	22-02-2023		<b>DM5</b>	
8.	Lab Cycle-2	1	23-02-2023		<b>DM2</b>	
9.	Lab Cycle-3	3	01-03-2023		<b>DM5</b>	
10.	Lab Cycle-3	1	02-03-2023		<b>DM2</b>	
11.	Lab Cycle-3	1	09-03-2023		<b>DM2</b>	
12.	Lab Cycle-4	3	15-03-2023		<b>DM5</b>	
13.	Lab Cycle-4	1	16-03-2023		<b>DM2</b>	
14.	Lab Cycle-4	1	23-03-2023		<b>DM2</b>	
15	Project Design Phase	1	06-04-2023		<b>DM4</b>	
16	Lab Cycle-5	3	12-04-2023		<b>DM5</b>	
17	Lab Cycle-5	1	13-04-2023		<b>DM2</b>	
18	Lab Cycle-5	3	19-04-2023		<b>DM5</b>	
19	Project Design Phase	1	20-04-2023		<b>DM4</b>	
20	Lab Cycle-6	3	26-04-2023		<b>DM5</b>	
21	Lab Cycle-6	1	27-04-2023		<b>DM2</b>	
22	Lab Cycle-6	3	03-05-2023		<b>DM5</b>	
23	Lab Cycle-6	1	04-05-2023		<b>DM1</b>	
24	Project Backend Connectivity	3	10-05-2023		<b>DM4</b>	
25	Lab Cycle-7	1	11-0-5-2023		<b>DM1</b>	
26	Lab Cycle-7	3	17-05-2023		<b>DM5</b>	
27	Lab Cycle-8	1	18-05-2023		<b>DM1</b>	
28	Lab Cycle-8	3	24-05-2023		<b>DM5</b>	
29	Project Execution	1	25-05-2023		<b>DM4</b>	

### **Teaching Learning Methods**

<b>DM1</b>	Chalk and Talk	<b>DM4</b>	Assignment/Test/Quiz
<b>DM2</b>	ICT Tools	<b>DM5</b>	Laboratory/Field Visit
<b>DM3</b>	Tutorial	<b>DM6</b>	Web-based Learning

## **PART-C**

### **EVALUATION PROCESS (R20 Regulation):**

<b>Evaluation Task</b>	<b>Marks</b>
Report	10
Quality of work	10
Presentation	20
Interaction / Queries	10
Total	50

**PART-D:**  
**PROGRAM OUTCOMES**

PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem analysis:</b> 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	<b>Design/development of solutions:</b> 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	<b>Conduct investigations of complex problems:</b> 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	<b>Modern tool usage:</b> 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	<b>The engineer and society:</b> 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	<b>Environment and sustainability:</b> 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	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to
PO 11	<b>Project management and finance:</b> 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	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAMME SPECIFIC OUTCOMES**  
**(PSOs):**

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	(Dr. S. Nagarjuna Reddy)	(Dr.. K. Devi Priya)	(Dr. K.NAGA PRASANTHI)	(Dr. D. Veeraiah)
Signature				