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

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. NARENDRA BABU P
Course Name & Code : Pattern Recognition (20CS20)
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech / VI Sem AI & DS/A **A.Y.:** 2024-25

PREREQUISITE: Basic knowledge of probability & statistics, Data Mining
The main objective of the course is that the concept of a pattern and the fundamentals of pattern recognition and its relevance to classical and modern problems and to be able to identify where, when and how pattern recognition can be applied.

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

CO1	Understand the primitives of Pattern Recognition.(Understand-L2)
CO2	Understand the fundamental concepts of Bayesian approach. (Apply–L3)
CO3	Understand Bayesian classifier with respect to its parameter estimation. (Understand-L2)
CO4	Gain knowledge of Mixture densities and clustering techniques. (Understand- L)
CO5	Develop a statistical frame work for Speech Recognition.(Apply-L3)

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

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

TEXTBOOKS:

T1: Pattern classifications, Richard.O.Duda, Peter.E..Hart, David.G.Stroke.Wiley's student edition, Second Edition 2004.

T2: Pattern Recognition, an Introduction, V Susheela Devi, M NarasimhaMurthy, University Press, 2010

T3: Fundamentals of speech Recognition, Lawerence Rabiner, Biing-Hwang Juang Pearson Education

Reference Books:

R1: R.C Gonzalez and R.E.Woods,—Digital Image Processing ‖,Addison Wesley,1992.

R2: Pattern Recognition and Image Analysis–Earl Gose, Richard John baugh, Steve Jost PHI 2004.

R3: Pattern Recognition, Sergios The odoridis, Konstantinos Koutroumbas, Academic Press, Elsevier, 4ed.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Pattern Recognition

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and COs discussion, Pattern Recognition Syllabus Discussion	1	03-12-2024		1 & 2	
2.	Introduction	1	05-12-2024		1 & 2	
3.	Pattern Recognition Example	1	06-12-2024		1 & 2	
4.	Example	1	07-12-2024		1 & 2	
5.	Pattern Recognition Systems	1	10-12-2024		1 & 2	
6.	The Design Cycle	1	12-12-2024		1 & 2	
7.	Learning and adaptation	1	13-12-2024		1 & 2	
8.	**Bayesian Decision Theory:** Introduction	1	14-12-2024		1 & 2	
9.	continuous features–two categories classifications	1	17-12-2024		1 & 2	
10.	minimum error –rate classification	1	19-12-2023		1 & 2	
11.	zero–one loss function	1	20-12-2023		1 & 2	
12.	classifiers	1	21-12-2023		1 & 2	
13.	discriminate functions	1	24-12-2024		1 & 2	
14.	decision Surface	1	26-12-2024		1 & 2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Normal density

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	**Normal density:** Univariate density	1	27-12-2024		1 & 2	
16.	multivariate density	1	28-12-2024		1 & 2	
17.	discriminate functions for the normal Density case-1	1	31-12-2024		1 & 2	
18.	Case – 2	1	02-01-2025		1 & 2	
19.	Case – 3	1	03-01-2025		1 & 2	
20.	Bayes decision theory–discrete features	1	04-01-2025		1 & 2	
21.	compound Bayesian decision theory and context	1	07-01-2025		1 & 2	
22.	compound Bayesian decision theory and context	1	09-01-2025		1 & 2	
No. of classes required to complete UNIT-II: 8				**No. of classes taken:**		

UNIT-III: Maximum likelihood and Bayesian parameter estimation

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
23.	**Maximum likelihood and Bayesian parameter estimation:** Introduction	1	10-01-2025		1 & 2	
24.	maximum likelihood Estimation	1	11-01-2025		1 & 2	
25.	The Gaussian Case : Unknown μ	1	21-01-2025		1 & 2	
26.	The Gaussian μ Case : Unknown μ and ∑	1	23-01-2025		1 & 2	
27.	Bayesian parameter estimation– Gaussian case.	1	24-01-2025		1 & 2	
28.	Bayesian estimation,	1	25-01-2025		1 & 2	
29.	Bayesian parameter estimation– Gaussian case	1	28-01-2025		1 & 2	
30.	The Univariate Case : p(x|D)	1	30-01-2025		1 & 2	
No. of classes required to complete UNIT-III: 8				**No. of classes taken:**		

UNIT-IV: Un-supervised learning and clustering

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.	**Un-supervised learning and clustering:** Introduction	2	11-02-2025 13-02-2025		1 & 2	
32.	mixture densities and identifiability	2	13-02-2025 14-02-2025		1 & 2	
33.	maximum likelihood estimates	2	15-02-2025 18-02-2025		1 & 2	
34.	application to normal mixtures case-1	1	20-02-2025		1 & 2	
35.	Case - 2	1	21-02-2025		1 & 2	
36.	K- means clustering	1	22-02-2025		1 & 2	
37.	Date description and clustering– similarity measures	2	25-02-2025 27-02-2025		1 & 2	
38.	criteria function for clustering.	2	28-02-2025 01-03-2025		1 & 2	
No. of classes required to complete UNIT-IV: 13				**No. of classes taken:**		

UNIT-V: Pattern recognition using discrete hidden Markov models

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
39.	**Pattern recognition using discrete hidden Markov models:** Discrete-time Markov process	2	04-03-2025 06-03-2025		1 & 2	
40.		3	07-03-2025 08-03-2025 11-03-2025			
41.	Extensions to hidden Markov models	2	13-03-2025 15-03-2025		1 & 2	
42.	Classification using HMMs	2	18-03-2025 20-03-2025		1 & 2	
43.	Three basic Problems using HMMs	2	21-03-2025 22-03-2025		1 & 2	
44.	Types of HMMs	2	25-03-2025		1 & 2	
45.	Revision	3	27-03-2025 28-03-2025 29-03-2025		1 & 2	
No. of classes required to complete UNIT-V: 14				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Mr.Narendra Babu P**	**Mr.Narendra Babu P**	**Dr.V.Surya Narayana**	**Dr.O.RamaDevi**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: K. SUDHAKAR

Course Name & Code **:** BIGDATA ANALYTICS & 20CS19

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

Program/Sem/Sec : B.Tech/VI/A-Sec **A.Y.:** 2024-25

PREREQUISITE: - Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

Understanding the process of distributed data (Structured, Semi-Structured and Unstructured) that process the Terabytes of data using Hadoop Eco System Tools.

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

CO1	Identify Big Data and its Business Implications. **(Understand-L2)**
CO2	Process of distributed file system using Hadoop. **(Apply-L3)**
CO3	Illustrate the Map Reduce mechanism. **(Apply-L3)**
CO4	Develop Structured data processing tools. **(Apply-L3)**
CO5	Develop semi/ unstructured data processing tools. **(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	1	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	-	2	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	2	-	-	-
CO4	2	3	-	-	1	-	-	-	-	-	-	2	-	-	-
CO5	2	3	-	-	1	-	-	-	-	-	-	2	-	-	-
1 - Low **2 –**Medium **3 -** High															

TEXTBOOKS:

T1 Tom White" Hadoop: The Definitive Guide" Third Edit, O'reilyMedia,2012.

T2 Big Data and Analytics, 2ed Seema Acharya, Subhashini Chellappan, Wiley2015.

REFERENCE BOOKS:

- R1: Michael Berthold, DavidJ. Hand,"Intelligent Data Analysis," Springer,2007.
- R2: Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013).
- R3: Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
- R4AnandRajaramanandJefreyDavidUlman,"MiningofMassiveDatasets", CambridgeUniversityPress,2012.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction to Big data

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CO Discussion	1	02-12-2024		TLM2	
2.	Introduction to Big data	1	04-12-2024		TLM2	
3.	Types of Digital Data, Classification of Digital Data	1	06-12-2024		TLM2	
4.	Characteristics of Data	1	07-12-2024		TLM2	
5.	Evolution of Big Data	1	09-12-2024		TLM2	
6.	Definition of Big Data, Challenges with Big Data	1	11-12-2024		TLM2	
7.	What is Big Data? Other Characteristics of Data Which are not Definitional Traits of Big Data	1	16-12-2024		TLM2	

8.	Why Big Data? analyzing Data with Unix tools	1	17-12-2024		TLM2	
9.	Analyzing Data with Hadoop	1	18-12-2024		TLM2	
10.	Analyzing Data with Hadoop	1	19-12-2024		TLM2	
11.	Hadoop Streaming	1	20-12-2024		TLM2	
12.	Hadoop Streaming	1	21-12-2024		TLM2	
13.	Hadoop Echo System	1	23-12-2024		TLM2	
14.	Hadoop Echo System	1	26-12-2024		TLM2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Hadoop Distributed File System

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	The Design of HDFS	1	27-12-2024		TLM2	
16.	HDFS Concepts	1	28-12-2024		TLM2	
17.	Command Line Interface	1	30-12-2024		TLM2	
18.	Hadoop file system interfaces	1	02-01-2025		TLM2	
19.	Dataflow, Data Ingestion with Sqoop and Hadoop archives,	1	03-01-2025		TLM2	
20.	Dataflow, Data Ingestion with Sqoop and Hadoop archives,	1	04-01-2025		TLM2	
21.	Hadoop I/O: Compression	1	06-01-2025		TLM2	
22.	Serialization	1	08-01-2025		TLM2	
23.	Avro and File-Based Data structures	1	09-01-2025		TLM2	
24.	Bigdata Applications	1	10-01-2025		TLM2	
25.	Bigdata Analytics Use cases	1	11-01-2025		TLM2	

26	Bigdata Analytics Use cases	1	20-01-2025		TLM2	
27.	Bigdata Analytics Challenges	1	22-01-2025		TLM2	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: Map Reduce Technique

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	How Map Reduce works?	1	23-01-2025		TLM2	
29.	Anatomy of a Map Reduce Job Run	1	24-01-2025		TLM2	
30.	Job Failures	1	25-01-2025		TLM2	
31.	Job Scheduling	1	27-01-2025		TLM2	
32.	Job Scheduling	1	29-01-2025		TLM2	
33.	Shuffle and Sort	1	30-01-2025		TLM2	
34.	Shuffle and Sort	1	31-01-2025		TLM2	
35.	Task Execution	1	01-02-2025		TLM2	
36.	Task Execution	1	10-02-2025		TLM2	
37.	Map Reduce Types and Formats	1	12-02-2025		TLM2	
38.	Map Reduce Types and Formats	1	13-02-2025		TLM2	
39.	Map Reduce Features	1	14-02-2025		TLM2	
40.	Map Reduce Features	1	15-02-2025		TLM2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Structured Data Processing Tools

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Hive: Installation	1	17-02-2025		TLM2	
42.	Running Hive	1	19-02-2025		TLM2	
43.	Hive QL	1	20-02-2025		TLM2	

44.	Tables, Querying Data	1	21-02-2025		TLM1	
45.	User Defined functions	1	22-02-2025		TLM1	
46.	Sqoop: Introduction	1	24-02-2025		TLM1	
47.	generate code	1	27-02-2025		TLM1	
48.	Database import	1	28-02-2025		TLM1	
49.	Database import	1	01-03-2025		TLM1	
50.	working with imported data	1	03-03-2025		TLM1	
51.	working with imported data	1	05-03-2025		TLM1	
52.	Importing large objects	1	06-03-2025		TLM1	
53.	Importing large objects	1	07-03-2025			
54.	performing an export	1	08-03-2025			
55.	performing an export	1	10-03-2025			
56.	Applications	1	12-03-2025			
57.	Applications	1	13-03-2025			
No. of classes required to complete UNIT-IV: 16				**No. of classes taken:**		

UNIT-V: Semi-structured and unstructured Data Processing Tools Pig

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
58.	Introduction to PIG	1	14-03-2025		TLM1	
59.	Execution Modes of Pig	1	15-03-2025		TLM1	
60.	Comparison of Pig with Databases	1	17-03-2025		TLM2	
61.	Grunt, Pig Latin	1	19-03-2025		TLM2	
62.	User Defined Functions	1	20-03-2025		TLM2	
63.	Data Processing operators	1	22-03-2025		TLM2	
64.	HBase: Basics	1	24-03-2025		TLM2	
65.	Concepts, Clients	1	26-03-2025		TLM2	
66.	Example	1	27-03-2025		TLM2	

67.	HBase Versus RDBMS	1	28-03-2025		TLM2	
No. of classes required to complete UNIT-V: 10				**No. of classes taken:**		

CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
68.	BDA Use case – I	1	01-04-2025		TLM2	
				No. of classes taken:08		

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software projects. 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	**K. Sudhakar**	**Dr.K.Devi Priya**	**Dr.V.Surya Narayana**	**Dr. O. Rama Devi**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. M.KISHORE KUMAR
Course Name & Code : Deep Learning (20AD07)
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/ VI Sem /A **A.Y.:** 2024-25
PREREQUISITE : **Probability and Statistics, LATT, Machine Learning**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of the course is to make students learn the frameworks of deep learning and their application

CO1	Apply the fundamentals of linear algebra to machine learning algorithms. **(Apply-L3)**
CO2	Understand the fundamental building blocks of deep learning **(Understand- L2)**
CO3	Apply the concepts of Convolution Neural Networks to computer vision applications. **(Apply-L3)**
CO4	Apply the concepts of Recurrent Neural Networks to Natural Language Processing. **(Apply-L3)**
CO5	Apply the regularization techniques to improve the model performance. **(Apply-L3)**

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

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

TEXTBOOKS:

T1 Deep Learning, Ian Good fellow,Yoshua Bengio and Aaron Courvile,MIT Press,2016

T2 Deep Learning with Python, Francois Chollet, Manning Publications, Released December 2017.

T3 Deep Learning Illustrated :A Visual, Interactive Guide to Artificial Intelligence–Jon Krohn, Grant Beyleveld, AglaéBassens, Released September 2019, Publisher(s): Addison-Wesley Professional,ISBN:9780135116821

T4 Deep Learning from Scratch - Weidman,ReleasedSeptember2019,Publisher(s):O'Reilly Media, Inc., ISBN: 9781492041412

REFERENCE BOOKS:

R1 Artificial Neural Networks,Yegnanarayana,B.,PHILearningPvt.Ltd,2009

R2 Matrix Computations,Golub,G.,H.,andVanLoan,C.,F,JHUPress,2013.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Mathematical foundations of Deep 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
1.	Mathematical foundations of Deep Learning	1	02/12/2024		TLM1,2	
2.	Multiplying Matrices and Vectors	2	03/12/2024 – 05/12/2024		TLM1,2	
3.	Identity and Inverse Matrices	1	07/12/2024		TLM1,2	
4.	Linear dependence and Span	2	09/12/2024 – 10/12/2024		TLM1,2	
5.	Norms	2	12/12/2024 – 14/12/2024		TLM1,2	
6.	Special kinds of matrices and vectors	1	16/12/2024		TLM1,2	
7.	Trace operations	1	17/12/2024		TLM1,2	
8.	Eigen Decomposition	2	19/12/2024 – 21/12/2024		TLM1,2	
No. of classes required to complete UNIT-I: 12				**No. of classes taken:**		

UNIT-II: Fundamentals of Deep 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
9.	Anatomy of Neural Networks: Layers, Models, Loss functions and optimizers	4	23/12/2024 – 28/12/2024		TLM1,2	
10.	Training Deep Networks: Cost Functions , Optimizers	3	30/12/2024 – 31/12/2024		TLM1,2	
11.	Types of Deep Neural Networks	2	02/01/2025 – 04/01/2025		TLM1,2	
No. of classes required to complete UNIT-II: 09				**No. of classes taken:**		

UNIT-III: Convolution Neural Networks

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Motivation	1	07/01/2025		TLM1,2	
13.	Convolution Operation	1	09/01/2025		TLM1,2	
14.	Types of layers	2	20/01/2025 – 21/01/2025		TLM1,2	
15.	Pooling	2	23/01/2025 – 25/01/2025		TLM1,2	
16.	LENET5Architecture	3	27/01/2025– 30/01/2025		TLM1,2	
No. of classes required to complete UNIT-III: 09				**No. of classes taken:**		

UNIT-IV: Recurrent Neural Networks

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
17.	Architecture of traditional RNN	2	10/02/2025 – 11/02/2025		TLM1,2	
18.	Types and applications of RNN	2	13/02/2025 - 15/02/2025		TLM1,2	
19.	Variants of RNNs	2	17/02/2025 – 18/02/2025		TLM1,2	
20.	Word Embedding using Word2vec	4	20/02/2025 – 25/02/2025		TLM1,2	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Cluster Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
21.	Introduction to Regularization for Deep Learning	1	27/02/2025		TLM1,2	
22.	L1 and L2 Regularizations	2	01/03/2025 03/03/2025		TLM1,2	
23.	Dropout	1	04/03/2025		TLM1,2	
24.	Data Augmentation and Early Stopping	1	06/03/2025		TLM1,2	
25.	Case study on MNIST data	2	10/03/2025 11/03/2025		TLM1,2	
26.	Introduction to Auto encoders	1	13/03/2025		TLM1,2	
27.	Architecture and Implementation	2	15/03/2025 – 17/03/2025		TLM1,2	
28.	Denoising Auto encoders	1	18/03/2025		TLM1,2	
29.	Sparse Auto encoders	1	20/03/2025		TLM1,2	
30.	Use cases	2	22/03/2025 – 24/03/2025		TLM1,2	
31.	Projects and evaluation	2	25/03/2025 – 27/03/2025		TLM1,2	
No. of classes required to complete UNIT-V: 16				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PO 12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**M.Kishore Kumar**	**K.Venkatesh**	**Dr. V.Surya Narayana**	**Dr. O. Rama Devi**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. V. Suryanarayana
Course Name & Code : SOFTWARE ENGINEERING & 20IT01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem : B.Tech./VI/A SEC **A.Y.:** 2024-25

PREREQUISITE: Object Oriented Programming.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to provide an understanding of different s/w process models and how to choose one among them by gathering the requirements from a client and specifying them. Using those requirements in the design of the software architecture based on the choices with the help of modules and interfaces. To enable s/w development, by using different testing techniques like unit, integration and functional testing, quality assurance can be achieved.

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

CO1	Understand the fundamentals of software engineering concepts and software Process models. **(Understand-L2)**
CO2	Apply the requirement elicitation techniques for preparing SRS and design engineering. **(Apply-L3)**
CO3	Understanding the basic building blocks of UML, Class, and object diagrams. **(Understand-L2)**
CO4	Apply behavioral models for real world applications. **(Apply-L3)**
CO5	Demonstrate different software testing approaches for testing real time applications. **(Understand-L2)**

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

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

TEXTBOOKS:

T1 Roger S. Pressman, "Software engineering- A practitioner 's Approach", TMH International Edition,6th edition, 2005.
T2 Grady Booch, James Rum Baugh, Ivar Jacobson, "The Unified Modeling Language User Guide",PEARSON,4thImpression,2012.

REFERENCE BOOKS:

1. Software Engineering- Concepts and practices: Ugrasen Suman, Cengage learning
2. Object- oriented analysis and design using UML", Mahesh P. Matha, PHI
3. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI
4. https://onlinecourses.nptel.ac.in/noc20_cs68 **[1,2,3,4,5]**

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Software and software Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	CEOs and COs discussion	1	02-12-2024		TLM1	
2.	The evolving role of Software	1	03-12-2024		TLM1/TLM2	
3.	Characteristics of Software	1	04-12-2024		TLM1/TLM2	
4.	Importance of software Engineering,	1	07-12-2024		TLM1/TLM2	
5.	Changing nature of software	1	09-12-2024		TLM1/TLM2	
6.	Legacy Software	1	10-12-2024		TLM1/TLM2	
7.	Software Myths	1	11-12-2024		TLM1/TLM2	
8.	Software process model:layered technology	1	14-12-2024		TLM1/TLM2	
9.	Process framework The process and product	1	16-12-2024		TLM1/TLM2	
10.	Waterfall model	1	17-12-2024		TLM1/TLM2	
11.	Incremental model	1	18-12-2024		TLM1/TLM2	
12.	Spiral and V model	1	21-12-2024		TLM1/TLM2	
13.	Component based s/w development	1	23-12-2024		TLM1/TLM2	
14.	Unified Process model	1	24-12-2024		TLM1/TLM2	
No. of classes required to complete UNIT-I: 14				**No. of classes taken:**		

UNIT-II: Requirements Analysis and Software design

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
15.	Requirements gathering	1	28-12-2024		TLM1/TLM2	
16.	Requirement analysis	1	30-12-2024		TLM1/TLM2	
17.	Software requirement specification	1	31-12-2024		TLM1/TLM2	
18.	SRS document case study	1	04-01-2025		TLM1/TLM2	
19.	Overview of design process	1	06-01-2025		TLM1/TLM2	
20.	Design concepts	1	07-01-2025		TLM1/TLM2	
21.	Architectural concepts	1	08-01-2025		TLM1/TLM2	
22.	Examples	1	11-01-2025		TLM1/TLM2	
23.	Revision	1	18-01-2025		TLM1/TLM3	
No. of classes required to complete UNIT-II: 9				**No. of classes taken:**		

UNIT-III: Design using UML

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Building Blocks of UML	1	20-01-2025		TLM1/TLM2	
25.	Defining things	1	21-01-2025		TLM1/TLM2	
26.	Defining relationships and diagrams	1	22-01-2025		TLM1/TLM2	
27.	Common Mechanism in UML	1	25-01-2025		TLM1/TLM2	
28.	Class diagrams	1	27-01-2025		TLM1/TLM2	
29.	Examples	1	28-01-2025		TLM1/TLM2	
30.	Object diagrams and examples	1	29-01-2025		TLM1/TLM2	
31.	Revision	1	01-02-2025		TLM1/TLM3	
No. of classes required to complete UNIT-III: 08				**No. of classes taken:**		

UNIT-IV: Behavioral Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
32.	Interactions	1	10-02-2025		TLM1/TLM2	
33.	Interaction diagrams	1	11-02-2025		TLM1/TLM2	
34.	Use-cases	1	12-02-2025		TLM1/TLM2	
35.	Use-case diagrams	1	15-02-2025		TLM1/TLM2	
36.	Activity diagrams	1	17-02-2025		TLM1/TLM2	
37.	Events and signals, state machines	1	18-02-2025		TLM1/TLM2	
38.	processes and Threads, time,and space	1	19-02-2025		TLM1/TLM2	
39.	State chart diagrams	1	22-02-2025		TLM1/TLM2	
40.	Component diagrams	1	24-02-2025		TLM1/TLM2	
41.	Deployment diagrams	1	25-02-2025		TLM1/TLM2	
42.	Examples	1	01-03-2025		TLM1/TLM2	
43.	Revision	1	03-03-2025		TLM1/TLM3	
No. of classes required to complete UNIT-IV: 11				**No. of classes taken:**		

UNIT-V: Testing Techniques

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching LearningMethods	HOD Sign Weekly
44.	Software testing fundamentals	2	04-03-2025		TLM1/TLM2	
45.	Unit testing	1	05-03-2025		TLM1/TLM2	
46.	Integration testing	1	08-03-2025		TLM1/TLM2	
47.	Blackbox testing	1	10-03-2025		TLM1/TLM2	
48.	Whitebox testing	1	11-03-2025		TLM1/TLM2	
49.	Debugging	1	12-03-2025		TLM1/TLM2	
50.	System testing	1	15-03-2025		TLM1/TLM2	
51.	Examples	1	17-03-2025		TLM1/TLM2	
52.	Revision	1	18-03-2025		TLM1/TLM3	
No. of classes required to complete UNIT-V:10				**No. of classes taken:**		

Content Beyond the Syllabus:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching LearningMethods	HOD Sign Weekly
1.	Case study version control	1	19-03-2025		TLM1	
2.	Case study test case preparation	1	20-03-2025		TLM1	

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

PART-C

EVALUATION PROCESS (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.V Suryanarayana**	**Dr. M. Srinivasa Rao**	**Dr. Ch. Rajendra Babu**	**Dr. O. Rama Devi**
Signature				

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Phone: 08659-222933, Fax: 08659-222931
DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.Mallikarjuna Rao Dandu, Sr. Assistant Professor
Course Name & Code : Operations Research Techniques - 20ME83 **Regulation**: R20
L-T-P Structure : **4-0-0** **Credits:** 03
Program/Sem/Sec : B.Tech- AI&DS VI Sem A/S **A.Y.:** 2024-25

PREREQUISITE : **Nil**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to introduce the concepts of formulating an engineering problem into mathematical model to develop an optimal solution.

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

CO1	Apply linear programming approach for optimizing the objectives of industrial oriented problems. **(Applying-L3)**
CO2	Formulate and solve transportation models and assignment models**. (Applying-L3)**
CO3	Implement the strategies in competitive situations and able to sequence the jobs to be processed on machines. **(Applying-L3)**
CO4	Identify the replacement period of the equipment and analyze the waiting situations in an organization. **(Applying-L3)**
CO5	Determine the optimum inventory level and resolve the complex problem into simple problems by dynamic programming approach and apply optimum strategies. **(Applying-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	2	3				3			3		3	
CO2	3	3	1	2	1				3			3		3	
CO3	3	3	3	2	1				3			3		3	
CO4	3	2	3	2	3				1			3		3	
CO5	2	3	3	2	1				1			3		3	

TEXT BOOKS:

T1	S.D Sharma, ―Operation Research‖, Kedar Nath and RamNath - Meerut, 2008.
T2	Operations Research / N.V.S. Raju / SMS, 2009.

REFERENCE BOOKS:

R1	Singiresu S Rao, Engineering Optimization: Theory and Practice, A Wiley- Interscience Publication, 4th edition, 2009.
R2	Hiller & Libermann, Introduction to O.R (TMH), 9th EDITION, 2009.
R3	Kantiswarup. P.K.Gupta, Man Mohan, Operations Research, Sultan Chand & Sons, Educational Publications, New Delhi, 14th Edition, 2008.
R4	A.M.Natarajan, P.Balasubramani, A. Tamilarasi, Operations Research, Pearson Education, 2nd edition, 2014.
R5	Taha, Introduction to O.R .PHI, 9th edition, 2010.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-A

UNIT-I: INTRODUCTION & LINEAR PROGRAMMING PROBLEM

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**: Introduction To ORT & CEO, COs	1	02-12-2024		TLM1/TLM2	
2.	Operations Research Models, Phases & Applications	1	04-12-2024		TLM1/TLM2	
3.	**Linear Programming Problem (LPP)**: Formulation	1	06-12-2024		TLM1	
4.	Numerical	1	07-12-2024		TLM1	
5.	Graphical Solution For Special Cases Of LPP	1	09-12-2024		TLM1	
6.	Simplex Method	1	11-12-2024		TLM1	
7.	Numerical	1	13-12-2024		TLM1	
8.	Numerical	1	14-12-2024		TLM1	
9.	Big M Method	1	16-12-2024		TLM1	
10.	Numerical	1	18-12-2024		TLM1	
11.	Two Phase Simplex Method	1	20-12-2024		TLM1	
12.	Numerical	1	21-12-2024		TLM1	
13.	Big M method	1	23-12-2024		TLM1	
14.	Numerical	1	27-12-2024		TLM1	
No. of classes required to complete UNIT-I:		**14**		**No. of classes taken:**		

UNIT-II: TRANSPORTATION & ASSIGNMENT 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
15.	Introduction To TP, Terminology, Formulation	1	28-12-2024		TLM1/TLM2	
16.	Standard Form, Unbalanced TP	1	30-12-2024		TLM1	
17.	Numerical	1	01-01-2025		TLM1	
18.	IBFS: NWCM, LCM, VAM	1	03-01-2025		TLM1	
19.	Numerical	1	04-01-2025		TLM1	
20.	Test For Optimality: Stepping Stone Method, Modified Distribution Method (MODI Method)	1	06-01-2025		TLM1	
21.	Numerical	1	08-01-2025		TLM1	
22.	Degeneracy in TP, numerical	1	10-01-2025		TLM1	
23.	Introduction to Assignment Problem	1	11-01-2025		TLM1	
24.	Variants of Assignment Problems	1	20-01-2025		TLM1	
25.	Optimal Solution, Numerical	1	22-01-2025		TLM1	
26.	Travelling Salesmen Problem	1	24-01-2025		TLM1	
27.	Numerical	1	25-01-2025		TLM1	
No. of classes required to complete UNIT-II		13		**No. of classes taken:**		

UNIT-III: GAME THEORY AND JOB SEQUENCING

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
28.	**Introduction to Games Theory**: Terminology	1	27-01-2025		TLM1/TLM2	
29.	Minimax or Maximin Criterion, Optimal Strategy	1	27-01-2025		TLM1	
30.	Solution of games with saddle point	1	29-01-2025		TLM1	
31.	Rectangular games without saddle point, Numerical	1	31-01-2025		TLM1	
32.	2x2 games	1	01-02-2025		TLM1	
33.	mx2, 2xn, m X n games, Dominance Principle,	1	10-02-2025		TLM1	
34.	Graphical approach, Numerical	1	12-02-2025		TLM1	
35.	**Job Sequencing:** n jobs through 2 machines,	1	14-02-2025		TLM1	
36.	n jobs through 3 machines,	1	15-02-2025		TLM1	
37.	2 jobs through m machines	1	17-02-2025		TLM1	
38.	Numerical	1	19-02-2025		TLM1	
39.	Graphical model	1	21-02-2025		TLM1	
No. of classes required to complete UNIT-III		12		**No. of classes taken:**		

UNIT-IV: THEORY OF REPLACEMENT AND WAITING LINES

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.	**THEORY OF REPLACEMENT:** Introduction, Replacement of Equipment that Deteriorates Gradually	1	22-02-2025		TLM1/TLM2	
41.	Numerical	1	24-02-2025		TLM1	
42.	Replacement of Equipment that fails suddenly, Numerical	1	28-02-2025		TLM1	
43.	Numerical	1	01-03-2025		TLM1	
44.	Group Replacement Policy	1	03-03-2025		TLM1/TLM2	
45.	Numerical	1	05-03-2025		TLM1	
46.	**Introduction to Queuing Theory**	1	07-03-2025		TLM1/TLM2	
47.	Single Channel – Poisson arrivals – exponential service times – with infinite population, Derivation	1	08-03-2025		TLM1	
48.	Numerical	1	10-03-2025		TLM1	
49.	Single Channel – Poisson arrivals – exponential service times – with finite population, Numerical	1	12-03-2025		TLM1/TLM2	
50.	Numerical	1	14-03-2025		TLM1	
No. of classes required to complete UNIT-IV		12		**No. of classes taken:**		

UNIT-V: INVENTORY MODELS AND 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
52.	**INVENTORY MODELS**-terminology, EOQ	1	15-03-2025		TLM1/TLM2	
53.	Instantaneous Production, finite, continuous demand	1	17-03-2025		TLM1/TLM2	
54.	Shortages not Allowed	1	19-03-2025		TLM1	
55.	Purchase inventory models with one price break	1	21-03-2025		TLM1	
56.	Purchase inventory models with multiple price breaks	1	22-03-2025		TLM1	
57.	Numerical	1	24-03-2025		TLM1	
58.	**DYNAMIC PROGRAMMING (DP):** Introduction To DP	1	26-03-2025		TLM1/TLM2	
59.	Bellman's Principle of Optimality, Applications of Dynamic Programming	1	28-03-2025		TLM1/TLM2	
60.	Capital Budgeting Problem, Numerical	1	29-03-2025		TLM1	
61.	linear programming problem	1	02-04-2025		TLM1	
62.	Shortest path problems	1	03-04-2025		TLM1	
63.	Numerical	1	04-04-2025		TLM1	
No. of classes required to complete UNIT-V		12		**No. of classes taken:**		

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

.

Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	02-12-2024	01-02-2025	9
I MID Examinations	03-02-2025	08-02-2025	1
II Phase of Instructions	10-02-2025	05-04-2025	8
II MID Examinations	07-04-2025	12-04-2025	1
Preparation and Practical	14-04-2025	19-04-2025	1
Semester End Examinations	21-04-2025	03-05-2025	2

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1	To Attain a solid foundation in Electronics & Communication Engineering fundamentals with an attitude to pursue continuing education.
PEO 2	To Function professionally in the rapidly changing world with advances in technology.
PEO 3	To Contribute to the needs of the society in solving technical problems using Electronics & Communication Engineering principles, tools and practices.
PEO 4	To Exercise leadership qualities, at levels appropriate to their experience, which addresses issues in a responsive, ethical, and innovative manner.

PROGRAMME OUTCOMES (POs):

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**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.
PO4	**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.
PO5	**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.
PO6	**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.
PO7	**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.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Design and develop modern communication technologies for building the interdisciplinary skills to meet current and future needs of industry.
PSO 2	Design and Analyze Analog and Digital Electronic Circuits or systems and Implement real time applications in the field of VLSI and Embedded Systems using relevant tools.
PSO 3	Apply the Signal processing techniques to synthesize and realize the issues related to real time applications.

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mr. Mallikarjuna Rao Dandu	Mr. V. Sankararao	Dr. M. B. S. Sreekara Reddy	Dr. M. B. S. Sreekara Reddy

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSEHANDOUT
PART-A

Name of Course Instructor: Dr. M. SRINIVASA RAO / Mr. NARENDRA BABU P
Course Name & Code : CASE TOOLS LAB (20AD 55)
L-T-P Structure : 0-0-3 **Credits:**1.5
Program/Sem/Sec : B.Tech VI Sem AI&DS-A **A.Y.:**2024-25

PRE-REQUISITE: Object Oriented Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of this course is that a student will be familiar with principles behind the Object-Oriented Design and able to apply those principles in a project setting. Students will analyze applications and know how to take a pragmatic approach to software design and development.

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

CO1	Analyze Software Requirements for the given Real-World Application using Use Cases. **(Analyze-L4)**
CO2	Develop the UML Diagrams to view Software System in static aspects. **(Analyze-L4)**
CO3	Develop the UML Diagrams to view Software System in dynamic aspects. **(Analyze-L4)**
CO4	Improve individual /team work skills, communication & report writing skills with Ethical values.

COURSE ARTICULATION MATRIX (Correlation between COs, PO's & PSOs):

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

Note: Enter Correlation Levels **1** or **2** or **3.**

If there is no correlation, **put '-'**

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

PART-B

COURSE DELIVERY PLAN (LESSONPLAN): Section-A

S.No.	Topics to be covered	No.of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Introduction to CO's & PO's	3	04.12.24			
2	Cycle-1: Analyze the Requirements for the following Case Studies. 1) Automated Teller Machine (ATM) 2) Library Management System 3) Railway Ticket Reservation System	6	11.12.24 18.12.24		TLM4	
3	Cycle-2: Analyze the Requirements for the following Case Studies. 1) Point-of-Sale Terminal 2) Customer Support Service Operations 3) Cab Booking Service	6	08.01.25 22.01.25		TLM4	
4	Cycle-3: Basics of UML 1) Introduction to UML 2) Familiarization with any one of the Software such as Rational Rose or Umbrella or Gliffy Diagram etc.	6	29.01.25 12.02.25		TLM4	
5	Cycle-4: For each case study given earlier, Construct Use Case Diagram for following: 1) Identify and Analyze the Actors. 2) Identify the Actions. 3) Analyze the Relationships between Actors and Actions. 4) Sketch the Use Case Diagram.	3	19.02.25		TLM4	
6	Cycle-5 and Cycle-6: For each case study given earlier, Construct Class Diagram in the following manner: 1) Identify and Analyze the Classes related to your problem. 2) Analyze the Attributes and Operations 3) Analyze the Relationships between Classes 4) Sketch the Class Diagram	6	26.02.25 05.03.25		TLM4	
7	Cycle7: For each case study given earlier, Construct Interaction Diagrams in the following manner: 1) Identify the Objects participating in Communication. 2) Identify the Messages between the objects. 3) Give numbering to messages. 4) Use Flat Sequencing or Procedural Sequencing for numbering.	3	12.03.25		TLM4	
8	Cycle-8: For each case study given earlier, Construct Activity Diagram in the following manner: 1) Identify activities in your case	3	19.03.25		TLM4	

	study. 2) Identify relationships among activities. 3) Use Fork or Join, if necessary. 4) Sketch the diagram.					
9	Cycle9: For each case study given earlier, Construct State Chart Diagram in the following manner: 1) Identify the different states in your case study. 2) List out the different sub-states present in the state. 3) Identify relationships among the state to state. 4) Sketch the diagram.	3	19.03.25		TLM4	
10	Cycle10: For each case study given earlier, Construct Component Diagram in the following manner: 1) Identify the different components in your case study. 2) Create a visual for each of the component. 3) Describe the organization and relationships between components using interfaces, ports etc. 4) Sketch the diagram.	3	26.03.25		TLM4	
11	Cycle11: For each case study given earlier, Construct Deployment Diagram in the following manner: 1) Identify the nodes. 2) Identify the relationships among the nodes. 3) Sketch the Diagram.	3	26.03.25		TLM4	
12	Internal Exam	3	02.04.25			

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

PART-C

EVALUATION PROCESS (R20Regulations):

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

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

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

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

Parameter	Marks
Procedure/Algorithm	05
Experimentation/ Program execution	10
Observations/Calculations/Validation	10
Result/Inference	05
Viva voce	05
Total	35

PART-D

PROGRAMMEOUTCOMES(POs):

PO1	**Engineering knowledge: Apply the knowledge of mathematics**, science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze Complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs With appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, And synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and Modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the Knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities And norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply the same to one's own work, as a Member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for and have the preparation and ability to Engaging independent and life-long learning in the broadest context of technological change.

PROGRAMMESPECIFICOUTCOMES(PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. NARENDRA BABU P	Mr. NARENDRA BABU P	Dr. V. Suryanarayana	Dr. O.RamaDevi
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

Name of Course Instructor : K. SUDHAKAR
Course Name & Code : DATA ANALYTICS AND VISUALIZATION LAB & 20CS62
L-T-P Structure : **0-0-3**
Credits : 1.5
Program/Sem/Sec : B.Tech /VI/A
A.Y. : 2024-25

PREREQUISITE: - Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment

COURSE EDUCATIONAL OBJECTIVE(CE0):
The Objective of the course is to provide practical, foundation level training that enables immediate and effective participation in Big Data and other Analytics projects using Hadoop and Data Visualization using Tableau.

COURSE OUTCOMES (CO):
CO1: Demonstrate the installation of big data analytic tools. **(Understand–L2)**
CO2: Apply data modeling techniques to large datasets. **(Apply–L3)**
CO3: Conduct exploratory data analysis using visualization. **(Understand–L2)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

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

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

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	HOD Sign
1.	Refreshing Linux Commands and Installation of Hadoop	3	06-12-2024 13-12-2024		
2.	Implementation of Run a basic Word Count Map Reduce program	3	20-12-2024 27-12-2024		
3.	Implementation of Matrix Multiplication with Hadoop Map Reduce	3	03-01-2025		
4.	Implementation of Weather mining by taking weather dataset using Map Reduce	3	10-01-2025		
5.	Installation of Hive along with practice examples	3	24-01-2025		
6.	Installation of Sqoop along with Practice examples	3	31-01-2025		
7.	Downloading and installing Tableau Understanding about importing data, saving, opening, and sharing workbooks	3	14-01-2025		
8.	Data Preparation with Tableau	3	21-01-2025		
9.	Charts: Bar Charts, Legends, Filters, and Hierarchies, Step Charts, Line Charts	3	28-01-2025		
10.	Maps: Symbol Maps, Filled Maps, Density Maps, Maps with Pie Charts	3	07-03-2025		
11.	Interactive Dash boards	3	21-03-2025		

12.	Interactive Dash boards	3	28-03-2025		
13.	Interactive Dash boards	3	04-04-2025		
14.	Lab Internal Exam	3	11-04-2025		

PART-C

PROGRAMME OUTCOMES (POs):

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software projects. 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**
Faculty Name	**K. SUDHAKAR**	**Dr. K. Devi Priya**	**Dr. V. Surya Narayana**	**Dr.O. Rama Devi**
Signature				

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE HANDOUT

PART-A

PROGRAM : B.Tech. VI-Sem.

ACADEMIC YEAR : 2024-25

COURSE NAME & CODE : Deep Learning using Tensor Flow Lab (20AD56)

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

COURSE CREDITS : 1.5

COURSE INSTRUCTOR : Mr. M. Kishore Kumar

COURSE COORDINATOR : Mr. K.Venkatesh

PRE-REQUISITE: Python Programming.

Course Educational Objective: The Objective of the course is to provide practical, foundationlevel training that enables to handle various high dimensional data sets using various deep learning techniques.

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

CO1: Implement deep neural networks to solve real world problems (Apply-L3)
CO2: Choose an appropriate pre-trained model to solve real-time problems. (Analyze – L4)
CO3: Interpret the results of two different deep learning models. (Analyze – L4)
CO4: Improve individual / teamwork skills, communication & report writing skills withethical values.

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

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

DL LAB SCHEDULE (LESSON PLAN): Section-A

Expt. No	Experiments to be conducted	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1	Numerical Methods to solve matrix problems in Python	6	05/12/2024 – 12/12/2024		TLM8	
2	Eigen Value decomposition techniques	6	19/12/2024 – 26/12/2024		TLM8	
3	Dimensionality Reduction-PCA	6	02/01/2025 – 16/01/2025		TLM8	
4	Fundamentals of Tensor flow	6	23/01/2025 – 30/01/2025		TLM8	
5	Build a Convolution Neural Network for MNIST HandwrittenDigit Classification	6	13/02/2025 – 20/02/2025		TLM8	
6	Build a Convolution Neural	3	27/02/2025		TLM8	
7	Network for simple image Classification	3	06/03/2025		TLM8	
8	Implement one hot encoding of words or characters	3	20/03/2025		TLM8	
9	Word 2 vec Framework	3	27/03/2025		TLM8	
10	Implement word embedding for IMDB dataset.	3	03/04/2025		TLM8	

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

PART-C

EVALUATION PROCESS (R20 Regulations):

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

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

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

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

Parameter	**Marks**
Procedure/Algorithm	05
Experimentation/Program execution	10
Observations/Calculations/Validation	10
Result/Inference	05
Viva voce	05
Total	35

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

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