

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(An Autonomous Institution since 2010)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),

An ISO 21001:2018, 14001:2015, 50001:2018 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: Ms. P. SARALA

Course Name & Code : DATA WAREHOUSING & DATA MINING & 23AD04

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

Credits: 3

Program/Sem/Sec : B.Tech V Sem CSE –A Section

A.Y.: 2026-27

PREREQUISITE: Data Structures, Algorithms, Probability & Statistics, Data Base Management Systems

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and datamining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

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

CO1	Design data warehouses to support effective data modeling, integration, and analytical processing.
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications.
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance.
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets.
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively.

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

TEXTBOOKS:

- T1** Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.
- T2** Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

REFERENCE BOOKS:

- R1** Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
- R2** Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.
- R3** (NPTELcourse by Prof.PabitraMitra)http://onlinecourses.nptel.ac.in/noc17_mg24/preview
- R4** http://www.saedsayad.com/data_mining_map.htm

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Data Warehousing and Online Analytical Processing**

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.	Data Warehousing and Online Analytical Processing: Basic concepts	1	01-07-26		1 & 2	
2.	Data Warehouse Modeling	1	02-07-26		1 & 2	
3.	Data Cube and OLAP, Data Warehouse Design and Usage	1	03-07-26		1 & 2	
4.	Data Warehouse Implementation	1	08-07-26		1 & 2	
5.	Cloud Data Warehouse, Data Mining and Patten Mining	1	09-07-26		1 & 2	
6.	Technologies	1	10-07-26		1 & 2	
7.	Applications, Major issues	1	15-07-26		1 & 2	
8.	Data Objects & Attribute Types		16-07-26		1 & 2	
9.	Basic Statistical Descriptions of Data	1	17-07-26		1 & 2	
10.	Data Visualization	1	22-07-26		1 & 2	
11.	Measuring Data Similarity and Dissimilarity, ABL	1	23-07-26		1 & 2	
12.	Unit-1 Revision	1	24-07-26		1 & 2	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: 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
13.	Data Preprocessing: An Overview	1	29-07-26		1 & 2	
14.	Data Cleaning	1	30-07-26		1 & 2	
15.	Data Integration	1	31-07-26		1 & 2	
16.	Data Integration	1	05-08-26		1 & 2	
17.	Data Reduction	1	06-08-26		1 & 2	
18.	Data Reduction	1	07-08-26		1 & 2	
19.	ABL	1	12-08-26		1 & 2	

20.	Data Transformation	1	13-08-26		1 & 2	
21.	Data Transformation	1	14-08-26		1 & 2	
22.	Data Discretization	1	19-08-26		1 & 2	
23.	Data Discretization	1	20-08-26		1 & 2	
24.	Unit-II revision	1	21-08-26		1 & 2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		

UNIT-III: Classification

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Classification: Basic Concepts	1	02-09-26		1 & 2	
26.	General Approach to solving a classification problem	1	03-09-26		1 & 2	
27.	Decision Tree Induction, Attribute Selection Measures	1	09-09-26		1 & 2	
28.	Tree Pruning, Scalability and Decision Tree Induction	1	10-09-26		1 & 2	
29.	Visual Mining for Decision Tree Induction	1	11-09-26		1 & 2	
30.	Bayesian Classification Methods: Bayes Theorem	1	16-09-26		1 & 2	
31.	Naïve Bayes Classification	1	17-09-26		1 & 2	
32.	ABL	1	18-09-26		1 & 2	
33.	Rule-Based Classification , Model Evaluation and Selection	1	23-09-26		1 & 2	
34.	Unit-III Revision	1	24-09-26		1 & 2	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV: Association Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Association Analysis : Problem Definition , Frequent Item set Generation	1	25-09-26		1 & 2	
36.	Rule Generation, Confident Based Pruning	1	30-09-26		1 & 2	
37.	Rule Generation in Apriori Algorithm	1	01-10-26		1 & 2	
38.	Compact Representation of frequent item sets, FP-Growth Algorithm	1	07-10-26		1 & 2	
39.	ABL, Unit-IV revision	1	08-10-26		1 & 2	
No. of classes required to complete UNIT-IV: 05				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
40.	Cluster Analysis: Overview, Basics and Importance of Cluster Analysis	1	09-10-26		1 & 2	
41.	Clustering techniques, Different Types of Clusters	1	14-10-26		1 & 2	

42.	K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means	1	15-10-26		1 & 2
43.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	16-10-26		1 & 2
44.	DBSCAN: Traditional Density Center-Based Approach, Algorithm	1	28-10-26		1 & 2
45.	ABL, Strengths and Weaknesses, Unit-5 revision	1	29-10-26		1 & 2
No. of classes required to complete UNIT-V: 06				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

Content Beyond Syllabus

S.NO	Topics to be Covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes COs	Text Book Followed	HOD Sign
1.	Explainable Artificial Intelligence (XAI) in Data Mining	1	30-10-2026					
No. of Classes		1		No. of classes taken:				
II MID EXAMINATIONS 02-11-2026 TO 07-11-2026								

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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	Ms. P. Sarala	Dr. D. Venkata Subbaiah	Dr. K. Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. K. Venkatrao

Course Name & Code : COMPUTER NETWORKS 23CS07
23CS07

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V/A

A.Y.: 2026-27

PREREQUISITE: -Foundational understanding of basic computer concepts

COURSE EDUCATIONAL OBJECTIVES(CEO):

Course Objectives:

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:

CO1	Understand various network types, topologies, reference models, and transmission media (Understand-L2)
CO2	Examine data link layer design issues, framing techniques, error control, and flow control mechanisms. (Analyze-L4)
CO3	Apply multiple media access control techniques and evaluate Ethernet standards for network communication. (Apply-L3)
CO4	Implement routing algorithms, congestion control techniques, and IP addressing schemes for efficient network communication. (Apply-L3)
CO5	Utilize transport layer protocols (UDP & TCP) and application layer services (HTTP, DNS, Email) to enable secure and reliable data communication. (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	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	1	3	-	-
CO3	2	2	3	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	3	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	3	3	-
	1 - Low			2 - Medium						3 - High					

Text Books:

1. **Computer Networks**, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI

2. **Data Communications and Networks**, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. **Data Communications and Networks-** Achut S Godbole, AtulKahate

2. **Computer Networks**, Mayank Dave, CENGAGE

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction & Physical Layer**

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 Computer Networks: Definition, Uses, Advantages	1	29-06-2026		TLM2	
2.	Network Types: LAN, MAN, WAN	1	30-06-2026		TLM2	
3.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid-----> tutorial(ABL)	1	04-07-2026		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer	1	06-07-2026		TLM2	
5.	TCP/IP Reference Model – Layers, Function, Protocols	1	07-07-2026		TLM2	
6.	Comparison: OSI vs TCP/IP	1	11-07-2026		TLM2	
7.	Introduction to Physical Layer	1	13-07-2026		TLM2	
8.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	1	14-07-2026		TLM2	
9.	Unguided Media: Radio, Microwave, Infrared	1	18-07-2026		TLM1	
10.	Recap + Quiz + Discussion	1	20-07-2026		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Data Link Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Design Issues, Framing Methods: Fixed & Variable Size	1	21-07-2026		TLM1	
12.	Flow Control: Stop-and-wait, Sliding Window	1	25-07-2026		TLM1	
13.	Error Control: Types of Errors, Detection & Correction	1	27-07-2026		TLM1	
14.	CRC and Checksum (One's complement, Internet checksum)	1	28-07-2026		TLM1	
15.	Services to Network Layer	1	01-08-2026		TLM1	
16.	Elementary Protocols: Simplex, Stop-and-Wait	1	04-08-2026		TLM1	
17.	Protocols for Noisy Channels	1	03-08-2026		TLM1	
18.	Sliding Window Protocols: Go-back-N, Selective Repeat	1	08-08-2026		TLM1	
19.	Summary and Protocol Comparison	1	10-08-2026		TLM1	

20.	Recap + Hands-on Simulation + Quiz	1	11-08-2026		TLM1	
No. of classes required to complete UNIT-II: 10			No. of classes taken:			
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: Media Access Control & Wired LANs

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.	Media Access – Random Access: ALOHA, CSMA	1	17-08-2026		TLM1	
22.	CSMA/CD & CSMA/CA	1	18-08-2026		TLM1	
23.	Channelization Techniques: FDMA, TDMA, CDMA	1	20-08-2026		TLM1	
24.	Wired LANs: Introduction to Ethernet	1	31-08-2026		TLM1	
25.	Standard Ethernet – Frame Structure	1	01-09-2026		TLM1	
26.	Fast Ethernet – Features, Standards	1	03-09-2026		TLM1	
27.	Gigabit Ethernet and 10 Gigabit Ethernet	1	07-09-2026		TLM1	
28.	Ethernet Summary + Comparison Table	1	08-09-2026		TLM1	
29.	Practice: Frame design and decoding	1	10-09-2026		TLM1	
No. of classes required to complete UNIT-III: 09			No. of classes taken:			

UNIT-IV: – Network Layer

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.	Design Issues – Packet Switching, Store-and-Forward	1	15-09-2026		TLM1	
31.	Connectionless vs Connection-Oriented Services	1	17-09-2026		TLM1	
32.	Datagram vs Virtual Circuit Networks	1	19-09-2026		TLM1	
33.	Routing Algorithms: Optimality, Shortest Path, Flooding	1	22-09-2026		TLM1	
34.	Distance Vector and Link State Routing	1	24-09-2026		TLM1	
35.	Congestion Control: Principles, Algorithms	1	26-09-2026		TLM1	
36.	Traffic Control: Leaky Bucket, Token Bucket	1	29-09-2026		TLM1	
37.	Internetworking: IPv4, IPv6	2	01-10-2026 03-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 08			No. of classes taken:			

UNIT-V: Transport & Application Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
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38.	Introduction to Transport Layer – Port Numbers	1	06-10-2026		TLM1
39.	UDP – Format, Features, Applications	1	08-10-2026		TLM1
40.	TCP – Services, Connection Establishment, Segments	1	10-10-2026		TLM1
41.	TCP Features – Flow, Error, Congestion Control-----→ tutorial(ABL)	1	13-10-2026		TLM1
42.	Application Layer: Introduction to WWW & HTTP	1	15-10-2026		TLM1
43.	Email Architecture: SMTP, POP3, IMAP	1	17-10-2026		TLM1
44.	Email Security, Web-based Mail	1	27-10-2025		TLM1
45.	TELNET – Remote Access, DNS – Hierarchy, Resolution Process	1	29-10-2025		TLM1
No. of classes required to complete UNIT-V: 08				No. of classes taken:	

Content Beyond 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
1.	Overview of how networking works in cloud platforms and IoT	1	31-10-2026					
No. of classes		1		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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. Venkatrao	Dr. B Sivarama krishna	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor:Mr.T.N.V.S PRAVEEN

Course Name & Code : FORMAL LANGUAGES AND AUTOMATA THEORY
23CS08

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /A

A.Y.: 2026-27

PREREQUISITE: -Discrete Mathematics Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

To learn fundamentals of Regular and Context Free Grammars and Languages

- To understand the relation between Regular Language and Finite Automata and machines

- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators

- To understand the relation between Contexts free Languages, PDA and TM

- To learn how to design PDA as acceptor and TM as Calculators

CO1	Construct finite automata and demonstrate their equivalence & minimization for language recognition. (Apply-L3)
CO2	Implement regular expressions and finite automata, and apply closure properties & pumping lemma for language validation. (Apply-L3)
CO3	Develop context-free grammars and apply simplification techniques & normal forms for formal language processing. (Apply-L3)
CO4	Design pushdown automata and demonstrate their equivalence with context-free grammars. (Apply-L3)
CO5	Construct Turing machines and apply computational techniques to solve decision problems and complexity analysis. (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	
C01	3	3	1	2								1	3		2	
C02	3	3		2								1	3		2	
C03	3	3	3	2								1	3	1	3	
C04	3	1	1	2								1	3	1	3	
C05	3	3	1	2								2	3	1	2	
	1 - Low			2 -Medium					3 - High							

TEXTBOOKS:

- T1** Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
- T2** Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

REFERENCE BOOKS:

- R1** Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
R2 Theory of Computation, V. Kulkarni, Oxford University Press, 2013
R3 Theory of Automata, Languages and Computation, Rajendra kumar, McGraw Hill,2014

E-Resources

1) <https://nptel.ac.in/courses/106/104/106104028/>

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Finite Automata**

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- Course Objective & Outcomes	1	29-06-2026		TLM2	
2	Need of Automata theory, Central Concepts of Automata Theory	1	30-06-2026		TLM2	
3	Finite Automata, Transition Systems	1	01-07-2026		TLM1	
4	Acceptance of a String, DFA, Design of DFAs,	1	02-07-2026		TLM1	
5	NFA, Design of NFA,Activity Based learning - Equivalence of DFA and NFA	1	06-07-2026		TLM1	
6	Equivalence of DFA and NFA	1	07-07-2026		TLM1	
7	Finite Automata with ϵ Transitions	1	09-07-2026		TLM1	
8	Minimization of Finite Automata	1	13-07-2026		TLM1	
9	Finite Automata with output-Mealy and Moore Machines	1	14-07-2026		TLM1	
10	Activity Based learning- Finite Automata with output-Mealy and Moore Machines	1	16-07-2026		TLM 7	
11	Applications and Limitation of Finite Automata	1	20-07-2026		TLM1	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Regular Expressions

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	Regular Expressions	1	21-07-2026		TLM2	
13	Regular Sets, Identity Rules					
14	Equivalence of two RE	1	22-07-2026		TLM1	
15	Simplification of REs, Finite Automata and Regular Expressions	1	23-07-2026		TLM1	
16	Inter Conversion, Equivalence between FA and RE	1	28-07-2026		TLM1	
17	Pumping Lemma of Regular Sets	1	29-07-2026		TLM1	
18	Closure Properties of Regular Sets, Grammars	1	30-07-2026		TLM1	
19	Activity Based learning - Regular Expressions	1	05-08-2026		TLM 7	
20	Classification of Grammars	1	06-08-2026		TLM1	
21	Chomsky Hierarchy	1	10-08-2026		TLM1	
22	Right and Left Linear Regular Grammars,	1	11-08-2026		TLM1	
23	Equivalence between RG and FA, Inter Conversion.	1	12-08-2026		TLM1	
No. of classes required to complete UNIT-II: 11				No. of classes taken:		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: Context Free Grammar

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	Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees,	1	13-08-2026		TLM1	
25	Ambiguous Grammars	1	17-08-2026		TLM1	
26	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	18-08-2026		TLM1	
27	ε- Productions, Unit Productions	1	20-08-2026		TLM1	
28	Normal Forms-Chomsky Normal Form	1	31-08-2026		TLM1	
29	Greibach Normal Form	1	01-09-2026		TLM1	
30	Pumping Lemma, Closure Properties, Applications of Context Free Grammars.	1	02-09-2026		TLM1	
31	Activity Based Learning- Context Free Grammar	1	07-09-2026		TLM1	
No. of classes required to complete UNIT-III: 8				No. of classes taken:		

UNIT-IV: Push down Automata

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	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description	1	08-09-2026		TLM2	
33	Language Acceptance of Pushdown Automata	1	09-09-2026		TLM1	
34	Design of Pushdown Automata	1	10-09-2026		TLM1	
35	Deterministic and Non – Deterministic Pushdown Automata	1	15-09-2026		TLM1	
36	Equivalence of Pushdown Automata and Context Free Grammar	1	17-09-2026		TLM1	
37	Two Stack Pushdown Automata	1	21-09-2026		TLM1	
38	Application of Pushdown Automata	1	23-09-2026		TLM1	
39	Activity based learning- Pushdown Automata	1	28-09-2026		TLM1	
No. of classes required to complete UNIT-IV: 8				No. of classes taken:		

UNIT-V: Turning Machine

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	Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions	1	30-09-2026		TLM1	
41	Transition Tables and Transition Diagrams	1	05-10-2026		TLM1	
42	Language of a TM, Design of TMs	1	06-10-2026		TLM1	
43	Types of TMs, Church's Thesis,	1	07-10-2026		TLM1	

44	Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem	1	12-10-2026		TLM1
45	Modified PCP	1	15-10-2026		TLM1
46	Classes of P and NP	1	28-10-2026		TLM2
47	NP-Hard and NP-Complete Problems				TLM2
No. of classes required to complete UNIT-V: 7				No. of classes taken:	

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes	Text Book followed	HOD Sign Weekly
1.	Designing and implementing the control logic of Vending machines using Finite Automata	1	29-10-2026					
No. of classes		1			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
TLM 7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.T.N.V.S PRAVEEN	Dr. D.Veeraiah	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.N.V.Maha Lakshmi

Course Name & Code : Artificial Intelligence & 23AD02

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

Program/Sem/Sec :BTECH/V/A

Credits: 3

A.Y.: 2026-27

PREREQUISITE: Basic Engineering and Mathematics knowledge

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Enumerate the history & Foundation of AI. (Understand - L2)
CO2	Apply the searching algorithms for AI in problem solving. (Apply-L3)
CO3	Choose the appropriate representation of knowledge. (Apply-L3)
CO4	Choose the appropriate logic concepts. (Apply-L3)
CO5	Understand the Expert Systems techniques in AI. (Understand -L2)

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

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

TEXTBOOKS:

T1	Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, third edition, 2009. can also second edition, 2003.
T2	Elaine Rich, Kevin Knight Artificial Intelligence, TMH, second edition, 2007.

REFERENCE BOOKS:

R1	Nils J. Nilsson "Artificial Intelligence - A New Synthesis", Morgan Kaufmann, 1988
R2	David poole, Alan Mackworth, "Artificial Intelligence: Foundations for computational agents", Cambridge Univ. press, 2010.
R3	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
R4	Artificial Intelligence, Saroj Kaushik, CENGAGE Learning

ONLINE RESOURCES:

1	https://ai.google
2	https://swayam.gov.in/nd1_noc19_me71/preview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction: AI problems,	1	29-06-2026		TLM1	
2.	Basics of AI	1	30-06-2026		TLM1	
3.	foundation of AI and history of AI	1	04-07-2026		TLM1	
4.	intelligent agents: Agents and Environments,	1	06-07-2026		TLM1	
5.	the concept of rationality,	1	07-07-2026		TLM2	
6.	the nature of environments	1	11-07-2026		TLM2	
7.	structure of agents,	1	13-07-2026		TLM2	
8.	problem solving agents	1	14-07-2026		TLM2	
9.	problem formulation.	1	18-07-2026		TLM2	
No. of classes required to complete UNIT-I: 09				No. of classes taken:		

UNIT-II:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Searching- Searching for solutions, uniformed search strategies	1	20-07-2026		TLM2	
11.	Breadth first search	1	21-07-2026		TLM2	
12.	Breadth first search	1	25-07-2026		TLM1	
13.	Depth first Search.	1	27-07-2026		TLM1	
14.	Search with partial information (Heuristic search) Hill climbing	1	28-07-2026		TLM2	
15.	Activity Based learning-DFS, BFS	1	01-08-2026		TLM7	
16.	A* Algorithm	1	03-08-2026		TLM1	
17.	A* Algorithm	1	04-08-2026		TLM2	
18.	AO* Algorithm	1	08-08-2026		TLM1	
19.	AO* Algorithm	1	10-08-2026		TLM2	
20.	Problem reduction, Game Playing- Adversial search	1	11-08-2026		TLM2	
21.	mini-max algorithm,	1	17-08-2026		TLM1	
22.	optimal decisions in multiplayer games	1	18-08-2026		TLM2	
23.	Problem in Game playing, Alpha-Beta pruning, Evaluation functions.	1	22-08-2026		TLM1	
No. of classes required to complete UNIT-II: 14				No. of classes taken:		

UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Representation of Knowledge: Knowledge representation issues,	1	31-08-2026		TLM2	
25.	predicate logic- logic programming	1	01-09-2026		TLM2	
26.	semantic nets- frames and inheritance, constraint propagation	1	05-09-2026		TLM2	
27.	representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty,	1	07-09-2026		TLM2	
28.	review of probability, Bayes' probabilistic interference	1	08-09-2026		TLM2	
29.	dempstershafer theory	1	12-09-2026		TLM2	
No. of classes required to complete UNIT-III: 06				No. of classes taken:		

UNIT-IV:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Logic concepts: First order logic, Inference in first order logic,	1	15-09-2026		TLM2	
31.	propositional vs. first order inference, unification & lifts forward chaining	1	19-09-2026		TLM2	
32.	Backward chaining	1	21-09-2026		TLM2	
33.	Resolution	1	22-09-2026		TLM2	
34.	Learning from observation	1	26-09-2026		TLM2	
35.	Inductive learning,	1	28-09-2026		TLM2	
36.	Decision trees,	1	29-09-2026		TLM2	
37.	Explanation based learning	1	03-10-2026		TLM2	
38.	Statistical Learning methods	1	05-10-2026		TLM2	
39.	Reinforcement Learning	1	06-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Expert Systems: Architecture of expert systems,	1	10-10-2026		TLM2	
41.	Roles of expert systems	1	12-10-2026		TLM2	
42.	Knowledge Acquisition Meta knowledge Heuristics.	1	13-10-2026		TLM2	
43.	Typical expert systems – MYCIN	1	17-10-2026		TLM2	
44.	DART, XCON	1	26-10-2026		TLM2	
45.	Expert systems shells.	1	27-10-2026		TLM2	

No. of classes required to complete UNIT-V: 06	No. of classes taken:
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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.	Agentic AI – Introduction, components of AI agents, autonomous decision-making, applications, challenges, and future directions.	01	31-10-2026		TLM2	

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
TLM7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

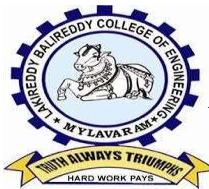
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.N.V.Maha Lakshmi	Dr.N.V.Maha Lakshmi	Dr.K.Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



LAKIREDDY BALIREDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Mallikarjunarao Dandu, Sr. Assistant Professor

Course Name & Code : Sustainable Energy Technologies- 23ME81 **Regulation:** R23

L-T-P Structure : 3-0-0 **Credits:** 03

Program/Sem/Sec : B. Tech- CSE V Sem A/S **A.Y.:** 2026-27

PREREQUISITE : Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-L2)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	2	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-	1	2	3	-	-	-	-	2	-	-	-
CO3	2	2	-	-	1	2	3	-	-	-	-	2	-	-	-
CO4	3	2	-	-	-	2	3	-	-	-	-	2	-	-	-
CO5	2	2	-	-	-	2	3	-	-	-	-	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).

TEXT BOOKS:

T1 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

R3. Non-conventional Energy Source- G S Sawhney- PHI, New Delhi, 2012

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I:****SOLAR RADIATION**

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.	Course Outcomes	1	29-06-2026		TLM2	
2.	Role and potential of new and	1	30-07-2026		TLM1	
	renewable sources, the solar energy option	1	02-07-2026		TLM1	
3.	Environmental impact of solar power, Structure of	1	06-07-2026		TLM1 TLM2	
	the Sun, The solar constant	1	07-07-2026		TLM2	
4.	Sun-earth relationships	1	09-07-2026		TLM2	
5.	Coordinate systems and	1	13-07-2027		TLM2	
	coordinates of the sun,	1	14-07-2027		TLM2	
	Extraterrestrial and terrestrial solar radiation	1	16-07-2026		TLM2	
6.	Solar radiation on tilted surface	1	20-07-2026		TLM2	
	Instruments for measuring solar radiation	1	21-07-2026		TLM2	
	sun shine, Solar radiation data	1	23-07-2026		TLM2	
7.	ABL	1	27-07-2026		TLM6	
8.	Lab visit	1	28-07-2026		TLM4	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II:**SOLAR PV MODULES AND PV 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.	PV module Circuit Design	1	30-07-2026		TLM2	
	Module Structure, Packing Density	1	03-08-2026		TLM2	
2.	Interconnections, Mismatch and temperature effects	1	04-08-2026		TLM2	
3.	Electrical and Mechanical Insulation	1	06-08-2026		TLM2	
	Lifetime of PV modules	1	10-08-2026		TLM2	
	Degradation and failure, PV module parameters, Efficiency of PV Systems	1	11-08-2026		TLM2	
4.	Solar PV Systems, Battery Operation, Types of Batteries	1	13-08-2026		TLM2	

	Battery parameters, Applications	1	17-08-2026		TLM2	
5.	Selection of batteries for Solar PV System	1	18-08-2026		TLM2	
6.	ABL	1	20-08-2026		TLM6	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT-III:

SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	31-08-2026		TLM2	
2.	Classification of concentrating collectors	1	01-09-2026		TLM2	
3.	Solar Energy Storage and Applications, Different methods	1	03-09-2026		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	07-09-2026		TLM2	
	Solar Applications, solar heating cooling technique	1	08-09-2026			
5.	Solar distillation and drying, Solar cookers	1	10-09-2026		TLM2	
	Central power tower concept, Solar chimney	1	15-09-2026		TLM2	
6.	ABL	1	17-09-2026		TLM6	
No. of classes required to complete UNIT-III: 8				No. of classes taken:		

UNIT-IV :

WIND ENERGY, BIO-MASS

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.	Wind energy: Sources and potential	1	21-09-2026		TLM2	
2.	Horizontal and Vertical axis wind mill	1	22-09-2026		TLM2	
3.	Performance characteristics, Betz criteria	1	24-09-2026		TLM2	
4.	Types of winds, Wind data measurement	1	28-09-2026		TLM2	
5.	Bio-mass: Principles of bio-conversion	1	29-09-2026		TLM2	
6.	Anaerobic/aerobic digestion, Types of biogas digesters, Gas yield, Gasifiers, Applications	1	01-10-2026		TLM2	

7.	ABL	1	05-10-2026		TLM6	
No. of classes required to complete UNIT-IV:07				No. of classes taken:		

UNIT-V :

GEOHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS

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.	Geothermal Energy Origin, Applications	1	06-10-2026		TLM2	
	Types of Geothermal Resources, Geothermal power generation	1	08-10-2026		TLM2	
		1	12-10-2026		TLM2	
2.	Relative merits and demerits, Ocean Energy: Ocean Thermal energy	1	13-10-2026		TLM2	
3.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	15-10-2026		TLM2	
4.	Challenges and applications, Fuel Cells: Introduction, Applications	1	26-10-2026		TLM2	
5.	Alkaline fuel cell, PEM fuel cell, MC fuel cell	1	27-10-2026		TLM2	
6.	ABL	1	29-10-2026		TLM6	
No. of classes required to complete UNIT-V: 08				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	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	7
Dussrhra Holidays	19-10-2026	24-10-2026	1
II Phase of Instructions Contd..	26-10-2026	31-10-2026	1
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

PART-C
EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mallikarjunarao Dandu	Dr. K. Delip Kumar	Dr. K. Delip Kumar	Dr. M B S Sreekar Reddy



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Ms. P. SARALA

Course Name & Code : Data Mining Lab (23AD55)

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

Program/Sem/Sec : B. Tech V Sem CSE – A Section

Credits:1.5

A.Y.: 2026-27

PRE-REQUISITE: Python/R-Tool.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of this lab is to provide practical exposure to the implementation of widely used data mining algorithms and to develop the ability to evaluate their performance in both supervised and unsupervised learning environments.

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

CO 1	Apply data preprocessing, similarity measures, and machine learning models using Python for solving data mining tasks.
CO 2	Develop and evaluate classification, clustering, and association rule mining techniques using appropriate algorithms.
CO 3	Analyze performance of data mining models using validation techniques and interpret results for decision-making.
CO 4	Improve individual/teamwork skills, communication, report writing, and practice ethical responsibilities in project work.

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	3	2	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	-	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):

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	Data preprocessing tasks using python libraries: a) Loading the dataset b) Identifying the dependent and independent variables	3	04-07-26		TLM4	
2	Data preprocessing tasks using python libraries: c) Dealing with missing data	3	11-07-26		TLM4	
3	Data preprocessing tasks using python libraries: a) Dealing with categorical data	3	18-07-26		TLM4	
4	Data preprocessing tasks using python libraries: b) Scaling the features. c) Splitting dataset into Training and Testing Sets	3	25-07-26		TLM4	
5	Similarity and Dissimilarity Measures using python: a) Pearson's Correlation b) Cosine Similarity	3	01-08-26		TLM4	
6	Similarity and Dissimilarity Measures using python: c) Jaccard Similarity d) Euclidean Distance	3	08-08-26		TLM4	
7	Similarity and Dissimilarity Measures using python: d) Euclidean Distance e) Manhattan Distance	3	22-08-26		TLM4	
8	Build a model using linear regression algorithm on any dataset.	3	05-09-26		TLM4	
9	Build a classification model using Decision Tree algorithm on iris dataset.	3	12-09-26		TLM4	
10	Apply Naïve Bayes Classification algorithm on any dataset.	3	19-09-26		TLM4	
11	Generate frequent item set using Apriori Algorithm in python.	3	26-09-26		TLM4	
12	Generate association rules for any market basket data.	3	03-10-26		TLM4	
13	Apply K- Means clustering algorithm on any dataset.	3	10-10-26		TLM4	
14	Apply Hierarchical, DBSCAN Clustering algorithm on any dataset.	3	17-10-26		TLM4	
15	Internal Exam	3	31-10-26		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

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day to Day Work	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Vice-voce	20
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.
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PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Ms. P. Sarala	Dr. D. Venkata Subbaiah	Dr. K. Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. K. Venkatrao

Course Name & Code : COMPUTER NETWORKS LAB 23CS58

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

Program/Sem/Sec : B.Tech/CSE/V/A

Credits: 2

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

COURSE OUTCOMES (CO):

CO1: Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques. **(Apply - L3)**

CO2: Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation. **(Apply - L3)**

CO3: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(Apply - L3)**

CO4: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(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
C01	3	2	3	2	3								1	3	
C02	3	3	3	3	2								1	3	
C03	3	3	2	3	3								2	3	
C04								3	3	3			3	2	

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.	Study of Network devices in detail and connect the computers in Local Area Network.	03	01-07-2026		
2.	Write a Program to implement the data link layer framing methods such as i) Character stuffing ii) bit stuffing.	03	08-07-2026		
3.	Write a Program to implement data link layer framing method checksum.	03	15-07-2026		
4.	Write a program for Hamming Code generation for error detection and correction.	03	22-07-2026		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	29-07-2026		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	05-08-2026		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	12-08-2026		
8.	Write a Program to implement Stop and Wait Protocol.	03	19-08-2026		
9.	Write a program for congestion control using leaky bucket algorithm	03	02-09-2026		
10.	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).	03	09-09-2026		
11.	Wireshark	03	16-09-2026		
	i. Packet Capture Using Wire shark				
	ii. Starting Wire shark	03	23-09-2026		
	iii. Viewing Captured Traffic				
12.	iv. Analysis and Statistics & Filters.				
	Do the following using NS3 Simulator	03	30-09-2026		
	i. NS3 Simulator-Introduction				
	ii. Simulate to Find the Number of Packets Dropped	03	07-10-2026		
	iii. Simulate to Find the Number of Packets Dropped by TCP/UDP		14-10-2026		
iv. Simulate to Find the Number of Packets Dropped due to Congestion					
v. Simulate to Compare Data Rate & Throughput.					
13.	Internal Exam	03	28-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30

Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. K. Venkatrao	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbiah	Dr. S. Nagarjuna Reddy
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING



COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.K Devi Priya

Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS4)

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

Credits: 2

Program/Sem/Sec : B.Tech. -CSE/V/A

A.Y.: 2026-27

PREREQUISITE: Object oriented programming, Full stack development-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to equip students with hands-on skills in developing full stack web applications using Java, Node.js, and React. It focuses on building backend services using JDBC, Servlets, and Express.js, along with frontend development using React.js. Students will learn to integrate databases like MySQL and MongoDB for real-time data handling. The course emphasizes applying MVC architecture, REST APIs, and deployment practices for complete web solutions.

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

CO1	Apply JDBC and Servlet technologies to develop web applications that interact with relational databases. (Apply-L3)
CO2	Apply the MVC architecture using JSP, Servlets, and JavaBeans to design structured and maintainable web applications. (Apply-L3)
CO3	Apply Node.js and Express.js to create RESTful services and perform backend operations with MongoDB. (Apply-L3)
CO4	Apply React.js to develop dynamic user interfaces and integrate them with backend APIs for full stack web solutions. (Apply-L4)

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	3		3							2	2	2	3
CO2	3	2	3		3							2	3	3	2
CO3	3	2	3		3							2	2	3	2
CO4	3	2	3		3							2	2	3	2
			1 - Low			2 -Medium			3 - High						

REFERENCE BOOKS:

R1	"Head First Servlets and JSP" By: Bryan Basham, Kathy Sierra, Bert Bates Publisher: O'Reilly Media
R2	"Learning Node.js Development" By: Andrew Mead Publisher: Packt Publishing
R3	"MongoDB: The Definitive Guide" By: Kristina Chodorow Publisher: O'Reilly Media
R4	"Learning React: Modern Patterns for Developing React Apps" By: Alex Banks and Eve Porcello Publisher: O'Reilly Media

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.	FSD-II & JDBC Introduction	3	30-06-2026		DM5/ DM6	
2.	JDBC Programs	3	7-07-2026		DM5/ DM6	
3.	Servlet Programs	3	14-07-2026		DM5/ DM6	
4.	JSP Introduction	3	21-07-2026		DM5/ DM6	
5.	JSP MVC programs	6	28-07-2026 04-08-2026		DM5/ DM6	
6.	Node JS Introduction	3	11-08-2026		DM5/ DM6	
7.	Express JS Framework	3	18-08-2026		DM5/ DM6	
8.	Node JS & Express JS Programs	6	1-09-2026 8-09-2026		DM5/ DM6	
9.	MangoDB	3	15-09-2026		DM5/ DM6	
10.	MangoDB with Express JS	3	22-9-2026,		DM5/ DM6	
11.	React JS	3	29-9-2026		DM5/ DM6	
12.	React JS and Full stack Integration	3	6-10-2026		DM5/ DM6	
13.	Web Application Development	3	13-10-2026		DM5/ DM6	
14.	Internal Test	3	27-10-2026		DM5/ DM6	

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

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

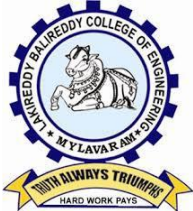
PROGRAMME OUTCOMES (POs):

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 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	Dr.K DeviPriya	Dr.K DeviPriya	Dr. Y.V.B. Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A. Koteswara Rao

Course Name & Code : User Interface Design Using Flutter Lab & 23IT53

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/V/A

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to

- 1.Learns to Implement Flutter Widgets and Layouts
- 2.Understands Responsive UI Design and with Navigation in Flutter
- 3.Knowledge on Widges and customize widgets for specific UI elements, Themes
- 4.Understand to include animation apart from fetching data

COURSE OUTCOMES (CO):

CO1: Apply Flutter and Dart fundamentals to design and develop interactive user interfaces.

(Apply-L3)

CO2: Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. **(Apply-L3)**

CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical value

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
CO2	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
CO3	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
CO4	2	2	2	3	2	-	1	-	-	1	-	2	1	2	2

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.	Basic Flutter Programs	02	29-06-2026		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	02	06-07-2026		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	02	13-07-2026		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	02	20-07-2026		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	02	27-07-2026		
6.	Practice Lab	02	03-08-2026		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	02	10-08-2026		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	02	17-08-2026		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	02	07-09-2026		
10.	a) Create a scrollable List Widget in Form & Add items to it. b) Implement the List View & Display the selected item in the prompt window.	02	21-09-2026		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	02	28-09-2026		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	02	05-10-2026		
13.	Internal Exam	02	26-10-2026		

PART - C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART - D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
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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. A. Koteswara Rao	Dr. B. Srinivasa Rao	Dr. Y. Vijaya Bhaskar Reddy	Dr. S. Nagarjuna Reddy
Signature				



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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr.M. Srinivasa Rao
Course Name & Code : 23AD02-ARTIFICIAL INTELLIGENCE
L-T-P Structure : 3-0-0
Program/Sem/Sec : B.Tech/V Sem/B Sec

Credits: 3
A.Y.: 2026-27

PREREQUISITE: Basic Engineering and Mathematics knowledge

COURSE EDUCATIONAL OBJECTIVES (CEOs):

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. The student should be made to introduce the concepts of Expert Systems.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. To learn different knowledge representation techniques.

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

CO1	Enumerate the history & Foundation of AI (Understand-L2)
CO2	Apply the Searching algorithms for AI in problem solving (Apply-L3)
CO3	Choose the appropriate representation of knowledge (Apply-L3)
CO4	Choose the appropriate logic concepts (Apply-L3)
CO5	Understand the Expert systems techniques in AI (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	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	1	2	3	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-	2	3	-
CO4	3	3	-	2	-	-	-	-	-	-	-	1	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	1	1	-
			1 - Low			2 - Medium			3 - High						

TEXTBOOKS:

T1	S. Russel and P. Norvig "Artificial Intelligence–A Modern Approach", Second Edition, Pearson Education.
T2	Kevin Night and Elaine Rich, Nair B. "Artificial Intelligence (SIE)", Mc Graw Hill

REFERENCE BOOKS:

R1	David Poole, Alan Mack worth, Randy Goebel, "Computational Intelligence: a logical approach", Oxford University Press.
R2	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
R3	J.Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
R4	Artificial Intelligence, Saroj Kaushik, CENGAGE Learning.

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.	Introduction: AI problems	1	29/06/2026		TLM1,2	
2.	Foundation of AI and history of AI	1	01/07/2026		TLM1,2	
3.	Intelligent Agents : Agents, Types of Agents	1	03/07/2026		TLM1,2	
4.	Environments, Concept of rationality	1	06/07/2026		TLM1,2	
5	Nature of environments	1	08/07/2026		TLM1,2	
6.	Structure of agents	1	10/07/2026		TLM1,2	
7.	Problem solving agents	1	13/07/2026		TLM1,2	
8.	Problem formulation	1	15/07/2026		TLM1,2	
9	AI's Impact on Jobs and Economy (Group Discussion)	1	17/07/2026		TLM6	
No. of classes required to complete UNIT-I: 09				No. of classes taken:		

UNIT-II: Searching

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	Searching for solutions	1	20/07/2026		TLM1,2	
11	uniformed search strategies	1	22/07/2026		TLM1,2	
12	Breadth first search, depth first Search.	1	24/07/2026		TLM1,2	
13	Search with partial information(Heuristic search)	1	27/07/2026		TLM1,2	
14	Hill climbing	1	29/07/2026		TLM1,2	
15	A* Algorithm	1	31/07/2026		TLM1,2	
16	AO* Algorithm, Problem reduction	1	03/08/2026		TLM1,2	
17	Game Playing-Adversial search	1	05/08/2026		TLM1,2	
18	Games, mini-max algorithm	1	07/08/2026		TLM1,2	
19	optimal decisions in multiplayer games, Problem in Game playing	1	10/08/2026		TLM1,2	
20	Alpha-Beta pruning, Evaluation functions	1	12/08/2026		TLM1,2	
21	Types of Deep Neural Networks	1	14/08/2026		TLM1,2	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		

UNIT-III: Representation of Knowledge

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	Knowledge Representation and issues	1	17/08/2026		TLM1,2	
23	Predicate logic- logic programming	1	19/08/2026		TLM1,2	
24	Semantic nets- frames and inheritance,	1	21/08/2026		TLM1,2	
25	Constraint propagation	1	31/08/2026		TLM1,2	
26	Representing knowledge using Rules	1	02/09/2026		TLM1,2	
27	Rules based deduction systems	1	07/09/2026		TLM1,2	
28	Reasoning under uncertainty and review of probability	1	09/09/2026		TLM1,2	
29	Bayes' probabilistic interferences	1	11/09/2026		TLM1,2	
30	Dempster shafer theory	1	16/09/2026		TLM1,2	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV: Logic Concepts

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	First order logic. Inference in first order logic	1	18/09/2026		TLM1,2	
32	Propositional vs. first order, Inference	1	21/09/2026		TLM1,2	
33	Unification & lifts forward chaining	1	23/09/2026		TLM1,2	
34	Backward chaining, Resolution	1	25/09/2026		TLM1,2	
35	Learning from observation Inductive learning	1	28/09/2026		TLM1,2	
36	Decision trees, Explanation based learning,	1	30/09/2026		TLM1,2	
37	Statistical Learning methods	1	05/10/2026		TLM1,2	
38	Reinforcement Learning.	1	07/10/2026		TLM1,2	
No. of classes required to complete UNIT-IV: 08				No. of classes taken:		

UNIT-V: Expert 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
39	Architecture of expert systems	1	09/10/2026		TLM1,2	
40	Knowledge Acquisition Meta knowledge Heuristics.	1	12/10/2026		TLM1,2	
41	Typical expert systems	1	14/10/2026		TLM1,2	
42	MYCIN	1	16/10/2026		TLM1,2	
43	DART	1	26/10/2026		TLM1,2	
44	XCON: Expert systems shells.	1	28/10/2026		TLM1,2	
No. of classes required to complete UNIT-V: 06				No. of classes taken:		

Contents beyond the Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
45	Generative AI	1	30/10/2026		TLM1,5	

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 (R23 Regulation):**

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15
II-Quiz Examination (UNIT-III, 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):

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.
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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.
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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):

PSO1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PSO2	The ability to design and develop computer programs in networking, web applications and I per the society needs.
PSO3	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. M. Srinivasa Rao	Dr. N.V. Maha Lakshmi	Dr. K. Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: DR. B. SIVARAMAKRISHNA

Course Name & Code : COMPUTER NETWORKS (23CS07)

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V/B

A.Y: 2026-27

PREREQUISITE: -Foundational understanding of basic computer concepts

COURSE EDUCATIONAL OBJECTIVES(CEO):

Course Objectives:

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:

CO1	Understand various network types, topologies, reference models, and transmission media (Understand-L2)
CO2	Examine data link layer design issues, framing techniques, error control, and flow control mechanisms. (Analyze-L4)
CO3	Apply multiple media access control techniques and evaluate Ethernet standards for network communication. (Apply-L3)
CO4	Implement routing algorithms, congestion control techniques, and IP addressing schemes for efficient network communication. (Apply-L3)
CO5	Utilize transport layer protocols (UDP & TCP) and application layer services (HTTP, DNS, Email) to enable secure and reliable data communication. (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	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	1	3	-	-
CO3	2	2	3	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	3	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	3	3	-
1 - Low 2 -Medium 3 - High															

Text Books:

1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI

2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate

2. Computer Networks, Mayank Dave, CENGAGE

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction & Physical Layer

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 Computer Networks: Definition, Uses, Advantages	1	29-06-26		TLM2	
2.	Network Types: LAN, MAN, WAN	1	02-07-26		TLM2	
3.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid	1	04-07-26		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer	1	06-07-26		TLM2	
5.	TCP/IP Reference Model – Layers, Function, Protocols	1	08-07-26		TLM2	
6.	Comparison: OSI vs TCP/IP	1	09-07-26		TLM2	
7.	Introduction to Physical Layer					
8.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	1	11-07-26		TLM2	
9.	Unguided Media: Radio, Microwave, Infrared	1	13-07-26		TLM1	
10.	Recap + Quiz + Discussion	1	15-07-26		TLM1	
11.	Tutorial/ABL Activity	1	16-07-26		TLM1	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Data Link Layer

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.	Design Issues, Framing Methods: Fixed & Variable Size	1	18-07-26		TLM1	
13.	Flow Control: Stop-and-wait, Sliding Window	1	20-07-26		TLM1	
14.	Error Control: Types of Errors, Detection & Correction	1	22-07-26		TLM1	
15.	CRC and Checksum (One's complement, Internet checksum)	1	23-07-26		TLM1	
16.	Services to Network Layer	1	25-07-26		TLM1	
17.	Elementary Protocols: Simplex, Stop-and-Wait	1	27-07-26		TLM1	
18.	Protocols for Noisy Channels	1	29-07-26		TLM1	
19.	Sliding Window Protocols: Go-back-N, Selective Repeat	1	30-07-26		TLM1	

20.	Summary and Protocol Comparison	1	01-08-26		TLM1	
21.	Recap + Hands-on Simulation + Quiz	1	03-08-26		TLM1	
22.	Tutorial/ABL Activity	1	05-08-26		TLM1	
No. of classes required to complete UNIT-II: 11				No. of classes taken:		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: Media Access Control & Wired LANs

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.	Media Access – Random Access: ALOHA, CSMA	1	06-08-26		TLM1	
24.	CSMA/CD & CSMA/CA	1	08-08-26		TLM1	
25.	Channelization Techniques: FDMA, TDMA, CDMA	1	10-08-26		TLM1	
26.	Wired LANs: Introduction to Ethernet	1	12-08-26		TLM1	
27.	Standard Ethernet – Frame Structure	1	13-08-26		TLM1	
28.	Fast Ethernet – Features, Standards	1	17-08-26		TLM1	
29.	Gigabit Ethernet and 10 Gigabit Ethernet	1	19-08-26		TLM1	
30.	Ethernet Summary + Comparison Table	1	20-08-26		TLM1	
31.	Practice: Frame design and decoding	1	22-08-26		TLM1	
32.	Recap + Tutorial/ABL Activity	1	30-08-26		TLM1	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV: – Network Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Design Issues – Packet Switching, Store-and-Forward	1	31-08-26 02-09-26		TLM1	
34.	Connectionless vs Connection-Oriented Services	1	03-09-26 06-09-26		TLM1	
35.	Datagram vs Virtual Circuit Networks	1	07-09-26 09-09-26		TLM1	
36.	Routing Algorithms: Optimality, Shortest Path, Flooding	1	10-09-26 12-09-26		TLM1	
37.	Distance Vector and Link State Routing	1	16-09-26		TLM1	
38.	Congestion Control: Principles, Algorithms	1	17-09-26		TLM1	
39.	Traffic Control: Leaky Bucket, Token Bucket	1	19-09-26		TLM1	
40.	Internetworking: IPv4, IPv6	1	21-09-26		TLM1	
41.	Recap +Tutorial/ABL Activity	1	23-09-26		TLM1	
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

UNIT-V: Transport & Application Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
42.	Introduction to Transport Layer – Port Numbers	1	24-09-26 26-09-26		TLM1	
43.	UDP – Format, Features, Applications	1	28-09-26 30-09-26		TLM1	
44.	TCP – Services, Connection Establishment, Segments	1	01-10-26 03-10-26		TLM1	
45.	TCP Features – Flow, Error, Congestion Control	2	05-10-26 07-10-26		TLM1	
46.	Application Layer: Introduction to WWW & HTTP	1	8-10-26 10-10-26		TLM1	
47.	Email Architecture: SMTP, POP3, IMAP	1	12-10-26 14-10-26		TLM1	
48.	Email Security, Web-based Mail	2	15-10-26		TLM1	
49.	TELNET – Remote Access	1	17-10-26		TLM1	
50.	DNS – Hierarchy, Resolution Process	1	26-10-26		TLM2	
51.	Recap + Assessment	2	28-10-26		TLM2	
52.	Tutorial/ ABL Activity		29-10-26		TLM2	
No. of classes required to complete UNIT-V: 13				No. of classes taken:		

Content Beyond 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
1.	Overview of how networking works in cloud platforms and IoT	1	31-10-2026					
No. of classes		1			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 (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. B Sivarama Krishna	Dr. B Sivarama Krishna	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. B SIVARAMAKRISHNA

Course Name & Code : COMPUTER NETWORKS LAB (23CS58)

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/III/D

A.Y.: 2026-

27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking; networks are assembled, and experiments are carried out to understand the layered architecture and how do some important protocols work

COURSE OUTCOMES (CO):

CO1: Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques. **(Apply – L3)**

CO2: Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation. **(Apply – L3)**

CO3: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(Apply – L3)**

CO4: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(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	3	2	3	2	3								1	3	
CO2	3	3	3	3	2								1	3	
CO3	3	3	2	3	3								2	3	
CO4								3	3	3			3	2	

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
53.	Study of Network devices in detail and connect the computers in Local Area Network.	03			
54.	Write a Program to implement data link layer framing methods such as i) Character stuffing ii) bit stuffing.	03			
55.	Write a Program to implement data link layer framing method checksum.	03			
56.	Write a program for Hamming Code generation for error detection and correction.	03			
57.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03			
58.	Write a Program to implement Sliding window protocol for Goback N.	03			
59.	Write a Program to implement Sliding window protocol for Selective repeat.	03			
60.	Write a Program to implement Stop and Wait Protocol.	03			
61.	Write a program for congestion control using leaky bucket algorithm	03			
62.	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).	03			
63.	Wireshark <ul style="list-style-type: none"> • Packet Capture Using Wire shark • Starting Wire shark • Viewing Captured Traffic • Analysis and Statistics & Filters. 	03			
64.	Do the following using NS3 Simulator <ul style="list-style-type: none"> • NS3 Simulator-Introduction • Simulate to Find the Number of Packets Dropped • Simulate to Find the Number of Packets Dropped by TCP/UDP. • Simulate to Find the Number of Packets Dropped due to Congestion. • Simulate to Compare Data Rate& Throughput. 	03			
65.	Internal Exam	03			

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change
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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. B. Siva Rama Krishna	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbiah	Dr. S. Nagarjuna Reddy
Signature				



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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor	: Kamala Priya B, Sr. Assistant Professor	
Course Name & Code	: Sustainable Energy Technologies- 23ME81	Regulation: R23
L-T-P Structure	: 3-0-0	Credits: 03
Program/Sem/Sec	: B.Tech- CSE/V Sem B/S	A.Y.: 2026-27
PREREQUISITE	: Nil	

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-L2)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO2	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO3	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO4	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO5	3	2	-	-	-	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 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: SOLAR RADIATION**

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.	Course Outcomes, Role and potential of new and renewable sources	1	30-06-2026		TLM2	
2.	The solar energy option	1	03-07-2026		TLM2	
3.	Environmental impact of solar power	1	04-07-2026		TLM2	
4.	Structure of the Sun, The solar constant	1	07-07-2026		TLM2	
5.	Sun-earth relationships	1	10-07-2026		TLM2	
6.	Coordinate systems and coordinates of the sun	1	11-07-2026		TLM2	
7.	Extraterrestrial and terrestrial solar radiation, Solar radiation on tilted surface	1	14-07-2026		TLM2	
8.	Instruments for measuring solar radiation and sun shine	1	17-07-2026		TLM2	
9.	Solar radiation data	1	18-07-2026		TLM2	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: SOLAR PV MODULES AND PV 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.	PV module Circuit Design, Module Structure	1	21-07-2026		TLM2	
2.	Packing Density	1	24-07-2026		TLM2	
3.	Interconnenctions	1	25-07-2026		TLM2	
4.	Mismatch and temperature effects, Electrical and Mechanical Insulation	1	28-07-2026		TLM2	
5.	Lifetime of PV modules	1	31-07-2026		TLM2	
6.	Degradation and failure	1	01-08-2026		TLM2	
7.	PV module parameters, Efficiency of PV Systems, Solar PV Systems	1	04-08-2026		TLM2	
8.	Battery Operation, Types of Batteries	1	07-08-2026		TLM2	
9.	Battery parameters, Applications, Selection of batteries for Solar PV System	1	11-08-2026		TLM2	
No. of classes required to complete UNIT-II: 13				No. of classes taken:		

UNIT-III: SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	14-08-2026		TLM2	
2.	Classification of concentrating collectors, Solar Energy Storage and Applications: Different methods	1	18-08-2026		TLM4	
3.	Sensible latent heat and stratified storage	1	21-08-2026		TLM2	
4.	Solar ponds	1	22-08-2026		TLM2	
5.	Solar Applications, solar heating cooling technique	1	01-09-2026		TLM2	
6.	Solar distillation	1	05-09-2026		TLM2	
7.	Solar drying, Solar cookers	1	08-09-2026		TLM2	
8.	Central power tower concept	1	11-09-2026		TLM2	
9.	Solar chimney	1	15-09-2026		TLM2	
No. of classes required to complete UNIT-III: 12				No. of classes taken:		

UNIT-IV : WIND ENERGY, BIO-MASS

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.	Wind energy: Sources and potential ,Horizontal axis wind mill	1	18-09-2026		TLM4	
2.	Vertical Axis wind mill	1	19-09-2026		TLM2	
3.	Performance characteristics	1	22-09-2026		TLM2	
4.	Betz criteria	1	25-09-2026		TLM2	
5.	Types of winds	1	26-09-2026		TLM2	
6.	Wind data measurement, Bio-mass: Principles of bio-conversion	1	29-09-2026		TLM2	
7.	Anaerobic/aerobic digestion	1	03-10-2026		TLM2	
8.	Types of biogas digesters, Gas yield, Gasifiers	1	06-10-2026		TLM2	
9.	Applications	1	09-10-2026		TLM2	
No. of classes required to complete UNIT-IV:12				No. of classes taken:		

UNIT-V : GEOTHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS

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.	Geothermal Energy: Origin, Applications	1	10-10-2026		TLM2	
2.	Types of Geothermal Resources, Geothermal power generation, Relative merits and demerits	1	13-10-2026		TLM2	
3.	Ocean Energy: Ocean Thermal	1	16-10-2026		TLM2	

	energy				
4.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	17-10-2026		TLM4
5.	Challenges and applications, Fuel Cells: Introduction, Applications	1	27-10-2026		TLM2
6.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell ,Alkaline fuel cell, PEM fuel cell	1	30-10-2026		TLM2
7.	MC fuel cell	1	31-10-2026		TL M2
No. of classes required to complete UNIT-V: 09				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	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	7
II Phase of Instructions..Continued	26-10-2026	31-10-2026	1
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

PART-C

EVALUATION PROCESS (R23 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
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PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor

Course Coordinator

Module Coordinator

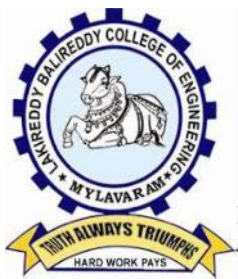
HOD

Kamala Priya B

Dr. K. Dilip Kumar

Dr. K. Dilip Kumar

Dr. M B S Sreevara
Reddy



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.N.Srikanth

Course Name & Code : Data Warehousing and Data Mining & 23AD04

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

Credits: 3

Program/Sem/Sec : III B.tech/V-sem/B-Sec

A.Y.: 2026-27

PREREQUISITE: DBMS, Probability, and Statistics

Course Objectives: The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of algorithms.

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

CO1	Design data warehouses to support effective data modeling, integration, and analytical processing. (Level-3)
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications. (Level-2)
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance. (Level-3)
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets. (Level-3)
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively. (Level-2)

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	PS O1	PS O2	PSO 3
CO1	3	-	2	-	3	-	-	-	-	-	-	2	2	-	3
CO2	3	2	-	-	3	-	-	-	-	-	-	2	2	-	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	2
CO4	2	2	-	2	3	-	-	-	-	-	-	2	3	-	2
CO5	2	2	-	2	3	-	-	-	-	-	-	2	3	1	2
	1 - Low			2 -Medium						3 - High					

TEXT BOOKS:

T1 Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.

T2 Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

Reference Books:

R1	Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
R2	Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.
R3	(NPTEL course by Prof. Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/preview
R4	http://www.saedsayad.com/data_mining_map.htm

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Data Warehousing and Online Analytical Processing:**

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.	Data Warehousing and Online Analytical Processing: Basic concepts	2	29-06-2026 01-07-2026		TLM 1,2 &3	
2.	Data Warehouse Modeling: Data Cube and OLAP	2	04-07-2026 06-07-2026		TLM1&2	
3.	Data Warehouse Design and Usage	1	08-07-2026		TLM 1,2 &3	
4.	Data Warehouse Implementation,	2	13-07-2026 15-07-2026		TLM1&2	
5.	Cloud Data Warehouse	1	18-07-2026		TLM 1,2 &3	
6.	Data Mining and Patten Mining, Technologies, Applications, Major issues	2	20-07-2026 22-07-2026		TLM1&2	
7.	Data Objects &Attribute Types	1	25-07-2026		TLM 1,2 &3	
8.	Basic Statistical Descriptions of Data	2	27-07-2026 29-07-2026		TLM1&2	
9.	Data Visualization, Measuring Data Similarity and Dissimilarity.	1	01-08-2026		TLM 1,2 &3	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II: 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
10.	Data Preprocessing: An Overview	2	03-08-2026 05-08-202		TLM1&2	
11.	Data Cleaning	1	10-08-2026		TLM 1,2 &3	
12.	Data Integration	1	12-08-2026		TLM 1,2 &3	
13.	Data Reduction	2	17-08-2026 19-08-2026		TLM1&2	
14.	Data Transformation and Data Discretization.	1	22-08-2026		TLM 1,2 &3	
No. of classes required to complete UNIT-II: 7				No. of classes taken:		

UNIT-III: Classification:

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.	Classification: Basic Concepts,	1	31-08-2026		TLM1&2	
16.	General Approach to solving a classification problem	1	02-09-2026		TLM1&2	
17.	Decision Tree Induction: Attribute Selection Measures,	1	05-09-2026		TLM1&2	
18.	Tree Pruning	1	07-09-2026		TLM1&2	
19.	Scalability and Visual Mining for Decision Tree Induction	1	09-09-2026		TLM1&2	
20.	Bayesian Classification Methods: Bayes Theorem	1	16-09-2026		TLM1&2	
21.	Naïve Bayes Classification and Rule-Based Classification	1	19-09-2026		TLM1&2	
22.	Model Evaluation and Selection	1	21-09-2026		TLM 1,2 &3	
No. of classes required to complete UNIT-III: 8				No. of classes taken:		

UNIT-IV: Association Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
23.	Problem Definition,	1	23-09-2026		TLM1&2	
24.	Frequent Item set Generation	1	26-09-2026		TLM 1,2 &3	
25.	Rule Generation: Confident Based Pruning	1	28-09-2026		TLM1&2	
26.	Rule Generation in Apriori Algorithm	2	30-09-2026 03-10-2026		TLM1&2	
27.	Compact Representation of frequent item sets	1	05-10-2026		TLM1&2	
28.	FP-Growth Algorithm	1	07-10-2026		TLM1&2	
No. of classes required to complete UNIT-IV: 07				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
29.	Basics and Importance of Cluster Analysis	1	12-10-2026		TLM 1,2 &3	
30.	Clustering techniques	1	14-10-2026		TLM1&2	
31.	Different Types of Clusters	1	15-10-2026		TLM1&2	
32.	K-means: The Basic K-means	1	17-10-2026		TLM1&2	

	Algorithm					
33.	Bi-secting K Means	1	26-10-2026			TLM1&2
34.	Agglomerative Hierarchical Clustering	1	28-10-2026			TLM1&2
35.	DBSCAN: Traditional Density Center-Based Approach	1	29-10-2026			TLM 1,2 &3
36.	DBSCAN Algorithm, Strengths and Weaknesses	1	30-10-2026			TLM1&2
37.	Content Beyond Syllabus: "Explainable Artificial Intelligence (XAI) in Data Mining"	2	31-10-2026			TLM 1,2 &3
No. of classes required to complete UNIT-V: 10				No. of classes taken:		

Content Beyond Syllabus

S. No.	Topics to be Covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes (COs)	Text Book Followed	HOD Sign
1	Explainable Artificial Intelligence (XAI) in Data Mining	2	29-10-2026 & 27-10-2026		TLM1,2,5 &6	CO4, CO5	T1	
No. of Classes		2		No. of classes taken:				

Use Cases

S. No.	Topics to be Covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes (COs)	HOD Sign
1	Student Placement Prediction	1	08-10-2026		Hands-on	CO4, CO5	
2	Retail Sales Analysis	1	15-10-2026		Hands-on	CO4, CO5	

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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Units-III, IV & V)	A2=5
II- Descriptive Examination (UNITS-III, IV & V)	M2=15

II-Quiz Examination (UNITS-III, IV & V)	Q2=10
Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

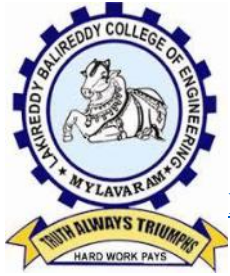
PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web application 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.N.Srikanth	Dr. D. Venkata Subbaiah	Dr. D. Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. N.Srikanth
Course Name & Code : DATA MINING LAB-23AD55
L-T-P Structure : 0-0-3 **Credits:1.5**
Program/Sem/Sec : B.Tech. – CSE-V/B **A.Y.:2026-27**

PREREQUISITE: Data Base Management Systems, Python Programming/R Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of this lab is to provide practical exposure to the implementation of widely used data mining algorithms and to develop the ability to evaluate their performance in both supervised and unsupervised learning environments.

Software Requirements: Python/R-Tool

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

CO1	Apply data preprocessing, similarity measures, and machine learning models using Python for solving data mining tasks. (Apply – L3)
CO2	Develop and evaluate classification, clustering, and association rule mining techniques using appropriate algorithms. (Apply – L3)
CO3	Analyze performance of data mining models using validation techniques and interpret results for decision-making. (Apply – L3)
CO4	Improve individual/teamwork skills, communication, report writing, and practice ethical responsibilities in project work.

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

COs	PO1	P O2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	-	2	2	-	-
1 - Low 2 –Medium 3 - High															

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.	Introduction- Practice on Python Programming	3	01-07-2026		DM5	
2.	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	8-07-2026		DM5	
3.	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	15-07-2026		DM5	
4.	Similarity and Dissimilarity Measures using python	3	22-07-2026		DM5	
5.	Build a model using linear regression algorithm on any dataset.	3	29-07-2026		DM5	
6.	Build a classification model using Decision Tree algorithm on iris dataset	3	05-08-2026		DM5	
7.	Apply Naïve Bayes Classification algorithm on any dataset	3	12-08-2026		DM5	
8.	Generate frequent item sets using Apriori Algorithm in python	3	19-08-2026		DM5	
9.	Generate association rules for any market basket data.	3	2-09-2026		DM5	
10.	Apply K- Means clustering algorithms on any dataset.	3	1-09-2026		DM5	
11.	Apply Hierarchical Clustering algorithm on any dataset	3	9-09-2026		DM5	
12.	Apply DBSCAN clustering algorithm on any dataset.	3	16-10-2026		DM5	
13.	Apply DBSCAN clustering algorithm on any dataset.	3	23-10-2026		DM5	
14.	Internal exam	3	30-10-2026		DM5	

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

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day-to-day work	A1 = 15
Internal test	A3 = 15
CIE Total:	M1 = 30
Procedure/Algorithm	B1 = 20
Program execution and Result/Inference	B2 = 30
Viva voce	B = 20
SEE Total:	M2 = 70
Total Marks = CIE + SEE = (M1+M2)	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.N.Srikanth	Dr. D. Venkata Subbaiah	Dr. D. Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr D Veeraiah

Course Name & Code : FORMAL LANGUAGES AND AUTOMATA THEORY
23CS08

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /B

A.Y.: 2026-27

PREREQUISITE: -Discrete Mathematics Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course are to

To learn fundamentals of Regular and Context Free Grammars and Languages

- To understand the relation between Regular Language and Finite Automata and machines

- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators

- To understand the relation between Contexts free Languages, PDA and TM

- To learn how to design PDA as acceptor and TM as Calculators

CO1	Construct finite automata and demonstrate their equivalence & minimization for language recognition. (Apply-L3)
CO2	Implement regular expressions and finite automata and apply closure properties & pumping lemma for language validation. (Apply-L3)
CO3	Develop context-free grammars and apply simplification techniques & normal forms for formal language processing. (Apply-L3)
CO4	Design pushdown automata and demonstrate their equivalence with context-free grammars. (Apply-L3)
CO5	Construct Turing machines and apply computational techniques to solve decision problems and complexity analysis. (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	1	2								1	3		2
CO2	3	3		2								1	3		2
CO3	3	3	3	2								1	3	1	3
CO4	3	1	1	2								1	3	1	3
CO5	3	3	1	2								2	3	1	2
			1 - Low			2 -Medium			3 - High						

TEXTBOOKS:

- T1** Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
- T2** Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

REFERENCE BOOKS:

- R1** Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
R2 Theory of Computation, V. Kulkarni, Oxford University Press, 2013
R3 Theory of Automata, Languages and Computation, Rajendra kumar, McGraw Hill,2014

E-Resources

- 1) <https://nptel.ac.in/courses/106/104/106104028/>

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Finite Automata**

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- Course Objective & Outcomes, Need of Automata theory, Central Concepts of Automata Theory	1	29-06-2026		TLM2	
2.	Finite Automata, Transition Systems	1	30-06-2026		TLM2	
3.	Acceptance of a String, DFA, Design of DFAs,	1	04-07-2026		TLM1	
4.	NFA, Design of NFA	1	06-07-2026		TLM1	
5.	Equivalence of DFA and NFA	1	07-07-2026		TLM1	
6.	Activity Based learning- – Concept of NFA, DFA, Equivalence between DFA and NFA	1	11-07-2026		TLM7	
7	Finite Automata with ϵ -Transitions	1	13-07-2026		TLM1	
8	Minimization of Finite Automata	1	14-07-2026		TLM1	
9.	Finite Automata with output-Mealy and Moore Machines	1	18-07-2026		TLM1	
10.	Activity Based learning- Finite Automata with output-Mealy and Moore Machines	1	20-07-2026		TLM7	
11.	Applications and Limitation of Finite Automata	1	21-07-2026		TLM1	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Regular Expressions

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.	Regular Expressions, Regular Sets, Identity Rules	1	25-07-2026		TLM2	
13	Equivalence of two RE	1	27-07-2026		TLM1	
14	Simplification of REs, Finite Automata and Regular Expressions	1	28-07-2026		TLM1	
15	Inter Conversion, Equivalence Between FA and RE	1	01-08-2026		TLM1	
16	Pumping Lemma of Regular Sets	1	03-08-2026		TLM1	
17	Closure Properties of Regular Sets,	1	04-08-2026		TLM1	
18	Grammars, Classification of Grammars	1	08-08-2026		TLM1	
19	Chomsky Hierarchy	1	10-08-2026		TLM1	

20	Right and Left Linear Regular Grammars	1	11-08-2026		TLM1
21	Equivalence between RG and FA, Inter Conversion	2	17-08-2026 18-08-2026		TLM1
22	Activity Based Learning - Grammars	1	22-08-2026		TLM7

No. of classes required to complete UNIT-II: 12

No. of classes taken:

I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)

UNIT-III: Context Free Grammar

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	Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees,	1	31-08-2026		TLM2		
24	Ambiguous Grammars	1	01-09-2026		TLM1		
25	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	05-09-2026		TLM1		
26	C- Productions, Unit Productions	1	07-09-2026		TLM1		
27	Normal Forms-Chomsky Normal Form	1	12-09-2026		TLM1		
28	Greibach Normal Form	1	15-09-2026		TLM1		
29	Pumping Lemma, Closure Properties, Applications of Context Free Grammars	1	19-09-2026		TLM1		
30	Activity Based Learning- Context Free Grammar	1	21-09-2026		TLM7		
No. of classes required to complete UNIT-III: 8			No. of classes taken:				

UNIT-IV: Push down Automata

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.	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description	1	22-09-2026		TLM2	
32.	Language Acceptance of Push Down Automata	1	26-09-2026		TLM1	
33.	Design of Pushdown Automata	1	28-09-2026		TLM1	
34.	Deterministic and Non Deterministic Pushdown Automata	1	29-09-2026		TLM1	
35	CFG to PDA	1	03-10-2026		TLM1	
36	PDA to CFG	1	05-10-2026			
37	Two Stack Pushdown Automata, Application of Pushdown Automata	1	06-10-2026		TLM1	
38	Activity based learning on Pushdown Automata	1	10-10-2026		TLM7	
No. of classes required to complete UNIT-IV: 8			No. of classes taken:			

UNIT-V: Turning Machine

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.	Turning Machine: Definition, Model, Representation of TMs- Instantaneous Descriptions	1	12-10-2026		TLM2	
40.	Language of a TM, Design of TMs	1	13-10-2026		TLM1	

41.	Types of TMs, Church's Thesis	1	17-10-2026		TLM1
42.	Universal and Restricted TM, Decidable & Undecidable, halting Problem	1	26-10-2026		TLM1
43.	Post's Correspondence Problem, Modified PCP	1	27-10-2026		TLM1
44.	Classes of P and NP, NP-Hard and NP-Complete Problems	1	31-10-2026		TLM1
No. of classes required to complete UNIT-V: 6					No. of classes taken:

II MID EXAMINATIONS (02-11-2026 TO 07-11-2026)

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	TLM	COs	HOD Sign Weekl y
1.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2026				
No. of classes		1	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
TLM 7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. D. Veeraiah	Dr. D. Veeraiah	Dr. D. Venkata Subbaiah	Dr .S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P. Narasimha Rao

Course Name & Code : User Interface Design Using Flutter Lab & 23IT53

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/V/B

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to

- 1.Learns to Implement Flutter Widgets and Layouts
- 2.Understands Responsive UI Design and with Navigation in Flutter
- 3.Knowledge on Widges and customize widgets for specific UI elements, Themes
- 4.Understand to include animation apart from fetching data

COURSE OUTCOMES (CO):

CO1: Apply Flutter and Dart fundamentals to design and develop interactive user interfaces.

(Apply-L3)

CO2: Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. **(Apply-L3)**

CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical value

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
CO2	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
CO3	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
CO4	2	2	2	3	2	-	1	-	-	1	-	2	1	2	2

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.	Basic Flutter Programs	02	01-07-2026		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	02	08-07-2026		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	02	15-07-2026		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	02	22-07-2026		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	02	29-07-2026		
6.	Practice Lab	02	05-08-2026		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	02	12-08-2026		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	02	19-08-2026		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	02	02-09-2026		
10.	a) Create a scrollable List Widget in Form & Add items to it. b) Implement the List View & Display the selected item in the prompt window.	02	09-09-2026		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	02	30-09-2026		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	02	07-10-2026		
13.	Internal Exam	02	14-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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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. P. Narasimha Rao	Mr. A. Koteswara Rao	Dr. Y. Vijaya Bhaskar Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. Md. Amanatulla

Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS4)

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

Credits: 2

Program/Sem/Sec : B.Tech. -CSE/V/B

A.Y.: 2026-27

PREREQUISITE: Object oriented programming, Full stack development-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to equip students with hands-on skills in developing full stack web applications using Java, Node.js, and React. It focuses on building backend services using JDBC, Servlets, and Express.js, along with frontend development using React.js. Students will learn to integrate databases like MySQL and MongoDB for real-time data handling. The course emphasizes applying MVC architecture, REST APIs, and deployment practices for complete web solutions.

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

C01	Apply JDBC and Servlet technologies to develop web applications that interact with relational databases. (Apply-L3)
C02	Apply the MVC architecture using JSP, Servlets, and JavaBeans to design structured and maintainable web applications. (Apply-L3)
C03	Apply Node.js and Express.js to create RESTful services and perform backend operations with MongoDB. (Apply-L3)
C04	Apply React.js to develop dynamic user interfaces and integrate them with backend APIs for full stack web solutions. (Apply-L4)

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	3		3							2	2	2	3
C02	3	2	3		3							2	3	3	2
C03	3	2	3		3							2	2	3	2
C04	3	2	3		3							2	2	3	2
	1 - Low			2 - Medium						3 - High					

REFERENCE BOOKS:

R1	"Head First Servlets and JSP" By: Bryan Basham, Kathy Sierra, Bert Bates Publisher: O'Reilly Media
R2	"Learning Node.js Development" By: Andrew Mead Publisher: Packt Publishing
R3	"MongoDB: The Definitive Guide" By: Kristina Chodorow Publisher: O'Reilly Media
R4	"Learning React: Modern Patterns for Developing React Apps" By: Alex Banks and Eve Porcello Publisher: O'Reilly Media

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.	FSD-II & JDBC Introduction	3	29-06-2026		DM5/ DM6	
2.	JDBC Programs	3	6-07-2026		DM5/ DM6	
3.	Servlet Programs	3	13-07-2026		DM5/ DM6	
4.	JSP Introduction	3	20-07-2026		DM5/ DM6	
5.	JSP MVC programs	6	27-07-2026 03-08-2026		DM5/ DM6	
6.	Node JS Introduction	3	10-08-2026		DM5/ DM6	
7.	Express JS Framework	3	17-08-2026		DM5/ DM6	
8.	Node JS & Express JS	6	31-08-2026		DM5/ DM6	
9.	MangoDB	3	07-09-2026		DM5/ DM6	
10.	MangoDB with Express JS	3	21-09-2026		DM5/ DM6	
11.	React JS	3	28-9-2026		DM5/ DM6	
12.	React JS and Full stack Integration	3	05-10-2026		DM5/ DM6	
13.	Web Application Development	3	12-10-2026		DM5/ DM6	
14.	Internal Test	3	26-10-2026		DM5/ DM6	

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

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

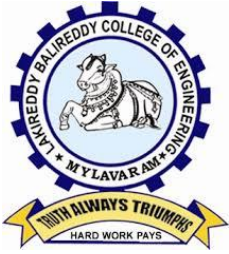
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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. Md. Amanatulla	Dr. K DeviPriya	Dr. Y.V.B. Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: **Dr. PHANEENDRA KANAKAMEDALA**

Course Name & Code : Introduction to Quantum Computation - 23QT05

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

Credits: 3

Program/Sem/Sec : B.Tech/V SEM / Minors

A.Y.: 2026-27

Regulations : R23

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

C01	Understand the axiomatic foundations of quantum mechanics including states, observables, Hilbert space, and unitary evolution. (Understand-L2)
C02	Understand the concepts of qubits and their physical realizations. (Understand-L2)
C03	Apply density matrix methods to study mixed state evolution and demonstrate quantum correlations such as entanglement and Bell's theorem. (Apply-L3)
C04	Apply universal quantum gates and implement basic quantum algorithms (Apply-L3)
C05	Understand basic quantum error correction techniques and the current status and future roadmap of quantum computing. (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
C01	2	1													
C02	2	1											1		
C03	2	2	1	1	1							2	1	1	
C04	2	2	2	2	1	1	1	1	1		1	2	2	2	2
C05	1	1	1									2	1	1	
			1 - Low			2 -Medium			3 - High						

Syllabus

Unit I – Foundations of Quantum Mechanics

- Axiomatic quantum theory
 - Quantum states, observables, measurement
 - Hilbert space, unitary transformations
 - Schrödinger equation & unitary evolution
 - No-cloning theorem

Unit II – Qubits and Physical Realizations

- Qubits vs classical bits
- Spin-half systems, photon polarizations
- Trapped atoms and ions

- Artificial atoms using circuits
- Semiconducting quantum dots
- Single & two-qubit gates – Solovay–Kitaev theorem

Unit III – Mixed States and Quantum Correlations

- Pure and mixed states
- Density matrices
- General quantum evolution & superoperators
- CPTP maps & Kraus operators
- Quantum correlations: entanglement & Bell’s theorems

Unit IV – Quantum Computation and Algorithms

- Review of Turing machines & classical complexity
- Reversible computation
- Universal quantum logic gates & circuits
- Quantum algorithms:
 - Deutsch,
 - Deutsch–Josza,
 - Bernstein–Vazirani

Unit V – Quantum Algorithms, Error Correction and Future Roadmap

- Quantum algorithms:
 - Grover’s algorithm
 - Shor’s algorithm (QFT & prime factorization)
- Introduction to error correction
 - Fault tolerance
 - Simple error correcting codes
- Survey of current status
 - NISQ era processors
 - Quantum advantage claims
 - Roadmap for future

TEXTBOOKS:

T1	Quantum Mechanics for Engineers – A.B. Bhattacharya & Atanu Nag
T2	Quantum Computation and Quantum Information – Nielsen and Chuang
T3	Quantum error Correction - Frank Gaitan
T4	Introduction to Quantum Computing – Hui Yung Wong

REFERENCE BOOKS:

R1	Quantum Information Science – Motta and Manenti
R2	Quantum computing explained- David McMahon.
R3	Quantum Computing and Techniques – Rajiv Chopra

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Foundations of Quantum Mechanics

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 Introduction to Quantum Computing	1	01-07-2026		TLM 2	
2.	Linear Algebra, Quantum States	2	02-07-2026		TLM 2	
3.	Observables, Measurement	1	08-07-2026		TLM 2	
4.	Installing Qiskit, Hilbert space	2	09-07-2026		TLM 2, 4	
5.	Unitary Transformations	1	15-07-2026		TLM 2	
6.	Schrödinger Equation and Unitary evolution	2	16-07-2026		TLM 2	
7.	No-cloning Theorem	1	22-07-2026		TLM 2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Qubits and Physical Realizations

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
8.	Spin-half Systems and Photon Polarizations	2	23-07-2026		TLM 2	
9.	Trapped atoms and ions	1	29-07-2026		TLM 2	
10.	Artificial atoms using circuits, Semiconducting quantum dots	2	30-07-2026		TLM 2	
11.	Single Qubit Gates	1	05-08-2026		TLM 2,5	
12.	Single Qubit Gates, Two Qubit gates	2	06-08-2026		TLM 2,5	
13.	Two Qubit gates	1	12-08-2026		TLM 2,5	
14.	Solovay - Kitaev Theorem	1	13-08-2026		TLM 2	
No. of classes required to complete UNIT-II: 10				No. of classes taken:		

UNIT-III: Mixed States and Quantum Correlations

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.	Density matrices	1	13-08-2026		TLM 2	
16.	Pure States	1	19-08-2026		TLM 2,5	
17.	Mixed States, General quantum evolution and super operators	2	20-08-2026		TLM 2,5	
18.	Positive and Completely Positive Trace-Preserving Maps	1	02-09-2026		TLM 2	

19.	Kraus Operators	2	03-09-2026		TLM 2	
20.	Quantum correlations - Entanglement	1	09-09-2026		TLM 2	
21.	Bell's theorems	2	10-09-2026		TLM 2,5	
22.	Practical Implementation of Bell States	1	16-09-2026		TLM 2, 4	
No. of classes required to complete UNIT-III: 11				No. of classes taken:		

UNIT-IV: Quantum Computation and Algorithms

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.	Review of Turing machines and classical computational complexity	1	17-09-2026		TLM 2	
24.	Reversible computation	1	23-09-2026		TLM 2	
25.	Universal quantum logic gates and circuits	2	24-09-2026		TLM 2,5	
26.	Quantum algorithms - Deutsch algorithm	1	30-09-2026		TLM 2,5	
27.	Deutsch Josza algorithm	2	01-10-2026		TLM 2,5	
28.	Bernstein - Vazirani algorithm	1	07-10-2026		TLM 2,5	
29.	Practical Implementation of Deutsch Josza and Bernstein - Vazirani Algorithms	1	08-10-2026		TLM 2,4	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V: Quantum Algorithms, Error Correction and Future Roadmap

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.	Database search - Grover's algorithm	1	08-10-2026		TLM 2,5	
31.	Quantum Fourier Transform and prime factorization - Shor's Algorithm.	2	14-10-2026		TLM 2,5	
32.	Introduction to Error correction - Fault-tolerance	1	15-10-2026		TLM 2	
33.	Simple error correcting codes,	2	28-10-2026		TLM 2	
34.	Survey of current status - NISQ era processors, Quantum advantage claims	2	28-10-2026		TLM 2,5	
35.	Roadmap for future	1	29-10-2026		TLM 2	
No. of classes required to complete UNIT-V: 09				No. of classes taken:		

Contents beyond the Syllabus

S. No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Quantum Machine Learning		17-09-2026		TLM2	

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
Commencement of Class Work	29-06-2026		
I Phase of Instructions	29-06-2026	22-08-2026	8W
I Mid Examinations	24-08-2026	29-08-2026	1W
II Phase of Instructions	31-08-2026	17-10-2026	7W
II Phase of Instructions Cont..	26-10-2026	31-10-2026	1W
II MID Examinations	02-11-2026	07-11-2026	1W
Preparation and Practical's	09-11-2026	14-11-2026	1W
Semester End Examinations	16-11-2026	28-11-2026	2W

PART-C**EVALUATION PROCESS (R23 Regulation):**

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, 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

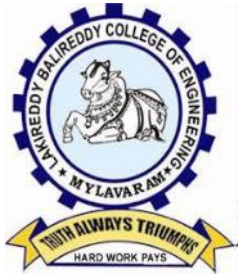
PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and 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 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	Engineer and society: Apply reasoning informed by 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 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 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, making 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 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. Phaneendra Kanakamedala	Dr. Phaneendra Kanakamedala	Dr. D. Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(An Autonomous Institution since 2010)

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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 : Mrs B.Swathi

Course Name & Code : Data Warehousing and Data mining & 23AD04

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

Credits: 3

Program/Sem/Sec : III B.tech/V-sem/C-Sec

A.Y.: 2026-27

PREREQUISITE: DBMS, Probability, and Statistics

Course Objectives: The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

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

CO1	Design data warehouses to support effective data modeling, integration, and analytical processing. (Level-3)
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications. (Level-2)
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance. (Level-3)
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets. (Level-3)
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively. (Level-2)

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	PS O1	PS O2	PSO 3
CO1	3	-	2	-	3	-	-	-	-	-	-	2	2	-	3
CO2	3	2	-	-	3	-	-	-	-	-	-	2	2	-	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	2
CO4	2	2	-	2	3	-	-	-	-	-	-	2	3	-	2
CO5	2	2	-	2	3	-	-	-	-	-	-	2	3	1	2
	1 - Low			2 -Medium						3 - High					

TEXT BOOKS:

- T1** Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.
- T2** Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

Reference Books:

R1	Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
R2	Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.
R3	(NPTEL course by Prof. Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/previe
R4	http://www.saedsayad.com/data_mining_map.htm

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Data Warehousing and Online Analytical Processing:**

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.	Data Warehousing and Online Analytical Processing: Basic concepts	3	29-06-2026 to 04-07-2026		TLM2	
2.	Data Warehouse Modeling: Data Cube and OLAP	2	06-07-2026 07-07-2026		TLM2	
3.	Data Warehouse Design and Usage	1	11-07-2026		TLM2	
4.	Data Warehouse Implementation,	2	13-07-2026 14-07-2026		TLM2	
5.	Cloud Data Warehouse	1	18-07-2026		TLM2	
6.	Data Mining and Patten Mining, Technologies, Applications, Major issues	2	20-07-2026 21-07-2026		TLM2	
7.	Data Objects & Attribute Types	1	25-07-2026		TLM2	
8.	Basic Statistical Descriptions of Data	2	27-07-2026 28-07-2026		TLM2	
9.	Data Visualization, Measuring Data Similarity and Dissimilarity.	2	01-08-2026 To 03-08-2026		TLM2	
10.	ABL	1	04-08-2026		TLM7	
No. of classes required to complete UNIT-I: 17				No. of classes taken:		

UNIT-II: 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
11.	Data Preprocessing: An Overview	1	08-08-2026		TLM2	
12.	Data Cleaning	2	10-08-2026 11-08-2026		TLM2	
13.	Data Integration	1	17-08-2026		TLM2	
14.	Data Reduction	1	18-08-2026		TLM2	
15.	Data Transformation and Data Discretization.	1	22-08-2026		TLM2	
No. of classes required to complete UNIT-II: 06				No. of classes taken:		

UNIT-III: Classification:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Classification: Basic Concepts	1	31-08-2026		TLM2	
17.	General Approach to solving a classification problem	1	01-09-2026		TLM2	
18.	Decision Tree Induction: Attribute Selection Measures,	1	05-09-2026		TLM1	
19.	Tree Pruning	1	07-09-2026		TLM1	
20.	Scalability and Decision Tree Induction	1	08-09-2026		TLM2	
21.	Visual Mining for Decision Tree Induction	1	12-09-2026		TLM2	
22.	Bayesian Classification Methods: Bayes Theorem	1	15-09-2026		TLM2	
23.	Naïve Bayes Classification & Based Classification	1	19-09-2026		TLM1	
24.	Model Evaluation and Selection	1	21-09-2026		TLM1	
25.	ABL	1	22-09-2026		TLM7	
No. of classes required to complete UNIT-III: 10						

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
26.	Problem Definition,	1	26-09-2026		TLM2	
27.	Frequent Item set Generation	1	28-09-2026 & 29-09-2026		TLM1	
28.	Rule Generation: Confident Based Pruning	1	03-10-2026		TLM1	
29.	Rule Generation in Apriori Algorithm	2	05-10-2026 06-10-2026		TLM1	
30.	Compact Representation of frequent item sets	1	10-10-2026		TLM2	
31.	FP-Growth Algorithm	1	12-10-2026		TLM2	
32.	ABL	1	13-10-2026		TLM7	
No. of classes required to complete UNIT-IV: 08				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
33.	Overview, Basics and Importance of Cluster Analysis, Clustering techniques, , Different Types of Clusters	1	17-10-2026		TLM2	
34.	K-means: The Basic K-means Algorithm, Additional Issues, Bi-secting K Means	1	26-10-2026		TLM2	
35.	Agglomerative Hierarchical Clustering	1	27-10-2026		TLM2	
36.	DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses	1	31-10-2026		TLM2	
No. of classes required to complete UNIT-V: 04				No. of classes taken:		

Content Beyond 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.	Explainable Artificial Intelligence (XAI) in Data Mining	1	31-10-2026		TLM2	

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
TLM7	ABL		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
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Cumulative Internal Examination (CIE): M	30
Semester End Examination (SEE)	70
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PART-D

PROGRAMME OUTCOMES (POs):

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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs B.Swathi	Dr. D. Venkata Subbaiah	Dr. D. Venkata Subbaiah	Dr. S.Nagarjuna Reddy
Signature				



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

hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: B.VIJAYA SRI

Course Name & Code : COMPUTER NETWORKS (23CS07)
23CS07

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /C

A.Y.: 2026-27

PREREQUISITE: -Foundational understanding of basic computer concepts

COURSE EDUCATIONAL OBJECTIVES(CEO):

Course Objectives:

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:

CO1	Understand various network types, topologies, reference models, and transmission media (Understand-L2)
CO2	Examine data link layer design issues, framing techniques, error control, and flow control mechanisms. (Analyze-L4)
CO3	Apply multiple media access control techniques and evaluate Ethernet standards for network communication. (Apply-L3)
CO4	Implement routing algorithms, congestion control techniques, and IP addressing schemes for efficient network communication. (Apply-L3)
CO5	Utilize transport layer protocols (UDP & TCP) and application layer services (HTTP, DNS, Email) to enable secure and reliable data communication. (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
C01	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
C02	3	3	-	2	-	-	-	-	-	-	-	1	3	-	-
C03	2	2	3	2	-	-	-	-	-	-	-	-	3	2	-
C04	3	3	3	3	-	-	-	-	-	-	-	1	3	3	-
C05	3	3	2	2	-	-	-	-	-	-	-	1	3	3	-
	1 - Low			2 - Medium						3 - High					

Text Books:**1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI****2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.****References Books:****1. Data Communications and Networks- Achut S Godbole, AtulKahate****2. Computer Networks, Mayank Dave, CENGAGE****PART-B****COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction & Physical Layer**

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 Computer Networks: Definition, Uses, Advantages	1	29-06-2026		TLM2	
2.	Network Types: LAN, MAN, WAN Network Topologies: Bus, Star, Ring, Mesh, Hybrid	1	03-07-2026		TLM1	
3.	OSI Reference Model – 7 Layers, Role of each layer	1	04-07-2026		TLM2	
4.	TCP/IP Reference Model – Layers, Function, Protocols	1	06-07-2026		TLM2	
5.	Comparison: OSI vs TCP/IP Introduction to Physical Layer	1	10-07-2026		TLM2	
6.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	1	11-07-2026		TLM2	
7.	Unguided Media: Radio, Microwave, Infrared	1	13-07-2026		TLM2	
8.	Recap + Quiz + Discussion	1	17-07-2026		TLM1	
9.	tutorial	1	18-07-2026		TLM1	
No. of classes required to complete UNIT-I: 09				No. of classes taken:		

UNIT-II: Data Link Layer

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.	Design Issues, Framing Methods: Fixed & Variable Size	1	20-07-2026		TLM1	
11.	Flow Control: Stop-and-wait, Sliding Window Error Control: Types of Errors, Detection & Correction	1	24-07-2026		TLM1	
12.	CRC and Checksum (One's complement, Internet checksum)	1	25-07-2026		TLM1	
13.	Services to Network Layer Elementary Protocols: Simplex, Stop-and-Wait	1	27-07-2026		TLM1	
14.	Protocols for Noisy Channels Sliding Window Protocols: Go-back-N, Selective Repeat	1	31-07-2026		TLM1	
15.	Summary and Protocol Comparison	1	01-08-2026		TLM1	
16.	Recap + Hands-on Simulation + Quiz	1	03-08-2026		TLM1	
17.	tutorial	1	07-08-2026		TLM1	

No. of classes required to complete UNIT-II: 08	No. of classes taken:
I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)	

UNIT-III: Media Access Control & Wired LANs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	Media Access – Random Access: ALOHA, CSMA, CSMA/CD & CSMA/CA	1	08-08-2026		TLM1	
19.	CSMA/CD & CSMA/CA	1	10-08-2026		TLM1	
20.	Channelization Techniques: FDMA, TDMA, CDMA Wired LANs: Introduction to Ethernet	1	14-08-2026		TLM1	
21.	Standard Ethernet – Frame Structure Fast Ethernet – Features, Standards	1	17-08-2026		TLM1	
22.	Gigabit Ethernet and 10 Gigabit Ethernet Ethernet Summary + Comparison Table	1	21-08-2026		TLM1	
23.	Practice: Frame design and decoding	1	22-08-2026		TLM1	
24.	Recap + tutorial	1	31-08-2026		TLM1	
No. of classes required to complete UNIT-III: 07				No. of classes taken:		

UNIT-IV: – Network Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
25.	Design Issues – Packet Switching, Store-and-Forward	1	05-09-2026		TLM1	
26.	Connectionless vs Connection-Oriented Services	1	07-09-2026		TLM1	
27.	Datagram vs Virtual Circuit Networks	1	11-09-2026		TLM1	
28.	Routing Algorithms: Optimality, Shortest Path, Flooding	1	12-09-2026			
29.	Distance Vector and Link State Routing Congestion Control: Principles, Algorithms	1	18-09-2026		TLM1	
30.	Traffic Control: Leaky Bucket, Token Bucket	1	19-09-2026		TLM1	
31.	Internetworking: IPv4, IPv6	1	21-09-2026		TLM1	
32.	Recap + tutorial	1	25-09-2026		TLM1	
No. of classes required to complete UNIT-IV: 08				No. of classes taken:		

UNIT-V: Transport & Application Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Introduction to Transport Layer – Port Numbers	1	26-09-2026		TLM1	
34.	UDP – Format, Features, Applications	1	28-09-2026		TLM1	
35.	TCP – Services, Connection Establishment, Segments	1	03-10-2026		TLM1	
36.	TCP Features – Flow, Error, Congestion Control	1	05-10-2026		TLM1	
37.	Application Layer: Introduction to WWW & HTTP	1	09-10-2026		TLM1	
38.	Email Architecture: SMTP, POP3, IMAP	1	10-10-2026		TLM1	
39.	Email Security, Web-based Mail	1	12-10-2026		TLM1	
40.	TELNET – Remote Access	1	16-10-2026		TLM1	
41.	DNS – Hierarchy, Resolution Process	1	17-10-2026		TLM2	
42.	Recap + Assessment	1	26-10-2026		TLM2	
43.	tutorial	1	30-10-2026		TLM2	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

Content Beyond 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
1.	Overview of how networking works in cloud platforms and IoT	1	31-10-2026					
No. of classes		1		No. of classes taken:				

Teaching Learning Methods			
TLM1	Chalk and Talk	TLM4	Demonstration (Lab/Field Visit)
TLM2	PPT	TLM5	ICT (NPTEL/Swayam Prabha/MOOCs)
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PART-C

EVALUATION PROCESS (R23 Regulation):

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II- Descriptive Examination (Unit-III, IV & V)	M2=15
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Mid Marks =80% of Max ((M1+Q1+A1), (M2+Q2+A2)) + 20% of Min ((M1+Q1+A1), (M2+Q2+A2))	M=30
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Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

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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	B.VIJAYA SRI	Dr. B Sivarama krishna	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr D Veeraiah

Course Name & Code : FORMAL LANGUAGES AND AUTOMATA THEORY
23CS08

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /C

A.Y.: 2026-27

PREREQUISITE: -Discrete Mathematics Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course are to

To learn fundamentals of Regular and Context Free Grammars and Languages

- To understand the relation between Regular Language and Finite Automata and machines

- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators

- To understand the relation between Contexts free Languages, PDA and TM

- To learn how to design PDA as acceptor and TM as Calculators

CO1	Construct finite automata and demonstrate their equivalence & minimization for language recognition. (Apply-L3)
CO2	Implement regular expressions and finite automata and apply closure properties & pumping lemma for language validation. (Apply-L3)
CO3	Develop context-free grammars and apply simplification techniques & normal forms for formal language processing. (Apply-L3)
CO4	Design pushdown automata and demonstrate their equivalence with context-free grammars. (Apply-L3)
CO5	Construct Turing machines and apply computational techniques to solve decision problems and complexity analysis. (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	1	2								1	3		2
CO2	3	3		2								1	3		2
CO3	3	3	3	2								1	3	1	3
CO4	3	1	1	2								1	3	1	3
CO5	3	3	1	2								2	3	1	2
			1 - Low			2 -Medium			3 - High						

TEXTBOOKS:

- T1** Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
- T2** Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

REFERENCE BOOKS:

- R1** Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
R2 Theory of Computation, V. Kulkarni, Oxford University Press, 2013
R3 Theory of Automata, Languages and Computation, Rajendra kumar, McGraw Hill,2014

E-Resources

- 1) <https://nptel.ac.in/courses/106/104/106104028/>

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Finite Automata**

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- Course Objective & Outcomes, Need of Automata theory, Central Concepts of Automata Theory	1	29-06-2026		TLM2	
2.	Finite Automata, Transition Systems	1	31-06-2026		TLM2	
3.	Acceptance of a String, DFA, Design of DFAs,	1	04-07-2026		TLM1	
4.	NFA, Design of NFA	1	06-07-2026		TLM1	
5.	Equivalence of DFA and NFA	1	08-07-2026		TLM1	
6.	Activity Based learning- – Concept of NFA, DFA, Equivalence between DFA and NFA	1	11-07-2026		TLM7	
7	Finite Automata with ϵ -Transitions	1	13-07-2026		TLM1	
8	Minimization of Finite Automata	1	15-07-2026		TLM1	
9.	Finite Automata with output-Mealy and Moore Machines	1	18-07-2026		TLM1	
10.	Activity Based learning- Finite Automata with output-Mealy and Moore Machines	1	20-07-2026		TLM7	
11.	Applications and Limitation of Finite Automata	1	22-07-2026		TLM1	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Regular Expressions

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.	Regular Expressions, Regular Sets, Identity Rules	1	25-07-2026		TLM2	
13	Equivalence of two RE	1	27-07-2026		TLM1	
14	Simplification of REs, Finite Automata and Regular Expressions	1	29-07-2026		TLM1	
15	Inter Conversion, Equivalence Between FA and RE	1	01-08-2026		TLM1	
16	Pumping Lemma of Regular Sets	1	03-08-2026		TLM1	
17	Closure Properties of Regular Sets,	1	05-08-2026		TLM1	
18	Grammars, Classification of Grammars	1	08-08-2026		TLM1	
19	Chomsky Hierarchy	1	10-08-2026		TLM1	

20	Right and Left Linear Regular Grammars	1	12-08-2026		TLM1
21	Equivalence between RG and FA, Inter Conversion	2	17-08-2026 19-08-2026		TLM1
22	Activity Based Learning - Grammars	1	22-08-2026		TLM7

No. of classes required to complete UNIT-II: 12

No. of classes taken:

I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)

UNIT-III: Context Free Grammar

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	Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees,	1	31-08-2026		TLM2	
24	Ambiguous Grammars	1	02-09-2026		TLM1	
25	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	05-09-2026		TLM1	
26	ε- Productions, Unit Productions	1	07-09-2026		TLM1	
27	Normal Forms-Chomsky Normal Form	1	09-09-2026		TLM1	
28	Greibach Normal Form	1	12-09-2026		TLM1	
29	Pumping Lemma, Closure Properties, Applications of Context Free Grammars	1	16-09-2026		TLM1	
30	Activity Based Learning- Context Free Grammar	1	19-09-2026		TLM7	

No. of classes required to complete UNIT-III: 8

No. of classes taken:

UNIT-IV: Push down Automata

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.	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description	1	21-09-2026		TLM2	
32.	Language Acceptance of Push Down Automata	1	23-09-2026		TLM1	
33.	Design of Pushdown Automata	1	26-09-2026		TLM1	
34.	Deterministic and Non Deterministic Pushdown Automata	1	28-09-2026		TLM1	
35	CFG to PDA	1	30-10-2026		TLM1	
36	PDA to CFG	1	03-10-2026			
37	Two Stack Pushdown Automata, Application of Pushdown Automata	1	05-10-2026		TLM1	
38	Activity based learning on Pushdown Automata	1	07-10-2026		TLM7	

No. of classes required to complete UNIT-IV: 8

No. of classes taken:

UNIT-V: Turning Machine

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.	Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions	1	10-10-2026		TLM2	
40.	Language of a TM, Design of TMs	1	12-10-2026		TLM1	
41.	Types of TMs, Church's Thesis	1	14-10-2026		TLM1	

42.	Universal and Restricted TM, Decidable & Undecidable, halting Problem	1	17-10-2026		TLM1
43.	Post's Correspondence Problem, Modified PCP	1	26-10-2026		TLM1
44.	Classes of P and NP, NP-Hard and NP-Complete Problems	1	28-10-2026		TLM1
No. of classes required to complete UNIT-V: 6				No. of classes taken:	

II MID EXAMINATIONS (02-11-2026 TO 07-11-2026)

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	TLM	COs	HOD Sign Weekl y
1.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2026				
No. of classes		1	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
TLM 7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. D. Veeraiah	Dr. D. Veeraiah	Dr. D. Venkata Subbaiah	Dr .S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.N.V.Maha Lakshmi

Course Name & Code : Artificial Intelligence & 23AD02

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

Program/Sem/Sec :BTECH/V/C

Credits: 3

A.Y.: 2026-27

PREREQUISITE: Basic Engineering and Mathematics knowledge

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Enumerate the history & Foundation of AI. (Understand - L2)
CO2	Apply the searching algorithms for AI in problem solving. (Apply-L3)
CO3	Choose the appropriate representation of knowledge. (Apply-L3)
CO4	Choose the appropriate logic concepts. (Apply-L3)
CO5	Understand the Expert Systems techniques in AI. (Understand -L2)

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

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

TEXTBOOKS:

T1	Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, third edition, 2009.can also second edition,2003.
T2	Elaine Rich, Kevin Knight Artificial Intelligence, TMH, second edition, 2007.

REFERENCE BOOKS:

R1	Nils J.Nilsson "Artificial Intelligence - A New Synthesis", ,Morgan Kaufmann, 1988
R2	David poole,Alan Mackworth, "Artificial Intelligence: Foundations for computational agents",Cambridge Univ.press,2010.
R3	G.Luger,"Artificial Intelligence: Structures and Strategies for complex problem solving ", Fourth Edition,Pearson Education.
R4	Artificial Intelligence, Saroj Kaushik, CENGAGE Learning

ONLINE RESOURCES:

1	https://ai.google
2	https://swayam.gov.in/nd1_noc19_me71/preview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction: AI problems,	1	02-07-2026		TLM1	
2.	Basics of AI	1	03-07-2026		TLM1	
3.	foundation of AI and history of AI	1	04-07-2026		TLM1	
4.	intelligent agents: Agents and Environments,	1	09-07-2026		TLM1	
5.	the concept of rationality,	1	10-07-2026		TLM2	
6.	the nature of environments	1	11-07-2026		TLM2	
7.	structure of agents,	1	16-07-2026		TLM2	
8.	problem solving agents	1	17-07-2026		TLM2	
9.	problem formulation.	1	18-07-2026		TLM2	
No. of classes required to complete UNIT-I: 09				No. of classes taken:		

UNIT-II:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Searching- Searching for solutions, uniformed search strategies	1	23-07-2026		TLM2	
11.	Breadth first search	1	24-07-2026		TLM2	
12.	Breadth first search	1	25-07-2026		TLM1	
13.	Depth first Search.	1	30-07-2026		TLM1	
14.	Search with partial information (Heuristic search) Hill climbing	1	31-07-2026		TLM2	
15.	Activity Based learning-DFS, BFS	1	01-08-2026		TLM7	
16.	A* Algorithm	1	06-08-2026		TLM1	
17.	A* Algorithm	1	07-08-2026		TLM2	
18.	AO* Algorithm	1	08-08-2026		TLM1	
19.	AO* Algorithm	1	13-08-2026		TLM2	
20.	Problem reduction, Game Playing- Adversial search	1	14-08-2026		TLM2	
21.	mini-max algorithm,	1	20-08-2026		TLM1	
22.	optimal decisions in multiplayer games	1	21-08-2026		TLM2	
23.	Problem in Game playing, Alpha-Beta pruning, Evaluation functions.	1	22-08-2026		TLM1	
No. of classes required to complete UNIT-II: 14				No. of classes taken:		

UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Representation of Knowledge: Knowledge representation issues,	1	03-09-2026		TLM2	
25.	predicate logic- logic programming	1	05-09-2026		TLM2	
26.	semantic nets- frames and inheritance, constraint propagation	1	10-09-2026		TLM2	
27.	representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty,	1	11-09-2026		TLM2	
28.	review of probability, Bayes' probabilistic interference	1	12-09-2026		TLM2	
29.	dempstershafer theory	1	17-09-2026		TLM2	
No. of classes required to complete UNIT-III: 06				No. of classes taken:		

UNIT-IV:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Logic concepts: First order logic, Inference in first order logic,	1	18-09-2026		TLM2	
31.	propositional vs. first order inference, unification & lifts forward chaining	1	19-09-2026		TLM2	
32.	Backward chaining	1	24-09-2026		TLM2	
33.	Resolution	1	25-09-2026		TLM2	
34.	Learning from observation	1	26-09-2026		TLM2	
35.	Inductive learning,	1	01-10-2026		TLM2	
36.	Decision trees,	1	03-10-2026		TLM2	
37.	Explanation based learning	1	08-10-2026		TLM2	
38.	Statistical Learning methods	1	09-10-2026		TLM2	
39.	Reinforcement Learning	1	10-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Expert Systems: Architecture of expert systems,	1	15-10-2026		TLM2	
41.	Roles of expert systems	1	16-10-2026		TLM2	
42.	Knowledge Acquisition Meta	1	17-10-2026		TLM2	

	knowledge Heuristics.				
43.	Typical expert systems – MYCIN, DART	1	29-10-2026		TLM2
44.	XCON, Expert systems shells.	1	30-10-2026		TLM2
No. of classes required to complete UNIT-V: 05				No. of classes taken:	

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.	Agentic AI – Introduction, components of AI agents, autonomous decision-making, applications, challenges, and future directions.	01	31-10-2026		TLM2	

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
TLM7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

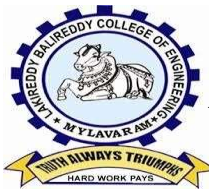
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 2	Problem analysis: Identify, formulate, review research literature,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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.N.V.Maha Lakshmi	Dr.N.V.Maha Lakshmi	Dr.K.Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Mallikarjunarao Dandu, Sr. Assistant Professor

Course Name & Code : Sustainable Energy Technologies- 23ME81 **Regulation:** R23

L-T-P Structure : 3-0-0 **Credits:** 03

Program/Sem/Sec : B. Tech- CSE V Sem C/S **A.Y.:** 2026-27

PREREQUISITE : Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-L2)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	2	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-	1	2	3	-	-	-	-	2	-	-	-
CO3	2	2	-	-	1	2	3	-	-	-	-	2	-	-	-
CO4	3	2	-	-	-	2	3	-	-	-	-	2	-	-	-
CO5	2	2	-	-	-	2	3	-	-	-	-	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).

TEXT BOOKS:

T1 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

R3. Non-conventional Energy Source- G S Sawhney- PHI, New Delhi, 2012

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I:****SOLAR RADIATION**

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.	Course Outcomes	1	01-07-2026		TLM2	
2.	Role and potential of new and renewable sources, The solar energy option	1	03-06-2026		TLM1	
3.	Environmental impact of solar power, Structure of the Sun, The solar constant	1	04-07-2026		TLM1 TLM2	
		1	08-07-2026		TLM2	
4.	Sun-earth relationships	1	10-07-2026		TLM2	
5.	Coordinate systems and coordinates of the sun,	1	11-07-2026		TLM2	
	Extraterrestrial and terrestrial solar radiation	1	15-07-2027		TLM2	
		1	17-07-2027		TLM2	
6.	Solar radiation on tilted surface	1	18-07-2026		TLM2	
	Instruments for measuring solar radiation	1	22-07-2026		TLM2	
	sun shine, Solar radiation data	1	24-07-2026		TLM2	
7.	ABL	1	25-07-2026		TLM6	
8.	Lab visit	1	29-07-2026		TLM4	
No. of classes required to complete UNIT-I: 13				No. of classes taken:		

UNIT-II:**SOLAR PV MODULES AND PV 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.	PV module Circuit Design	1	31-07-2026		TLM2	
	Module Structure, Packing Density	1	01-08-2026		TLM2	
2.	Interconnections, Mismatch and temperature effects	1	05-08-2026		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules	1	07-08-2026		TLM2	
	Degradation and failure, PV module parameters, Efficiency of PV Systems	1	08-08-2026		TLM2	
4.	Solar PV Systems, Battery Operation, Types of Batteries	1	12-08-2026		TLM2	

	Battery parameters, Applications	1	14-08-2026		TLM2	
5.	Selection of batteries for Solar PV System	1	19-08-2026		TLM2	
6.	ABL	1	21-08-2026		TLM6	
No. of classes required to complete UNIT-II: 09				No. of classes taken:		

UNIT-III:

SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	22-08-2026		TLM2	
2.	Classification of concentrating collectors	1	02-09-2026		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	05-09-2026		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	09-09-2026		TLM2	
	Solar Applications-solar heating cooling technique	1	11-09-2026		TLM2	
5.	Solar distillation and drying, Solar cookers	1	12-09-2026		TLM2	
	Central power tower concept, Solar chimney	1	16-09-2026		TLM2	
6.	ABL	1	18-09-2026		TLM6	
No. of classes required to complete UNIT-III: 8				No. of classes taken:		

UNIT-IV :

WIND ENERGY, BIO-MASS

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.	Wind energy: Sources and potential	1	19-09-2026		TLM2	
2.	Horizontal and Vertical axis wind mill	1	23-09-2026		TLM2	
3.	Performance characteristics, Betz criteria	1	25-09-2026		TLM2	
4.	Types of winds, Wind data measurement	1	26-09-2026		TLM2	
5.	Bio-mass: Principles of bio-conversion	1	30-09-2026		TLM2	
6.	Anaerobic/aerobic digestion, Types of biogas digesters, Gas yield, Gasifiers, Applications	1	03-10-2026		TLM2	

7.	ABL	1	07-10-2026		TLM6	
No. of classes required to complete UNIT-IV:07				No. of classes taken:		

UNIT-V :

GEOHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS

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.	Geothermal Energy Origin, Applications	1	09-10-2026		TLM2	
	Types of Geothermal Resources, Geothermal power generation	1	10-10-2026		TLM2	
		1	14-10-2026		TLM2	
2.	Relative merits and demerits, Ocean Energy: Ocean Thermal energy	1	16-10-2026		TLM2	
3.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	17-10-2026		TLM2	
4.	Challenges and applications, Fuel Cells: Introduction, Applications	1	28-10-2026		TLM2	
5.	Alkaline fuel cell, PEM fuel cell, MC fuel cell	1	30-10-2026		TLM2	
6.	ABL	1	31-10-2026		TLM6	
No. of classes required to complete UNIT-V: 08				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	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	7
Dussrhra Holidays	19-10-2026	24-10-2026	1
II Phase of Instructions Contd..	26-10-2026	31-10-2026	1
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

PART-C
EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

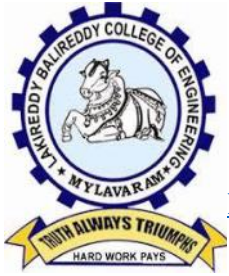
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mallikarjunarao Dandu	Dr. K. Delip Kumar	Dr. K. Delip Kumar	Dr. M B S Sreekar Reddy



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs B.Swathi
Course Name & Code :- DATA MINING LAB-23AD55
L-T-P Structure :0-0-3 **Credits:1.5**
Program/Sem/Sec : B.Tech. – CSE-V/C **A.Y.:2026-27**

PREREQUISITE: Data Base Management Systems, Python Programming/R Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of this lab is to provide practical exposure to the implementation of widely used data mining algorithms and to develop the ability to evaluate their performance in both supervised and unsupervised learning environments.

Software Requirements: Python/R-Tool

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

CO1	Apply data preprocessing, similarity measures, and machine learning models using Python for solving data mining tasks. (Apply – L3)
CO2	Develop and evaluate classification, clustering, and association rule mining techniques using appropriate algorithms. (Apply – L3)
CO3	Analyze performance of data mining models using validation techniques and interpret results for decision-making. (Apply – L3)
CO4	Improve individual/teamwork skills, communication, report writing, and practice ethical responsibilities in project work.

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	2	3	-	-	-	-	-	-	2	3	2	3
CO 2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO 3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO 4	-	-	-	-	-	-	-	2	3	3	-	2	2	-	-
	1 - Low					2 -Medium					3 - High				

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.	Introduction- Practice on Python Programming	3	02-07-2026		DM5	
2.	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	09-07-2026		DM5	
3.	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	16-07-2026		DM5	
4.	Similarity and Dissimilarity Measures using python	3	23-07-2026		DM5	
5.	Build a model using linear regression algorithm on any dataset.	3	30-07-2026		DM5	
6.	Practice Session	3	06-08-2026			
7.	Build a classification model using Decision Tree algorithm on iris dataset	3	13-08-2026		DM5	
8.	Apply Naïve Bayes Classification algorithm on any dataset	3	20-08-2026		DM5	
9.	Generate frequent item sets using Apriori Algorithm in python	3	03-09-2026		DM5	
10.	Generate association rules for any market basket data.	3	10-09-2026		DM5	
11.	Apply K- Means clustering algorithm on any dataset.	3	17-10-2026		DM5	
12.	Apply Hierarchical Clustering algorithm on any dataset	3	24-10-2026		DM5	
13.	Apply DBSCAN clustering algorithm on any dataset.	3	01-10-2026		DM5	
14.	Apply DBSCAN clustering algorithm on any dataset.	3	08-10-2026		DM5	
15.	Add on Experiment	3	15-10-2026		DM5	
16.	Practice Session	3	22-10-2026		DM5	
17.	Internal exam	3	29-10-2026		DM5	

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

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day-to-day work	A1 = 15
Internal test	A3 = 15
CIE Total:	M1 = 30
Procedure/Algorithm	B1 = 20
Program execution and Result/Inference	B2 = 30
Viva voce	B = 20
SEE Total:	M2 = 70
Total Marks = CIE + SEE = (M1+M2)	100

PART-D

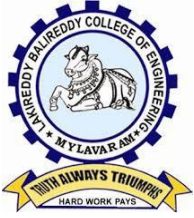
PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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	Mrs B.Swathi	Dr. D.Venkata Subbaiah	Dr. D.Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: B.VIJAYA SRI

Course Name & Code : COMPUTER NETWORKS LAB (23CS58)

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/III/C

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

COURSE OUTCOMES (CO):

CO1: Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques. **(Apply - L3)**

CO2: Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation. **(Apply - L3)**

CO3: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(Apply - L3)**

CO4: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(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
C01	3	2	3	2	3								1	3	
C02	3	3	3	3	2								1	3	
C03	3	3	2	3	3								2	3	
C04								3	3	3			3	2	

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.	Study of Network devices in detail and connect the computers in Local Area Network.	03	29-06-2026		
2.	Write a Program to implement the data link layer framing methods such as i) Character stuffing ii) bit stuffing.	03	06-07-2026		
3.	Write a Program to implement data link layer framing method checksum.	03	13-07-2026		
4.	Write a program for Hamming Code generation for error detection and correction.	03	20-07-2026		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	27-07-2026		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	03-08-2026		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	10-08-2026		
8.	Write a Program to implement Stop and Wait Protocol.	03	17-08-2026		
9.	Write a program for congestion control using leaky bucket algorithm	03	31-08-2026		
10.	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).	03	07-09-2026		
11.	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.	03	21-09-2026		
12.	Do the following using NS3 Simulator i. NS3 Simulator-Introduction ii. Simulate to Find the Number of Packets Dropped iii. Simulate to Find the Number of Packets Dropped by TCP/UDP iv. Simulate to Find the Number of Packets Dropped due to Congestion v. Simulate to Compare Data Rate& Throughput.	03	28-09-2026		
13.	Internal Exam	03	12-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30

Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 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	B. VIJAYA SRI	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbiah	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. N. SrinivasaRao

Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS4)

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

Credits: 2

Program/Sem/Sec : B.Tech. – CSE/V/C

A.Y.: 2026-27

PREREQUISITE: Object oriented programming, Full stack development-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to equip students with hands-on skills in developing full stack web applications using Java, Node.js, and React. It focuses on building backend services using JDBC, Servlets, and Express.js, along with frontend development using React.js. Students will learn to integrate databases like MySQL and MongoDB for real-time data handling. The course emphasizes applying MVC architecture, REST APIs, and deployment practices for complete web solutions.

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

CO1	Apply JDBC and Servlet technologies to develop web applications that interact with relational databases. (Apply-L3)
CO2	Apply the MVC architecture using JSP, Servlets, and JavaBeans to design structured and maintainable web applications. (Apply-L3)
CO3	Apply Node.js and Express.js to create RESTful services and perform backend operations with MongoDB. (Apply-L3)
CO4	Apply React.js to develop dynamic user interfaces and integrate them with backend APIs for full stack web solutions. (Apply-L4)

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	3		3							2	2	2	3
CO2	3	2	3		3							2	3	3	2
CO3	3	2	3		3							2	2	3	2
CO4	3	2	3		3							2	2	3	2
	1 - Low			2 -Medium				3 - High							

REFERENCE BOOKS:

R1	"Head First Servlets and JSP" By: Bryan Basham, Kathy Sierra, Bert Bates Publisher: O'Reilly Media
R2	"Learning Node.js Development" By: Andrew Mead Publisher: Packt Publishing
R3	"MongoDB: The Definitive Guide" By: Kristina Chodorow Publisher: O'Reilly Media
R4	"Learning React: Modern Patterns for Developing React Apps" By: Alex Banks and Eve Porcello Publisher: O'Reilly Media

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.	FSD-II & JDBC Introduction	3	01/07/2026		DM5	
2.	JDBC Programs	3	08/07/2026		DM5	
3.	Servlet Programs	3	15/07/2026		DM5	
4.	JSP Introduction	3	22/07/2026		DM5	
5.	JSP MVC programs	6	29/07/2026 05/08/2026		DM5	
6.	Node JS Introduction	3	12/08/2026		DM5	
7.	Express JS Framework	3	19/08/2026		DM5	
8.	Node JS & Express JS Programs	6	02/09/2026 09/09/2026		DM5	
9.	MangoDB	3	16/09/2026		DM5	
10.	MangoDB with Express JS	3	23/09/2026		DM5	
11.	React JS	3	30/09/2026		DM5	
12.	React JS and Full stack Integration	3	07/10/2026		DM5	
13.	Web Application Development	3	14/10/2026		DM5	
14.	Internal Test	3	28/10/2026		DM4	

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

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

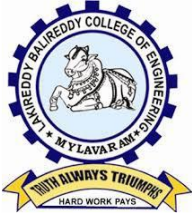
PROGRAMME OUTCOMES (POs):

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 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	Mr. N. SrinivasaRao	Dr. K. Devi Priya	Dr. Y.V.B. Reddy	Dr. S. Nagarjuna Reddy
Signature				



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

hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. D. Sainath

Course Name & Code : User Interface Design Using Flutter Lab & 23IT53

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/V/C

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to

- 1.Learns to Implement Flutter Widgets and Layouts
- 2.Understands Responsive UI Design and with Navigation in Flutter
- 3.Knowledge on Widges and customize widgets for specific UI elements, Themes
- 4.Understand to include animation apart from fetching data

COURSE OUTCOMES (CO):

CO1: Apply Flutter and Dart fundamentals to design and develop interactive user interfaces.

(Apply-L3)

CO2: Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. **(Apply-L3)**

CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical value

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
CO2	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
CO3	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
CO4	2	2	2	3	2	-	1	-	-	1	-	2	1	2	2

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.	Basic Flutter Programs	03	30-06-2026		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	03	07-07-2026		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	03	14-07-2026		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	03	21-07-2026		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	03	28-07-2026		
6.	Practice Lab	03	04-08-2026		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	03	11-08-2026		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	03	18-08-2026		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	03	01-09-2026		
10.	a) Create a scrollable List Widget in Form & Add items to it. b) Implement the List View & Display the selected item in the prompt window.	03	08-09-2026		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	03	29-09-2026		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	03	06-10-2026		
13.	Internal Exam	03	13-10-2026		

PART - C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART - D

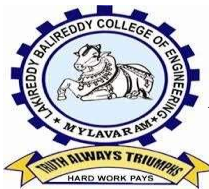
PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. D. Sainath	Mr. A. Koteswara Rao	Dr. Y. Vijaya Bhaskar Reddy	Dr. S. Nagarjuna Reddy
Signature				



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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Mallikarjunarao Dandu, Sr. Assistant Professor

Course Name & Code : Sustainable Energy Technologies- 23ME81 **Regulation:** R23

L-T-P Structure : 3-0-0 **Credits:** 03

Program/Sem/Sec : B. Tech- CSE V Sem D/S **A.Y.:** 2026-27

PREREQUISITE : Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-L2)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	2	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-	1	2	3	-	-	-	-	2	-	-	-
CO3	2	2	-	-	1	2	3	-	-	-	-	2	-	-	-
CO4	3	2	-	-	-	2	3	-	-	-	-	2	-	-	-
CO5	2	2	-	-	-	2	3	-	-	-	-	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).

TEXT BOOKS:

T1 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

R3. Non-conventional Energy Source- G S Sawhney- PHI, New Delhi, 2012

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I:****SOLAR RADIATION**

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.	Course Outcomes	1	29-06-2026		TLM2	
2.	Role and potential of new and renewable sources, The solar energy option	1	03-06-2026		TLM1	
3.	Environmental impact of solar power, Structure of the Sun, The solar constant	1	04-07-2026		TLM1 TLM2	
		1	06-07-2026		TLM2	
4.	Sun-earth relationships	1	10-07-2026		TLM2	
5.	Coordinate systems and coordinates of the sun,	1	11-07-2026		TLM2	
	Extraterrestrial and terrestrial solar radiation	1	13-07-2027		TLM2	
		1	17-07-2027		TLM2	
6.	Solar radiation on tilted surface	1	18-07-2026		TLM2	
	Instruments for measuring solar radiation	1	20-07-2026		TLM2	
	sun shine, Solar radiation data	1	24-07-2026		TLM2	
7.	ABL	1	25-07-2026		TLM6	
8.	Lab visit	1	27-07-2026		TLM4	
No. of classes required to complete UNIT-I: 13				No. of classes taken:		

UNIT-II:**SOLAR PV MODULES AND PV 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.	PV module Circuit Design	1	31-07-2026		TLM2	
	Module Structure, Packing Density	1	01-08-2026		TLM2	
2.	Interconnections, Mismatch and temperature effects	1	03-08-2026		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules	1	07-08-2026		TLM2	
	Degradation and failure, PV module parameters, Efficiency of PV Systems	1	08-08-2026		TLM2	
4.	Solar PV Systems, Battery Operation, Types of Batteries	1	10-08-2026		TLM2	

	Battery parameters, Applications	1	14-08-2026		TLM2	
5.	Selection of batteries for Solar PV System	1	17-08-2026		TLM2	
6.	ABL	1	21-08-2026		TLM6	
No. of classes required to complete UNIT-II: 14				No. of classes taken:		

UNIT-III:

SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	22-08-2026		TLM2	
2.	Classification of concentrating collectors	1	31-08-2026		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	05-09-2026		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds, Solar Applications-solar heating cooling technique	1	07-09-2026		TLM2	
5.	Solar distillation and drying, Solar cookers	1	11-09-2026		TLM2	
	Central power tower concept, Solar chimney	1	12-09-2026		TLM2	
6.	ABL	1	18-09-2026		TLM6	
No. of classes required to complete UNIT-III: 6				No. of classes taken:		

UNIT-IV :

WIND ENERGY, BIO-MASS

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.	Wind energy: Sources and potential	1	19-09-2026		TLM2	
2.	Horizontal and Vertical axis wind mill	1	21-09-2026		TLM2	
3.	Performance characteristics, Betz criteria	1	25-09-2026		TLM2	
4.	Types of winds, Wind data measurement	1	26-09-2026		TLM2	
5.	Bio-mass: Principles of bio-conversion	1	28-09-2026		TLM2	
6.	Anaerobic/aerobic digestion, Types of biogas digesters, Gas yield, Gasifiers, Applications	1	03-10-2026		TLM2	

7.	ABL	1	05-10-2026		TLM6	
No. of classes required to complete UNIT-IV:09				No. of classes taken:		

UNIT-V :

GEOHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS

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.	Geothermal Energy Origin, Applications	1	09-10-2026		TLM2	
	Types of Geothermal Resources, Geothermal power generation	1	10-10-2026		TLM2	
		1	12-10-2026		TLM2	
2.	Relative merits and demerits, Ocean Energy: Ocean Thermal energy	1	16-10-2026		TLM2	
3.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	17-10-2026		TLM2	
4.	Challenges and applications, Fuel Cells: Introduction, Applications	1	26-10-2026		TLM2	
5.	Alkaline fuel cell, PEM fuel cell, MC fuel cell	1	30-10-2026		TLM2	
6.	ABL	1	31-10-2026		TLM6	
No. of classes required to complete UNIT-V: 08				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	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	7
Dussrhra Holidays	19-10-2026	24-10-2026	1
II Phase of Instructions Contd..	26-10-2026	31-10-2026	1
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

PART-C
EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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PSO 3	To inculcate an ability to analyze, design and implement database applications.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mallikarjunarao Dandu	Dr. K. Delip Kumar	Dr. K. Delip Kumar	Dr. M B S Sreekar Reddy



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. Ch. Srinivasa Rao
Course Name & Code : Artificial Intelligence & 23AD02
L-T-P Structure :3-0-0
Program/Sem/Sec :B.Tech/V/D

Credits: 3
A.Y.: 2026-27

PREREQUISITE: Basic Engineering and Mathematics knowledge

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Enumerate the history & Foundation of AI. (Understand - L2)
CO2	Apply the searching algorithms for AI in problem solving. (Apply-L3)
CO3	Choose the appropriate representation of knowledge. (Apply-L3)
CO4	Choose the appropriate logic concepts. (Apply-L3)
CO5	Understand the Expert Systems techniques in AI. (Understand -L2)

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

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

TEXTBOOKS:

T1	Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, third edition, 2009.can also second edition,2003.
T2	Elaine Rich, Kevin Knight Artificial Intelligence, TMH, second edition, 2007.

REFERENCE BOOKS:

R1	Nils Nilsson "Artificial Intelligence - A New Synthesis", Morgan Kaufmann, 1988
R2	David Poole, Alan Mackworth, "Artificial Intelligence: Foundations for computational agents", Cambridge Univ.press,2010.
R3	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving ", Fourth Edition, Pearson Education.
R4	Artificial Intelligence, Saroj Kaushik, CENGAGE Learning

ONLINE RESOURCES:

1	https://ai.google
2	https://swayam.gov.in/nd1_noc19_me71/preview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction: AI problems,	1	29/06/2026		TLM3	
2.	Basics of AI	1	30/06/2026		TLM2	
3.	Foundation of AI and history of AI	1	02/07/2026		TLM2	
4.	Intelligent agents: Agents and Environments,	1	03/07/2026		TLM3	
5.	the concept of rationality,	1	04/07/2026		TLM2	
6.	The nature of environments	1	07/07/2026		TLM2	
7.	Structure of agents,	1	09/07/2026		TLM2	
8.	Problem solving agents	1	10/07/2026		TLM3	
9.	Problem formulation.	1	11/07/2026		TLM2	
10.	Revision	1	14/07/2026		TLM2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Searching- Searching for solutions, uniformed search strategies	1	16/07/2026		TLM2	
12.	Breadth first search	1	17/07/2026		TLM3	
13.	Breadth first search	1	18/07/2026		TLM2	
14.	Depth First Search.	1	21/07/2026		TLM2	
15.	Search with partial information	1	23/07/2026		TLM2	
16.	(Heuristic search) Hill climbing	1	24/07/2026		TLM3	
17.	A* Algorithm	1	25/07/2026		TLM2	
18.	A* Algorithm	1	30/07/2026		TLM2	
19.	AO* Algorithm	1	31/07/2026		TLM3	
20.	AO* Algorithm	1	01/08/2026		TLM2	
21.	Problem reduction, Game Playing-	1	04/08/2026		TLM2	
22.	Adversial search, Games	1	06/08/2026		TLM2	
23.	mini-max algorithm,	1	07/08/2026		TLM3	
24.	Optimal decisions in multiplayer games	1	08/08/2026		TLM2	
25.	Problem in Game playing	1	11/08/2026		TLM2	
26.	Alpha-Beta pruning	1	13/08/2026		TLM3	
27.	Evaluation functions.	1	14/08/2026		TLM2	
28.	Revision	1	18/08/2026		TLM2	
No. of classes required to complete UNIT-II: 18				No. of classes taken:		

UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Representation of Knowledge: Knowledge representation issues	1	20/08/2026		TLM3	
30.	predicate logic- logic programming	1	21/08/2026		TLM2	
31.	Semantic nets- frames and inheritance	1	22/08/2026		TLM2	
32.	Constraint propagation	1	01/09/2026		TLM2	
33.	Representing knowledge using rules,	1	03/09/2026		TLM2	
34.	Rules based deduction systems. Reasoning under uncertainty,	1	05/09/2026		TLM2	
35.	Review of probability, Bayes' probabilistic interference	1	08/09/2026		TLM2	
36.	Dempster Shafer theory	1	09/09/2026		TLM3	
No. of classes required to complete UNIT-III: 08				No. of classes taken:		

UNIT-IV:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Logic concepts: First order logic.	1	11/09/2026		TLM2	
38.	First order logic	1	12/09/2026		TLM2	
39.	Inference in first order logic,	1	15/09/2026		TLM2	
40.	Propositional vs. first order inference,	1	17/09/2026		TLM3	
41.	unification & lifts forward chaining	1	18/09/2026		TLM2	
42.	Backward chaining	1	19/09/2026		TLM2	
43.	Resolution	1	22/09/2026		TLM2	
44.	Learning from observation	1	24/09/2026		TLM3	
45.	Inductive learning,	1	25/09/2026		TLM2	
46.	Decision trees,	1	26/09/2026		TLM2	
47.	Decision trees,	1	29/09/2026		TLM2	
48.	Explanation based learning	1	01/10/2026		TLM2	
49.	Statistical Learning methods	1	03/10/2026		TLM2	
50.	Reinforcement Learning	1	06/10/2026		TLM2	
No. of classes required to complete UNIT-IV: 14				No. of classes taken:		

UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
51.	Expert Systems: Architecture of expert systems	1	08/10/2026		TLM3	
52.	Roles of expert systems	1	09/10/2026		TLM2	
53.	Knowledge Acquisition Meta	1	10/10/2026		TLM2	
54.	Knowledge Heuristics	1	13/10/2026		TLM3	
55.	Typical expert systems – MYCIN	1	15/10/2026		TLM2	
56.	DART	1	16/10/2026		TLM2	
57.	XCON	1	17/10/2026		TLM3	
58.	Expert systems shells.	1	27/10/2026		TLM2	
59.	Revision	1	29/10/2026		TLM2	
No. of classes required to complete UNIT-V:09				No. of classes taken:		

Contents beyond the Syllabus:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Generative AI and Large Language Models (LLMs)	1	30/10/2026		TLM6	
2.	AI in Cybersecurity	1	31/10/2026		TLM6	

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 (R23 Regulation):**

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

PART-D**PROGRAMME OUTCOMES (POs):**

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to 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 engineering practice.
PO 9	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.Ch. Srinivasa Rao	Dr. N. V. Maha Lakshmi	Dr. K. Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.G.V.SURESH
Course Name & Code : COMPUTER NETWORKS LAB (23CS58)
L-T-P Structure : 1-0-2 Credits: 2
Program/Sem/Sec : B.Tech/CSE/III/D A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are carried out to understand the layered architecture and how do some important protocols work

COURSE OUTCOMES (CO):

CO1: Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques. **(Apply – L3)**

CO2: Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation. **(Apply – L3)**

CO3: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(Apply – L3)**

CO4: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(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	3	2	3	2	3								1	3	
CO2	3	3	3	3	2								1	3	
CO3	3	3	2	3	3								2	3	
CO4								3	3	3			3	2	

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.	Study of Network devices in detail and connect the computers in Local Area Network.	03			
2.	Write a Program to implement data link layer framing methods such as i) Character stuffing ii) bit stuffing.	03			
3.	Write a Program to implement data link layer framing method checksum.	03			
4.	Write a program for Hamming Code generation for error detection and correction.	03			
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03			
6.	Write a Program to implement Sliding window protocol for Goback N.	03			
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03			
8.	Write a Program to implement Stop and Wait Protocol.	03			
9.	Write a program for congestion control using leaky bucket algorithm	03			
10.	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).	03			
11.	Wireshark <ul style="list-style-type: none">• Packet Capture Using Wire shark• Starting Wire shark• Viewing Captured Traffic• Analysis and Statistics & Filters.	03			
12.	Do the following using NS3 Simulator <ul style="list-style-type: none">• NS3 Simulator-Introduction• Simulate to Find the Number of Packets Dropped• Simulate to Find the Number of Packets Dropped by TCP/UDP.• Simulate to Find the Number of Packets Dropped due to Congestion.• Simulate to Compare Data Rate& Throughput.	03			
13.	Internal Exam	03			

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15

Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. G.V.Suresh	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbiah	Dr. S. Nagarjuna Reddy

Signature				
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: DR.G.V.SURESH
Course Name & Code : COMPUTER NETWORKS (23CS07)
L-T-P Structure : 3-0-0
Credits: 3
Program/Sem/Sec : B.Tech/CSE/V/D A.Y: 2026-27

PREREQUISITE: -Foundational understanding of basic computer concepts

COURSE EDUCATIONAL OBJECTIVES(CEO):

Course Objectives:

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:

CO1	Understand various network types, topologies, reference models, and transmission media (Understand-L2)
CO2	Examine data link layer design issues, framing techniques, error control, and flow control mechanisms. (Analyze-L4)
CO3	Apply multiple media access control techniques and evaluate Ethernet standards for network communication. (Apply-L3)
CO4	Implement routing algorithms, congestion control techniques, and IP addressing schemes for efficient network communication. (Apply-L3)
CO5	Utilize transport layer protocols (UDP & TCP) and application layer services (HTTP, DNS, Email) to enable secure and reliable data communication. (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	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	1	3	-	-
CO3	2	2	3	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	3	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	3	3	-
1 - Low 2 -Medium 3 - High															

Text Books:

1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI

2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate

2. Computer Networks, Mayank Dave, CENGAGE

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction & Physical Layer

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 Computer Networks: Definition, Uses, Advantages: Network Types: LAN, MAN, WAN	1	29-06-26		TLM2	
2.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid	1	04-07-26		TLM1	
3.	OSI Reference Model – 7 Layers, Role of each layer	1	06-07-26		TLM2	
4.	TCP/IP Reference Model – Layers, Function, Protocols, Comparison: OSI vs TCP/IP	1	08-07-26		TLM2	
5.	Introduction to Physical Layer	1	10-07-26		TLM2	
6.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	1	11-07-26		TLM2	
7.	Unguided Media: Radio, Microwave, Infrared	1	13-07-26		TLM1	
8.	Recap + Quiz + Discussion	1	15-07-26		TLM1	
9.	ABL Activity	1	16-07-26		TLM7	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Data Link Layer

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.	Design Issues, Framing Methods: Fixed & Variable Size	1	18-07-26		TLM1	
11.	Flow Control: Stop-and-wait, Sliding Window	1	20-07-26		TLM1	
12.	Error Control: Types of Errors, Detection & Correction, CRC and Checksum	1	22-07-26		TLM1	
13.	Services to Network Layer	1	25-07-26		TLM1	
14.	Elementary Protocols: Simplex, Stop-and-Wait	1	27-07-26		TLM1	
15.	Protocols for Noisy Channels, Sliding Window Protocols: Go-back-N, Selective Repeat	1	29-07-26		TLM1	
16.	Summary and Protocol Comparison	1	01-08-26		TLM1	
17.	Recap + Hands-on Simulation + Quiz	1	03-08-26		TLM1	

18.	ABL Activity	1	05-08-26		TLM7	
No. of classes required to complete UNIT-II: 11				No. of classes taken:		
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)						

UNIT-III: Media Access Control & Wired LANs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	Media Access – Random Access: ALOHA, CSMA	1	06-08-26		TLM1	
20.	CSMA/CD & CSMA/CA	1	08-08-26		TLM1	
21.	Channelization Techniques: FDMA, TDMA, CDMA	1	10-08-26		TLM1	
22.	Wired LANs: Introduction to Ethernet, Standard Ethernet – Frame Structure	1	12-08-26		TLM1	
23.	Fast Ethernet – Features, Standards	1	17-08-26		TLM1	
24.	Gigabit Ethernet and 10 Gigabit Ethernet, Ethernet Summary + Comparison Table	1	19-08-26		TLM1	
25.	Practice: Frame design and decoding	1	22-08-26		TLM1	
26.	ABL Activity	1	30-08-26		TLM7	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV: – Network Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
27.	Design Issues – Packet Switching, Store-and-Forward	1	31-08-26 02-09-26		TLM1	
28.	Connectionless vs Connection-Oriented Services	1	06-09-26		TLM1	
29.	Datagram vs Virtual Circuit Networks	1	07-09-26 09-09-26		TLM1	
30.	Routing Algorithms: Optimality, Shortest Path, Flooding	1	12-09-26		TLM1	
31.	Distance Vector and Link State Routing	1	16-09-26		TLM1	
32.	Congestion Control: Principles, Algorithms, Traffic Control: Leaky Bucket, Token Bucket	1	19-09-26		TLM1	
33.	Internetworking: IPv4, IPv6	1	21-09-26		TLM1	
34.	ABL Activity	1	23-09-26		TLM7	
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

UNIT-V: Transport & Application Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Introduction to Transport Layer – Port Numbers	1	26-09-26		TLM1	

36.	UDP – Format, Features, Applications	1	28-09-26 30-09-26		TLM1	
37.	TCP – Services, Connection Establishment, Segments	1	03-10-26		TLM1	
38.	TCP Features – Flow, Error, Congestion Control	2	05-10-26 07-10-26		TLM1	
39.	Application Layer: Introduction to WWW & HTTP	1	10-10-26		TLM1	
40.	Email Architecture: SMTP, POP3, IMAP, Email Security, Web-based Mail	1	12-10-26 14-10-26		TLM1	
41.	TELNET – Remote Access	1	17-10-26		TLM1	
42.	DNS – Hierarchy, Resolution Process	1	26-10-26		TLM2	
43.	ABL Activity	2	28-10-26		TLM2	
No. of classes required to complete UNIT-V: 13					No. of classes taken:	

Content Beyond 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
1.	Overview of how networking works in cloud platforms and IoT	1	31-10-2026					
No. of classes		1				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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15

I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, 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.
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PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
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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.G.V.Suresh	Dr. B Sivarama Krishna	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. K Devi Priya

Course Name & Code :- DATA MINING LAB-23AD55

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

Credits: 1.5

Program/Sem/Sec : B.Tech. –CSE-V/D

A.Y.: 2026-27

PREREQUISITE: Data Base Management Systems, Python Programming/R Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of this lab is to provide practical exposure to the implementation of widely used data mining algorithms and to develop the ability to evaluate their performance in both supervised and unsupervised learning environments.

Software Requirements: Python/R-Tool

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

CO1	Apply data preprocessing, similarity measures, and machine learning models using Python for solving data mining tasks. (Apply – L3)
CO2	Develop and evaluate classification, clustering, and association rule mining techniques using appropriate algorithms. (Apply – L3)
CO3	Analyze performance of data mining models using validation techniques and interpret results for decision-making. (Apply – L3)
CO4	Improve individual/teamwork skills, communication, report writing, and practice ethical responsibilities in project work.

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	3	2	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	-	2	2	-	-
			1 - Low				2 -Medium				3 - High				

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.	Introduction- Practice on Python Programming	3	02-07-2026		DM5	
2.	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	09-07-2026		DM5	
3.	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	16-07-2026		DM5	
4.	Practice Session	3	23-07-2026		DM5	
5.	Similarity and Dissimilarity Measures using python	3	30-07-2026		DM5	
6.	Build a model using linear regression algorithm on any dataset.	3	06-08-2026		DM5	
7.	Build a classification model using Decision Tree algorithm on iris dataset	3	13-08-2026		DM5	
8.	Apply Naïve Bayes Classification algorithm on any dataset	3	20-08-2026		DM5	
9.	Revision-Practice Session	3	03-09-2026		DM5	
10.	Generate frequent item sets using Apriori Algorithm in python	3	10-09-2026		DM5	
11.	Generate association rules for any market basket data.	3	17-10-2026		DM5	
12.	Apply K- Means clustering algorithm on any dataset.	3	24-10-2026		DM5	
13.	Apply Hierarchical Clustering algorithm on any dataset	3	01-10-2026		DM5	
14.	Apply DBSCAN clustering algorithm on any dataset.	3	08-10-2026		DM5	
15.	Apply DBSCAN clustering algorithm on any dataset.	3	15-10-2026		DM5	
16.	Practice Session	3	22-10-2026		DM5	
17.	Internal exam	3	29-10-2026		DM5	

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

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day-to-day work	A1 = 15
Internal test	A3 = 15
CIE Total:	M1 = 30
Procedure/Algorithm	B1 = 20
Program execution and Result/Inference	B2 = 30
Viva voce	B = 20
SEE Total:	M2 = 70
Total Marks = CIE + SEE = (M1+M2)	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr.K Devi Priya	Dr.D.Venkata Subbaiah	Dr.K Devi Priya	Dr. S. Nagarjuna Reddy
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.K DeviPriya

Course Name & Code : DATA WAREHOUSING & DATA MINING & 23AD04

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

Credits: 3

Program/Sem/Sec : B.Tech V Sem CSE –D Section

A.Y.: 2026-27

PREREQUISITE: Data Structures, Algorithms, Probability & Statistics, Data Base Management Systems

COURSE EDUCATIONAL OBJECTIVES (CEOs): The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and datamining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

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

CO1	Design data warehouses to support effective data modeling, integration, and analytical processing. (Level-3)
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications. (Level-2)
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance. (Level-3)
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets. (Level-3)
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively. (Level-2)

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	-	3	-	-	-	-	-	-	2	2	-	3
C02	3	2	-	-	3	-	-	-	-	-	-	2	2	-	3
C03	3	3	3	2	3	-	-	-	-	-	-	2	3	2	2
C04	2	2	-	2	3	-	-	-	-	-	-	2	3	-	2
C05	2	2	-	2	3	-	-	-	-	-	-	2	3	1	2
	1 - Low			2 - Medium			3 - High								

TEXTBOOKS:

T1 Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.

T2 Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

REFERENCE BOOKS:

R1 Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.

R2 Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.

R3 (NPTELcourse by Prof.PabitraMitra)http://onlinecourses.nptel.ac.in/noc17_mg24/preview

R4 http://www.saedsayad.com/data_mining_map.htm

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Data Warehousing and Online Analytical Processing

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.	Data Warehousing and Online Analytical Processing: Basic concepts	1	29-06-26,		TLM1&2	
2.	Data Warehouse Modeling	1	30-06-26		TLM1&2	
3.	Data Cube and OLAP, Data Warehouse Design and Usage	1	01-07-26		TLM1&2	
4.	Data Warehouse Implementation	1	06-07-26		TLM1&2	
5.	Cloud Data Warehouse	1	07-07-26		TLM1&2	
6.	Data Mining and Patten Mining, Technologies	1	08-07-26		TLM1&2	
7.	Applications	1	13-07-26		TLM1&2	
8.	Major issues	1	14-07-26		TLM1&2	
9.	Data Objects & Attribute Types	1	15-07-26		TLM1&2	
10.	Basic Statistical Descriptions of Data Data Visualization	1	20-07-26		TLM1&2	
11.	Measuring Data Similarity and Dissimilarity	1	21-07-26		TLM1&2	
12.	ABL	1	22-07-26		TLM1&TLM2	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: 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
13.	Data Preprocessing: An Overview	1	27-07-26		TLM1&2	
14.	Data Cleaning	1	28-07-26		TLM1&2	
15.	Data Cleaning, Data Integration	1	29-07-26		TLM1&2	
16.	Data Integration	1	03-08-26		TLM1&2	
17.	Data Reduction	1	04-08-26		TLM1&2	
18.	Data Reduction	1	05-08-26		TLM1&2	
19.	ABL	1	10-08-26		TLM1&2	

20.	Data Transformation	1	11-08-26		TLM1&2	
21.	Data Transformation	1	12-08-26		TLM1&2	
22.	Data Discretization	2	17-08-26 to 18-08-2026		TLM1&2	
No. of classes required to complete UNIT-II: 11				No. of classes taken:		

UNIT-III: Classification

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.	Classification: Basic Concepts	1	19-08-26,		TLM1 &2	
24.	General Approach to solving a classification problem, Decision Tree Induction	2	21-08-26, 31-08-26		TLM1 &2	
25.	Attribute Selection Measures-ABL	1	01-09-26		TLM1 &2	
26.	Tree Pruning	1	02-09-26		TLM1 &2	
27.	Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction	1	07-09-26		TLM1 &2	
28.	Bayesian Classification Methods: Bayes Theorem	1	8-09-26		TLM1 &2	
29.	Naïve Bayes Classification	1	15-09-26		TLM1 &2	
30.	Rule-Based Classification, Model Evaluation and Selection	1	16-09-26		TLM1 &2	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV: Association Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Association Analysis : Problem Definition	1	21-09-26,		TLM1&2	
32.	Frequent Item set Generation	2	22-09-26, 23-09-26,		TLM1&2	
33.	Rule Generation, Confident Based Pruning	1	28-09-26		TLM1&2	
34.	Rule Generation in Apriori Algorithm	1	29-09-26		TLM1&2	
35.	Examples on Apriori Algorithm, ABL	1	30-09-26		TLM1&2	
36.	Compact Representation of frequent item sets, FP-Growth Algorithm	1	05-10-26		TLM1&2	
No. of classes required to complete UNIT-IV: 07				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
37.	Cluster Analysis: Overview, Basics and Importance of Cluster Analysis Clustering techniques, Different Types of Clusters	2	06-10-26, 12-10-26		TLM1&2	
38.	K-means: The Basic K-means Algorithm	1	13-10-26		TLM1&2	
39.	K-means Additional Issues, Bi-secting K Means	1	14-10-26		TLM1&2	
40.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm ABL	1	26-10-26		TLM1&2	
41.	DBSCAN: Traditional Density Center-Based Approach, Algorithm, Strengths and Weaknesses	2	27-10-26, 28-10-26		TLM1&2	
No. of classes required to complete UNIT-V: 07				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

Content Beyond Syllabus

S.NO	Topics to be Covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes COs	Text Book Followed	HOD Sign
1.	Explainable Artificial Intelligence (XAI) in Data Mining	1	28-10-2026					
No. of Classes		1		No. of classes taken:				
II MID EXAMINATIONS 02-11-2026 TO 07-11-2026								

PART-C**EVALUATION PROCESS (R23 Regulation):**

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (UNIT-III, IV & V)	M2=15

II-Quiz Examination (UNIT-III, 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
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Name of the Faculty	Dr.K DeviPriya	Dr. D. Venkata Subbaiah	Dr.K DeviPriya	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.O.V.Siva

Course Name & Code : FORMAL LANGUAGES AND AUTOMATA THEORY
23CS08

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /D

A.Y.: 2026-27

PREREQUISITE: -Discrete Mathematics Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course are to

To learn fundamentals of Regular and Context Free Grammars and Languages

- To understand the relation between Regular Language and Finite Automata and machines

- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators

- To understand the relation between Contexts free Languages, PDA and TM

- To learn how to design PDA as acceptor and TM as Calculators

CO1	Construct finite automata and demonstrate their equivalence & minimization for language recognition. (Apply-L3)
CO2	Implement regular expressions and finite automata and apply closure properties & pumping lemma for language validation. (Apply-L3)
CO3	Develop context-free grammars and apply simplification techniques & normal forms for formal language processing. (Apply-L3)
CO4	Design pushdown automata and demonstrate their equivalence with context-free grammars. (Apply-L3)
CO5	Construct Turing machines and apply computational techniques to solve decision problems and complexity analysis. (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	1	2								1	3		2
CO2	3	3		2								1	3		2
CO3	3	3	3	2								1	3	1	3
CO4	3	1	1	2								1	3	1	3
CO5	3	3	1	2								2	3	1	2
			1 - Low			2 -Medium			3 - High						

TEXTBOOKS:

- T1** Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
- T2** Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

REFERENCE BOOKS:

- R1** Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
R2 Theory of Computation, V. Kulkarni, Oxford University Press, 2013
R3 Theory of Automata, Languages and Computation, Rajendra kumar, McGraw Hill,2014

E-Resources

1) <https://nptel.ac.in/courses/106/104/106104028/>

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Finite Automata**

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- Course Objective & Outcomes	1	30-06-2026		TLM2	
2.	Need of Automata theory, Central Concepts of Automata Theory	1	02-07-2026		TLM2	
3.	Finite Automata, Transition Systems	1	03-07-2026		TLM1	
4.	Acceptance of a String, DFA, Design of DFAs,	1	04-07-2026		TLM1	
5.	NFA, Design of NFA	1	07-07-2026		TLM1	
6.	Equivalence of DFA and NFA	1	09-07-2026		TLM1	
7.	Activity Based learning- – Concept of NFA, DFA, Equivalence between DFA and NFA	1	11-07-2026		TLM7	
8.	Finite Automata with ϵ -Transitions	1	14-07-2026		TLM1	
9.	Minimization of Finite Automata	1	16-07-2026		TLM1	
10.	Finite Automata with output-Mealy and Moore Machines	1	23-07-2026		TLM1	
11.	Activity Based learning- Finite Automata with output-Mealy and Moore Machines	1	24-07-2026		TLM7	
12.	Applications and Limitation of Finite Automata	1	25-07-2026		TLM1	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II: Regular Expressions

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Regular Expressions	1	28-07-2026		TLM2	
14.	Regular Sets, Identity Rules					
15.	Equivalence of two RE	1	31-07-2026		TLM1	
16.	Simplification of REs, Finite Automata and Regular Expressions	1	01-08-2026		TLM1	
17.	Inter Conversion, Equivalence Between FA and RE	1	06-08-2026		TLM1	
18.	Pumping Lemma of Regular Sets	1	07-08-2026		TLM1	
19.	Closure Properties of Regular Sets, Grammars	1	08-08-2026		TLM1	
20.	Activity Based learning on Regular Expressions	1	11-08-2026		TLM7	

21.	Classification of Grammars	1	13-08-2026		TLM1
22.	Chomsky Hierarchy	1	14-08-2026		TLM1
23.	Right and Left Linear Regular Grammars	1	14-08-2026		TLM1
24.	Equivalence between RG and FA, Inter Conversion	2	20-08-2026 21-08-2026		TLM1
25	Revision	2	22-08-2026		TLM1 & 3

No. of classes required to complete UNIT-II: 14

No. of classes taken:

I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)

UNIT-III: Context Free Grammar

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees,	1	01-09-2026		TLM2	
27.	Ambiguous Grammars	1	03-09-2026		TLM1	
28.	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	05-09-2026		TLM1	
29.	E- Productions, Unit Productions	1	08-09-2026		TLM1	
30.	Normal Forms-Chomsky Normal Form	1	11-09-2026		TLM1	
31.	Greibach Normal Form	1	12-09-2026		TLM1	
32.	Pumping Lemma,	1	15-09-2026		TLM1	
33.	Closure Properties, Applications of Context Free Grammars.	1	17-09-2026		TLM1	
34.	Activity Based Learning- Context Free Grammar	1	18-09-2026		TLM7	

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

No. of classes taken:

UNIT-IV: Push down Automata

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description	1	19-09-2026		TLM2	
36.	Language Acceptance of Push Down Automata	1	22-09-2026		TLM1	
37.	Design of Pushdown Automata	1	24-09-2026		TLM1	
38.	Deterministic and Non – Deterministic Pushdown Automata	1	25-09-2026		TLM1	

39.	CFG to PDA	1	29-09-2026		TLM1
40.	PDA to CFG	1	01-10-2026		
41.	Two Stack Pushdown Automata	1	03-10-2026		TLM1
42.	Application of Pushdown Automata	1	09-10-2026		TLM1
43.	Activity based learning on Pushdown Automata	1	10-10-2026		TLM7
No. of classes required to complete UNIT-IV: 11				No. of classes taken:	

UNIT-V: Turning Machine

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.	Turning Machine: Definition, Model, Representation of TMs- Instantaneous Descriptions	1	13-10-2026		TLM2	
45.	Language of a TM, Design of TMs	2	15-10-2026 16-10-2026		TLM1	
46.	Types of TMs, Church's Thesis	1	18-10-2026		TLM1	
47.	Universal and Restricted TM, Decidable & Undecidable, halting Problem	1	17-10-2026		TLM1	
48.	Post's Correspondence Problem, Modified PCP	1	28-10-2026		TLM1	
49.	Activity Based learning on Turning Machines	1	30-10-2026		TLM7	
50.	Classes of P and NP	1	31-10-2026		TLM2	
51.	NP-Hard and NP-Complete Problems				TLM2	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

II MID EXAMINATIONS (02-11-2026 TO 07-11-2026)

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	TLM	COs	HOD Sign Weekly
1.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2026				
No. of classes		1			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
TLM7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.O.V.Siva	Dr. D. Veeraiah	Dr. D. Venkata Subbaiah	Dr .S. Nagarjuna Reddy
Signature				



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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. A. Koteswara Rao

Course Name & Code : User Interface Design Using Flutter Lab & 23IT53

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/V/D

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to

- 1.Learns to Implement Flutter Widgets and Layouts
- 2.Understands Responsive UI Design and with Navigation in Flutter
- 3.Knowledge on Widges and customize widgets for specific UI elements, Themes
- 4.Understand to include animation apart from fetching data

COURSE OUTCOMES (CO):

CO1: Apply Flutter and Dart fundamentals to design and develop interactive user interfaces.

(Apply-L3)

CO2: Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. **(Apply-L3)**

CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical value

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
CO2	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
CO3	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
CO4	2	2	2	3	2	-	1	-	-	1	-	2	1	2	2

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.	Basic Flutter Programs	02	04-07-2026		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	02	18-07-2026		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	02	25-07-2026		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	02	01-07-2026		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	02	22-08-2026		
6.	Practice Lab	02	29-08-2026		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	02	05-09-2026		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	02	19-08-2026		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	02	26-09-2026		
10.	a) Create a scrollable List Widget in Form & Add items to it. b) Implement the List View & Display the selected item in the prompt window.	02	03-10-2026		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	02	17-10-2026		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	02	24-10-2026		
13.	Internal Exam	02	31-10-2026		

PART - C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART - D

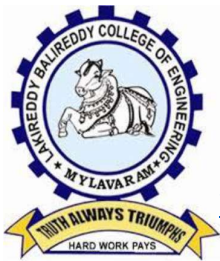
PROGRAMME OUTCOMES (POs):

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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.
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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr. A. Koteswara Rao	Dr. B. Srinivasa Rao	Dr. Y. Vijaya Bhaskar Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. Md. Amanatulla

Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS4)

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

Credits: 2

Program/Sem/Sec : B.Tech. -CSE/V/D

A.Y.: 2026-27

PREREQUISITE: Object oriented programming, Full stack development-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to equip students with hands-on skills in developing full stack web applications using Java, Node.js, and React. It focuses on building backend services using JDBC, Servlets, and Express.js, along with frontend development using React.js. Students will learn to integrate databases like MySQL and MongoDB for real-time data handling. The course emphasizes applying MVC architecture, REST APIs, and deployment practices for complete web solutions.

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

C01	Apply JDBC and Servlet technologies to develop web applications that interact with relational databases. (Apply-L3)
C02	Apply the MVC architecture using JSP, Servlets, and JavaBeans to design structured and maintainable web applications. (Apply-L3)
C03	Apply Node.js and Express.js to create RESTful services and perform backend operations with MongoDB. (Apply-L3)
C04	Apply React.js to develop dynamic user interfaces and integrate them with backend APIs for full stack web solutions. (Apply-L4)

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	3		3							2	2	2	3
C02	3	2	3		3							2	3	3	2
C03	3	2	3		3							2	2	3	2
C04	3	2	3		3							2	2	3	2
	1 - Low			2 - Medium						3 - High					

REFERENCE BOOKS:

R1	"Head First Servlets and JSP" By: Bryan Basham, Kathy Sierra, Bert Bates Publisher: O'Reilly Media
R2	"Learning Node.js Development" By: Andrew Mead Publisher: Packt Publishing
R3	"MongoDB: The Definitive Guide" By: Kristina Chodorow Publisher: O'Reilly Media
R4	"Learning React: Modern Patterns for Developing React Apps" By: Alex Banks and Eve Porcello Publisher: O'Reilly Media

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.	FSD-II & JDBC Introduction	3	01-07-2026		DM5/ DM6	
2.	JDBC Programs	3	08-07-2026		DM5/ DM6	
3.	Servlet Programs	3	15-07-2026		DM5/ DM6	
4.	JSP Introduction	3	22-07-2026		DM5/ DM6	
5.	JSP MVC programs	6	29-07-2026 05-08-2026		DM5/ DM6	
6.	Node JS Introduction	3	12-08-2026		DM5/ DM6	
7.	Express JS Framework	3	19-08-2026		DM5/ DM6	
8.	Node JS & Express JS	6	02-09-2026 09-09-2026		DM5/ DM6	
9.	MangoDB	3	16-09-2026		DM5/ DM6	
10.	MangoDB with Express JS	3	30-9-2026		DM5/ DM6	
11.	React JS	3	07-10-2026		DM5/ DM6	
12.	React JS and Full stack Integration	3	14-10-2026		DM5/ DM6	
13.	Web Application Development	3	21-10-2026		DM5/ DM6	
14.	Internal Test	3	28-10-2026		DM5/ DM6	

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

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

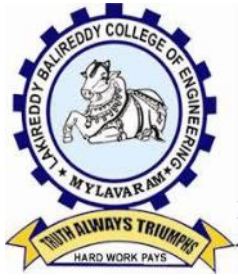
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PSO 3	To inculcate an ability to analyze, design and implement database applications.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. Md. Amanatulla	Dr. K DeviPriya	Dr. Y.V.B. Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.D.Venkata Subbaiah

Course Name & Code : Data Warehousing and Data mining & 23AD04

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

Credits: 3

Program/Sem/Sec : III B.tech/V-sem/E-Sec

A.Y.: 2026-27

PREREQUISITE: DBMS, Probability, and Statistics

Course Objectives: The main objective of the course is to:

- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

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

CO1	Design data warehouses to support effective data modeling, integration, and analytical processing. (Level-3)
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications. (Level-2)
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance. (Level-3)
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets. (Level-3)
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively. (Level-2)

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	PS O1	PS O2	PSO 3
CO1	3	-	2	-	3	-	-	-	-	-	-	2	2	-	3
CO2	3	2	-	-	3	-	-	-	-	-	-	2	2	-	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	2
CO4	2	2	-	2	3	-	-	-	-	-	-	2	3	-	2
CO5	2	2	-	2	3	-	-	-	-	-	-	2	3	1	2
	1 - Low			2 -Medium						3 - High					

TEXT BOOKS:

- T1** Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.
- T2** Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

Reference Books:

R1	Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
R2	Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.
R3	(NPTEL course by Prof. Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/previe
R4	http://www.saedsayad.com/data_mining_map.htm

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Data Warehousing and Online Analytical Processing:**

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.	Data Warehousing and Online Analytical Processing: Basic concepts	2	29-06-26&30-06-26		TLM2	
2.	Data Warehouse Modeling: Data Cube and OLAP	1	03-07-26		TLM2	
3.	Data Warehouse Design and Usage	2	06-07-26&07-07-26		TLM2	
4.	Data Warehouse Implementation,	1	10-07-26		TLM2	
5.	Cloud Data Warehouse	1	13-07-2026		TLM2	
6.	Data Mining and Pattern Mining, Technologies, Applications, Major issues	1	14-07-26		TLM2	
7.	Data Objects & Attribute Types	2	17-07-26&20-07-26		TLM2	
8.	Basic Statistical Descriptions of Data	1	21-07-26		TLM2	
9.	Data Visualization, Measuring Data Similarity and Dissimilarity.	1	24-07-2027		TLM2	
No. of classes required to complete UNIT-I: 12				No. of classes taken:		

UNIT-II: 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
10.	Data Preprocessing: An	2	27-07-26&		TLM2	

	Overview		28-07-26		
11.	Data Cleaning	1	31-07-26		TLM2
12.	Data Integration	2	3-8-26 & 04-08-26		TLM2
13.	Data Reduction	1	07-08-26		TLM2
14.	Data Transformation and Data Discretization	2	10-08-26&11-07-2026		TLM2
15.	Activity/Use case	1	14-08-2026		TLM2
No. of classes required to complete UNIT-II: 9				No. of classes taken:	

UNIT-III: Classification:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Classification: Basic Concepts,	1	17-08-2026		TLM1	
17.	General Approach to solving a classification problem	1	18-08-2026		TLM1	
18.	Decision Tree Induction: Attribute Selection Measures, Tree Pruning	1	21-08-2026		TLM1	
19.	Scalability and Decision Tree Induction	1	31-08-2026		TLM1	
20.	Visual Mining for Decision Tree Induction	1	01-09-2026		TLM1	
21.	Bayesian Classification Methods: Bayes Theorem, Naïve Bayes Classification	1	07-09-2026		TLM1	
22.	Rule-Based Classification	1	08-09-2026		TLM1	
23.	Model Evaluation and Selection	1	11-09-2026		TLM1	
No. of classes required to complete UNIT-III: 8						

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
24.	Problem Definition,	1	15-09-2026		TLM1	
25.	Frequent Item set Generation	1	18-09-2026		TLM1	
26.	Rule Generation: Confident Based Pruning	1	21-09-2026		TLM1	
27.	Rule Generation in Apriori Algorithm	1	22-09-2026		TLM1	
28.	Compact Representation of frequent item sets	2	25-09-2026& 28-09-2026		TLM1	
29.	FP-Growth Algorithm	1	29-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 7				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
30.	Overview	1	05-10-2026		TLM2	
31.	Basics and Importance of Cluster Analysis	1	06-10-2026		TLM2	
32.	Clustering techniques, Different Types of Clusters	1	09-10-2026		TLM2	
33.	K-means: The Basic K-means Algorithm	1	12-10-2026		TLM2	
34.	K-means Additional Issues	1	13-10-2026		TLM2	
35.	Bi-secting K Means, Agglomerative Hierarchical Clustering	1	16-10-2026		TLM2	
36.	DBSCAN: Traditional Density Center-Based Approach and DBSCAN Algorithm	1	26-10-2026		TLM2	
37.	DBSCAN: Strengths and Weaknesses. Activity/Use Case	1	27-10-2026		TLM2	
No. of classes required to complete UNIT-V: 8				No. of classes taken:		

Content Beyond 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
42	Explainable Artificial Intelligence (XAI) in Data Mining	1	30-10-2026		TLM2	

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 (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web application 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. D. Venkata Subbaiah	Dr. D. Venkata Subbaiah	Dr. D. Venkata Subbaiah	Dr. S.Nagarjuna Reddy
Signature				

Text Books:

1. **Computer Networks**, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI

2. **Data Communications and Networks**, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. **Data Communications and Networks-** Achut S Godbole, AtulKahate

2. **Computer Networks**, Mayank Dave, CENGAGE

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction & Physical Layer**

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 Computer Networks: Definition, Uses, Advantages	1	30-06-2026		TLM2	
2.	Network Types: LAN, MAN, WAN	1	02-07-2026		TLM2	
3.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid-----> tutorial(ABL)	1	03-07-2026		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer	1	07-07-2026		TLM2	
5.	TCP/IP Reference Model – Layers, Function, Protocols	1	09-07-2026		TLM2	
6.	Comparison: OSI vs TCP/IP	1	10-07-2026		TLM2	
7.	Introduction to Physical Layer	1	14-07-2026		TLM2	
8.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	1	16-07-2026		TLM2	
9.	Unguided Media: Radio, Microwave, Infrared	1	17-07-2026		TLM1	
10.	Recap + Quiz + Discussion	1	21-07-2026		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Data Link Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Design Issues, Framing Methods: Fixed & Variable Size	1	23-07-2026		TLM1	
12.	Flow Control: Stop-and-wait, Sliding Window	1	24-07-2026		TLM1	
13.	Error Control: Types of Errors, Detection & Correction	1	28-07-2026		TLM1	
14.	CRC and Checksum (One's complement, Internet checksum)	2	30-07-2026 31-07-2026		TLM1	
15.	Services to Network Layer	1	04-08-2026		TLM1	
16.	Elementary Protocols: Simplex, Stop-and-Wait	1	06-08-2026		TLM1	
17.	Protocols for Noisy Channels	1	07-08-2026		TLM1	
18.	Sliding Window Protocols: Go-back-N, Selective Repeat	1	11-08-2026		TLM1	
19.	Summary and Protocol Comparison	1	13-08-2026		TLM1	
20.	Recap + Hands-on Simulation + Quiz	1	14-08-2026		TLM1	

No. of classes required to complete UNIT-II: 10	No. of classes taken:
I MID EXAMINATIONS (25-08-2025 TO 30-08-2025)	

UNIT-III: Media Access Control & Wired LANs

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.	Media Access – Random Access: ALOHA, CSMA	1	18-08-2026		TLM1	
22.	CSMA/CD & CSMA/CA	1	20-08-2026		TLM1	
23.	Channelization Techniques: FDMA, TDMA, CDMA	1	21-08-2026		TLM1	
24.	Wired LANs: Introduction to Ethernet	1	01-09-2026		TLM1	
25.	Standard Ethernet – Frame Structure	1	03-09-2026		TLM1	
26.	Fast Ethernet – Features, Standards	1	08-09-2026		TLM1	
27.	Gigabit Ethernet and 10 Gigabit Ethernet	1	09-09-2026		TLM1	
28.	Ethernet Summary + Comparison Table	1	11-09-2026		TLM1	
29.	Practice: Frame design and decoding	1	15-09-2026		TLM1	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV: – Network Layer

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.	Design Issues – Packet Switching, Store-and-Forward	1	16-09-2026		TLM1	
31.	Connectionless vs Connection-Oriented Services	1	18-09-2026		TLM1	
32.	Datagram vs Virtual Circuit Networks	1	22-09-2026		TLM1	
33.	Routing Algorithms: Optimality, Shortest Path, Flooding	1	23-09-2026		TLM1	
34.	Distance Vector and Link State Routing	1	25-09-2026		TLM1	
35.	Congestion Control: Principles, Algorithms	1	29-09-2026		TLM1	
36.	Traffic Control: Leaky Bucket, Token Bucket	1	30-09-2026		TLM1	
37.	Internetworking: IPv4, IPv6	1	06-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 08				No. of classes taken:		

UNIT-V: Transport & Application Layer

S. No.	Topics to be covered	No. of Classes	Tentative Date of	Actual Date of	Teaching Learning	HOD Sign
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		Required	Completion	Completion	Methods	Weekly
38.	Introduction to Transport Layer – Port Numbers	1	07-10-2026		TLM1	
39.	UDP – Format, Features, Applications	1	08-10-2026		TLM1	
40.	TCP – Services, Connection Establishment, Segments	1	13-10-2026		TLM1	
41.	TCP Features – Flow, Error, Congestion Control-----→ tutorial(ABL)	1	14-10-2026		TLM1	
42.	Application Layer: Introduction to WWW & HTTP	1	15-10-2026		TLM1	
43.	Email Architecture: SMTP, POP3, IMAP	1	27-10-2026		TLM1	
44.	Email Security, Web-based Mail	1	28-10-2025		TLM1	
45.	TELNET – Remote Access DNS – Hierarchy, Resolution Process	1	29-10-2025		TLM1	
No. of classes required to complete UNIT-V: 08				No. of classes taken:		

Content Beyond 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
1.	Overview of how networking works in cloud platforms and IoT	1	30-10-2026					
No. of classes		1	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 (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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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.
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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. Venkatrao	Dr. B Sivarama krishna	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade & NBA (Under Tier - I),
An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.O.V.Siva

Course Name & Code : FORMAL LANGUAGES AND AUTOMATA THEORY
23CS08

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /E

A.Y.: 2026-27

PREREQUISITE: -Discrete Mathematics Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course are to

To learn fundamentals of Regular and Context Free Grammars and Languages

- To understand the relation between Regular Language and Finite Automata and machines

- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators

- To understand the relation between Contexts free Languages, PDA and TM

- To learn how to design PDA as acceptor and TM as Calculators

CO1	Construct finite automata and demonstrate their equivalence & minimization for language recognition. (Apply-L3)
CO2	Implement regular expressions and finite automata and apply closure properties & pumping lemma for language validation. (Apply-L3)
CO3	Develop context-free grammars and apply simplification techniques & normal forms for formal language processing. (Apply-L3)
CO4	Design pushdown automata and demonstrate their equivalence with context-free grammars. (Apply-L3)
CO5	Construct Turing machines and apply computational techniques to solve decision problems and complexity analysis. (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	1	2								1	3		2
CO2	3	3		2								1	3		2
CO3	3	3	3	2								1	3	1	3
CO4	3	1	1	2								1	3	1	3
CO5	3	3	1	2								2	3	1	2
			1 - Low			2 -Medium			3 - High						

TEXTBOOKS:

- T1** Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
- T2** Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

REFERENCE BOOKS:

- R1** Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
R2 Theory of Computation, V. Kulkarni, Oxford University Press, 2013
R3 Theory of Automata, Languages and Computation, Rajendra kumar, McGraw Hill,2014

E-Resources

- 1) <https://nptel.ac.in/courses/106/104/106104028/>

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Finite Automata**

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- Course Objective & Outcomes	1	29-06-2026		TLM2	
2.	Need of Automata theory, Central Concepts of Automata Theory	1	01-07-2026		TLM2	
3.	Finite Automata, Transition Systems	1	03-07-2026		TLM1	
4.	Acceptance of a String, DFA, Design of DFAs,	1	04-07-2026		TLM1	
5.	NFA, Design of NFA	1	06-07-2026		TLM1	
6.	Equivalence of DFA and NFA	1	08-07-2026		TLM1	
7.	Activity Based learning- – Concept of NFA, DFA, Equivalence between DFA and NFA	1	11-07-2026		TLM7	
8.	Finite Automata with ϵ -Transitions	1	13-07-2026		TLM1	
9.	Minimization of Finite Automata	1	15-07-2026		TLM1	
10.	Finite Automata with output-Mealy and Moore Machines	1	18-07-2026		TLM1	
11.	Activity Based learning- Finite Automata with output-Mealy and Moore Machines	1	20-07-2026		TLM7	
12.	Applications and Limitation of Finite Automata	1	22-07-2026		TLM1	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II: Regular Expressions

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Regular Expressions	1	27-07-2026		TLM2	
14.	Regular Sets, Identity Rules					
15.	Equivalence of two RE	1	29-07-2026		TLM1	
16.	Simplification of REs, Finite Automata and Regular Expressions	1	01-08-2026		TLM1	
17.	Inter Conversion, Equivalence Between FA and RE	1	05-08-2026		TLM1	
18.	Pumping Lemma of Regular Sets	1	07-08-2026		TLM1	
19.	Closure Properties of Regular Sets, Grammars	1	08-08-2026		TLM1	
20.	Activity Based learning on Regular Expressions	1	10-08-2026		TLM7	

21.	Classification of Grammars	1	12-08-2026		TLM1
22.	Chomsky Hierarchy	1	14-08-2026		TLM1
23.	Right and Left Linear Regular Grammars	1	17-08-2026		TLM1
24.	Equivalence between RG and FA, Inter Conversion	2	20-08-2026 21-08-2026		TLM1
25	Revision	1	22-08-2026		TLM1 & 3

No. of classes required to complete UNIT-II: 14

No. of classes taken:

I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)

UNIT-III: Context Free Grammar

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees,	1	31-08-2026		TLM2	
27.	Ambiguous Grammars	1	02-09-2026		TLM1	
28.	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	05-09-2026		TLM1	
29.	E- Productions, Unit Productions	1	07-09-2026		TLM1	
30.	Normal Forms-Chomsky Normal Form	1	11-09-2026		TLM1	
31.	Greibach Normal Form	1	12-09-2026		TLM1	
32.	Pumping Lemma,	1	16-09-2026		TLM1	
33.	Closure Properties, Applications of Context Free Grammars.	1	18-09-2026		TLM1	
34.	Activity Based Learning- Context Free Grammar	1	19-09-2026		TLM7	

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

No. of classes taken:

UNIT-IV: Push down Automata

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description	1	21-09-2026		TLM2	
36.	Language Acceptance of Push Down Automata	1	23-09-2026		TLM1	
37.	Design of Pushdown Automata	1	25-09-2026		TLM1	
38.	Deterministic and Non – Deterministic Pushdown Automata	1	26-09-2026		TLM1	

39.	CFG to PDA	1	30-09-2026		TLM1
40.	PDA to CFG	1	03-10-2026		
41.	Two Stack Pushdown Automata	1	05-10-2026		TLM1
42	Application of Pushdown Automata	1	09-10-2026		TLM1
43.	Activity based learning on Pushdown Automata	1	10-10-2026		TLM7
No. of classes required to complete UNIT-IV: 11				No. of classes taken:	

UNIT-V: Turning Machine

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.	Turning Machine: Definition, Model, Representation of TMs- Instantaneous Descriptions	1	12-10-2026		TLM2	
45.	Language of a TM, Design of TMs	2	14-10-2026 16-10-2026		TLM1	
46.	Types of TMs, Church's Thesis	1	17-10-2026		TLM1	
47.	Universal and Restricted TM, Decidable & Undecidable, halting Problem	1	26-10-2026		TLM1	
48.	Post's Correspondence Problem, Modified PCP	1	28-10-2026		TLM1	
49.	Activity Based learning on Turning Machines	1	30-10-2026		TLM7	
50.	Classes of P and NP	1	31-10-2026		TLM2	
51.	NP-Hard and NP-Complete Problems				TLM2	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

II MID EXAMINATIONS (02-11-2026 TO 07-11-2026)

Content Beyond Syllabus

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	TLM	COs	HOD Sign Weekly
1.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2026				
No. of classes		1			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
TLM7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

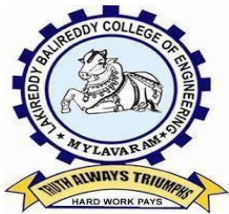
PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.O.V.Siva	Dr. D. Veeraiah	Dr. D. Venkata Subbaiah	Dr .S. Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: P.M. KAMALA KUMARI

Course Name & Code : Artificial Intelligence & 23AD02

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

Program/Sem/Sec :BTECH/V/E

Credits: 3

A.Y.: 2026-27

PREREQUISITE: Basic Engineering and Mathematics knowledge

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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

CO1	Enumerate the history & Foundation of AI. (Understand - L2)
CO2	Apply the searching algorithms for AI in problem solving. (Apply-L3)
CO3	Choose the appropriate representation of knowledge. (Apply-L3)
CO4	Choose the appropriate logic concepts. (Apply-L3)
CO5	Understand the Expert Systems techniques in AI. (Understand -L2)

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

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

TEXTBOOKS:

T1	Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, third edition, 2009.can also second edition,2003.
T2	Elaine Rich, Kevin Knight Artificial Intelligence, TMH, second edition, 2007.

REFERENCE BOOKS:

R1	Nils J.Nilsson "Artificial Intelligence - A New Synthesis", ,Morgan Kaufmann, 1988
R2	David poole,Alan Mackworth, "Artificial Intelligence: Foundations for computational agents",Cambridge Univ.press,2010.
R3	G.Luger,"Artificial Intelligence: Structures and Strategies for complex problem solving ", Fourth Edition,Pearson Education.
R4	Artificial Intelligence, Saroj Kaushik, CENGAGE Learning

ONLINE RESOURCES:

1	https://ai.google
2	https://swayam.gov.in/nd1_noc19_me71/preview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction: AI problems,	1	29-06-2026		TLM1	
2.	Basics of AI	1	02-07-2026		TLM1	
3.	Foundation of AI and history of AI	1	02-07-2026		TLM1	
4.	Intelligent agents: Agents and Environments,	1	04-07-2026		TLM1	
5.	The concept of rationality,	1	06-07-2026		TLM2	
6.	The nature of environments	1	09-07-2026		TLM2	
7.	Structure of agents,	1	11-07-2026		TLM2	
8.	Problem solving agents	1	11-07-2026		TLM2	
9.	Problem formulation.	1	13-07-2026		TLM2	
10.	Revision/ Activity based Learning	1	16-07-2026		TLM7	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Searching- Searching for solutions, uniformed search strategies	1	18-07-2026		TLM2	
12.	Breadth first search	1	18-07-2026		TLM2	
13.	Depth first Search.	1	20-07-2026		TLM2	
14.	Activity Based learning-DFS, BFS	1	22-07-2026		TLM7	
15.	Search with partial information (Heuristic search) Hill climbing	1	23-07-2026		TLM2	
16.	A* Algorithm	1	25-07-2026		TLM2	
17.	AO* Algorithm	1	27-07-2026		TLM2	
18.	Problem reduction, Game Playing-Adversial search	1	30-08-2026		TLM2	
19.	Problem reduction, Game Playing-Adversial search, Games,	1	01-08-2026		TLM2	
20.	Mini-max algorithm,	1	03-08-2026		TLM2	
21.	Optimal decisions in multiplayer games	1	06-08-2026		TLM2	
22.	Problem in Game playing	1	08-08-2026		TLM2	
23.	Alpha-Beta pruning	1	10-08-2026		TLM2	
24.	Evaluation functions.	1	13-08-2026		TLM2	
25.	Activity Based Learning	1	14-08-2026		TLM7	
No. of classes required to complete UNIT-II: 15				No. of classes taken:		

UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Representation of Knowledge: Knowledge representation issues,	1	17-08-2026		TLM2	
27.	Predicate logic- logic programming	1	20-08-2026		TLM2	
28.	Semantic nets- frames and inheritance	1	20-08-2026		TLM2	
29.	Constraint propagation	1	22-08-2026		TLM2	
30.	Representing knowledge using rules,	1	31-08-2026		TLM2	
31.	Rules based deduction systems. Reasoning under uncertainty,	1	03-09-2026		TLM2	
32.	Review of probability, Bayes' probabilistic interference	1	05-09-2026		TLM2	
33.	Dempstershafer theory	1	07-09-2026		TLM2	
34.	Activity Based Learning	1	10-09-2026		TLM7	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Logic concepts: First order logic.	1	12-09-2026		TLM2	
36.	First order logic	1	12-09-2026		TLM2	
37.	Inference in first order logic,	1	17-09-2026		TLM2	
38.	Propositional vs. first order inference,	1	19-09-2026		TLM2	
39.	Unification & lifts forward chaining	1	19-09-2026		TLM2	
40.	Backward chaining	1	21-09-2026		TLM2	
41.	Resolution	1	24-09-2026		TLM2	
42.	Learning from observation	1	26-09-2026		TLM2	
43.	Inductive learning,	1	28-09-2026		TLM2	
44.	Decision trees,	1	01-10-2026		TLM2	
45.	Explanation based learning	1	03-10-2026		TLM2	
46.	Statistical Learning methods	1	05-10-2026		TLM2	
47.	Reinforcement Learning	1	08-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 13				No. of classes taken:		

UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
48.	Expert Systems: Architecture of expert systems,	1	10-10-2026		TLM2	
49.	Roles of expert systems	1	12-10-2026		TLM2	
50.	Knowledge Acquisition Meta knowledge Heuristics.	1	15-10-2026		TLM2	
51.	Typical expert systems – MYCIN	1	12-10-2026		TLM2	
52.	DART	1	17-10-2026		TLM2	
53.	XCON	1	26-10-2026		TLM2	

54.	Expert systems shells.	1	29-10-2026	TLM2
No. of classes required to complete UNIT-V: 07			No. of classes taken:	

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.	Agentic AI – Introduction, components of AI agents, autonomous decision-making, applications, challenges, and future directions.	01	31-10-2026		TLM2	

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 (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I,II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, 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):

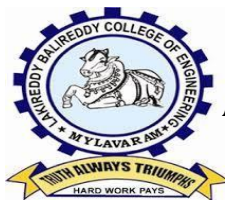
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
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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	P.M.Kamala Kumari	Dr.N.V.Maha Lakshmi	Dr.K.Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. K.Sai Babu, Assistant Professor

Course Name & Code : Sustainable Energy Technologies- 23ME81 Regulation: R23

L-T-P Structure : 3-0-0 Credits: 03

Program/Sem/Sec : B.Tech- CSE V Sem E/S A.Y.: 2026-27

PREREQUISITE : Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-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	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO2	2	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO3	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO4	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO5	1	1	-	-	-	3	3	-	-	-	-	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).

TEXT BOOKS:

T1 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

R3. Non-conventional Energy Source- G S Sawhney- PHI, New Delhi, 2012

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

SOLAR RADIATION

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.	Course Outcomes	1	30-06-2026		TLM2	
2.	Role and potential of new and renewable sources, The solar energy option, Environmental impact of solar power	1	01-07-2026		TLM1	
3.	Structure of the Sun, The solar constant	2	07-07-2026		TLM2	
4.	Sun-earth relationships	1	08-07-2026		TLM2	
5.	Coordinate systems and coordinates of the sun	1	14-07-2026		TLM2	
6.	Extraterrestrial and terrestrial solar radiation	2	15-07-2026		TLM2	
7.	Solar radiation on tilted surface	1	18-07-2026		TLM2	
8.	Instruments for measuring solar radiation and sun shine, Solar radiation data	2	22-07-2026		TLM2	
9.	ABL	1	25-07-2026		TLM6	
10.	Lab visit	1	28-07-2026		TLM4	
No. of classes required to complete UNIT-I: 13				No. of classes taken:		

UNIT-II:

SOLAR PV MODULES AND PV 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.	PV module Circuit Design, Module Structure, Packing Density	2	01-08-2026		TLM2	
2.	Interconnections, Mismatch and temperature effects	2	05-08-2026		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules, Degradation and failure	2	12-08-2026		TLM2	
4.	PV module parameters, Efficiency of PV Systems, Solar PV Systems	1	18-08-2026		TLM2	
5.	Battery Operation, Types of Batteries, Battery parameters, Applications, Selection of batteries for Solar PV System	1	19-08-2026		TLM2	

6.	ABL	1	22-08-2026		TLM6	
No. of classes required to complete UNIT-II: 09				No. of classes taken:		

UNIT-III:

SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	31-08-2026		TLM2	
2.	Classification of concentrating collectors	1	01-09-2026		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	02-09-2026		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	05-09-2026		TLM2	
5.	Solar Applications-solar heating cooling technique	1	08-09-2026		TLM2	
6.	Solar distillation and drying, Solar cookers	1	09-09-2026		TLM2	
7.	Central power tower concept, Solar chimney	1	15-09-2026		TLM2	
8.	ABL	1	16-09-2026		TLM6	
No. of classes required to complete UNIT-III: 08				No. of classes taken:		

UNIT-IV :

WIND ENERGY, BIO-MASS

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.	Wind energy: Sources and potential	1	19-09-2026		TLM2	
2.	Horizontal and Vertical axis wind mill, Performance characteristics	1	22-09-2026		TLM2	
3.	Betz criteria, Types of winds, Wind data measurement	1	23-09-2026		TLM2	
4.	Bio-mass: Principles of bio-conversion	1	26-09-2026		TLM2	
5.	Anaerobic/aerobic digestion	1	29-09-2026		TLM2	
6.	Types of biogas digesters	1	30-09-2026		TLM2	
7.	Gas yield, Gasifiers	1	03-10-2026		TLM2	
8.	Applications	1	06-10-2026		TLM2	
9.	ABL	1	07-10-2026		TLM6	
No. of classes required to complete UNIT-IV:09				No. of classes taken:		

**UNIT-V :
GEOHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS**

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.	Geothermal Energy: Origin, Applications, Types of Geothermal Resources	1	13-10-2026		TLM2	
2.	Geothermal power generation, Relative merits and demerits	1	14-10-2026		TLM2	
3.	Ocean Energy: Ocean Thermal energy, Open cycle and closed cycle OTEC plants, Environmental impacts	1	16-10-2026		TLM2	
4.	Challenges and applications, Fuel Cells: Introduction, Applications, Classification, Different types of Fuel Cells,	2	27-10-2026		TLM2	
5.	Phosphoric Acid fuel cell, Alkaline fuel cell, PEM fuel cell, MC fuel cell	2	30-10-2026		TLM2	
6.	ABL	1	31-10-2026		TLM6	
No. of classes required to complete UNIT-V: 08				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	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	9
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

PART-C
EVALUATION PROCESS (R23 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):

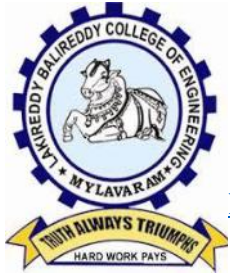
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching 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.
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PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. K. Sai Babu	Dr. P.Vijaya Kumar	Dr. P.Vijaya Kumar	Dr. M B S Sreekar Reddy



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(An Autonomous Institution since 2010)

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

hodcse@lbrce.ac.in, 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. D.Venkata Subbaiah
Course Name & Code :- DATA MINING LAB-23AD55
L-T-P Structure :0-0-3 **Credits:1.5**
Program/Sem/Sec : B.Tech. – CSE-V/E **A.Y.:2026-27**

PREREQUISITE: Data Base Management Systems, Python Programming/R Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of this lab is to provide practical exposure to the implementation of widely used data mining algorithms and to develop the ability to evaluate their performance in both supervised and unsupervised learning environments.

Software Requirements: Python/R-Tool

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

CO1	Apply data preprocessing, similarity measures, and machine learning models using Python for solving data mining tasks. (Apply – L3)
CO2	Develop and evaluate classification, clustering, and association rule mining techniques using appropriate algorithms. (Apply – L3)
CO3	Analyze performance of data mining models using validation techniques and interpret results for decision-making. (Apply – L3)
CO4	Improve individual/teamwork skills, communication, report writing, and practice ethical responsibilities in project work.

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	3	2	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	-	2	2	-	-
	1 - Low				2 -Medium				3 - High						

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.	Introduction- Practice on Python Programming	3	30-06-2026		DM5	
2.	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	7-07-2026		DM5	
3.	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	14-07-2026		DM5	
4.	Practice Session	3	21-07-2026		DM5	
5.	Similarity and Dissimilarity Measures using python	3	28-07-2026		DM5	
6.	Build a model using linear regression algorithm on any dataset.	3	4-08-2026		DM5	
7.	Build a classification model using Decision Tree algorithm on iris dataset	3	11-08-2026		DM5	
8.	Apply Naïve Bayes Classification algorithm on any dataset	3	18-08-2026		DM5	
9.	Practice(Example Problems)	3	01-09-2026		DM5	
10.	Generate frequent item sets using Apriori Algorithm in python	3	8-09-2026		DM5	
11.	Generate association rules for any market basket data.	3	15-09-2026		DM5	
12.	Apply K- Means clustering algorithm on any dataset.	3	22-09-2026		DM5	
13.	Apply Hierarchical Clustering algorithm on any dataset	3	29-09-2026		DM5	
14.	Apply DBSCAN clustering algorithm on any dataset.	3	6-10-2026		DM5	
15.	Apply DBSCAN clustering algorithm on any dataset.	3	13-10-2026		DM5	
16.	Internal exam	3	27-10-2025		DM5	

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

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day-to-day work	A1 = 15
Internal test	A3 = 15
CIE Total:	M1 = 30
Procedure/Algorithm	B1 = 20
Program execution and Result/Inference	B2 = 30
Viva voce	B = 20
SEE Total:	M2 = 70
Total Marks = CIE + SEE = (M1+M2)	100

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Dr. D.Venkata Subbaiah	Dr. D.Venkata Subbaiah	Dr. D.Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr. K. Venkatrao

Course Name & Code : COMPUTER NETWORKS LAB 23CS58

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

Program/Sem/Sec : B.Tech/CSE/V/E

Credits: 2

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

COURSE OUTCOMES (CO):

CO1: Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques. **(Apply - L3)**

CO2: Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation. **(Apply - L3)**

CO3: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(Apply - L3)**

CO4: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(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
C01	3	2	3	2	3								1	3	
C02	3	3	3	3	2								1	3	
C03	3	3	2	3	3								2	3	
C04								3	3	3			3	2	

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.	Study of Network devices in detail and connect the computers in Local Area Network.	03	29-06-2026		
2.	Write a Program to implement the data link layer framing methods such as i) Character stuffing ii) bit stuffing.	03	06-07-2026		
3.	Write a Program to implement data link layer framing method checksum.	03	13-07-2026		
4.	Write a program for Hamming Code generation for error detection and correction.	03	20-07-2026		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	27-07-2026		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	03-08-2026		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	10-08-2026		
8.	Write a Program to implement Stop and Wait Protocol.	03	17-08-2026		
9.	Write a program for congestion control using leaky bucket algorithm	03	31-08-2026		
10.	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).	03	07-09-2026		
11.	Wireshark	03	21-09-2026		
	i. Packet Capture Using Wire shark				
	ii. Starting Wire shark	03	28-09-2026		
	iii. Viewing Captured Traffic				
12.	iv. Analysis and Statistics & Filters.				
	Do the following using NS3 Simulator	03	05-10-2026		
	i. NS3 Simulator-Introduction				
	ii. Simulate to Find the Number of Packets Dropped	03	12-10-2026		
	iii. Simulate to Find the Number of Packets Dropped by TCP/UDP				
iv. Simulate to Find the Number of Packets Dropped due to Congestion					
v. Simulate to Compare Data Rate& Throughput.					
13.	Internal Exam	03	26-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30

Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

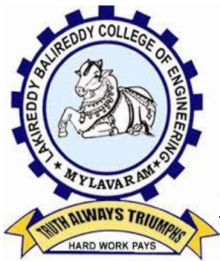
PROGRAMME OUTCOMES (POs):

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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	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. Venkatrao	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbiah	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. K. Naga Rajeswari

Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS3)

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

Credits: 2

Program/Sem/Sec : B.Tech. – CSE/V/E

A.Y.: 2026-27

PREREQUISITE: Object oriented programming, Full stack development-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to equip students with hands-on skills in developing full stack web applications using Java, Node.js, and React. It focuses on building backend services using JDBC, Servlets, and Express.js, along with frontend development using React.js. Students will learn to integrate databases like MySQL and MongoDB for real-time data handling. The course emphasizes applying MVC architecture, REST APIs, and deployment practices for complete web solutions.

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

C01	Apply JDBC and Servlet technologies to develop web applications that interact with relational databases. (Apply-L3)
C02	Apply the MVC architecture using JSP, Servlets, and JavaBeans to design structured and maintainable web applications. (Apply-L3)
C03	Apply Node.js and Express.js to create RESTful services and perform backend operations with MongoDB. (Apply-L3)
C04	Apply React.js to develop dynamic user interfaces and integrate them with backend APIs for full stack web solutions. (Apply-L4)

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	3		3							2	2	2	3
C02	3	2	3		3							2	3	3	2
C03	3	2	3		3							2	2	3	2
C04	3	2	3		3							2	2	3	2
	1 - Low			2 -Medium						3 - High					

REFERENCE BOOKS:

R1	"Head First Servlets and JSP" By: Bryan Basham, Kathy Sierra, Bert Bates Publisher: O'Reilly Media
R2	"Learning Node.js Development" By: Andrew Mead Publisher: Packt Publishing
R3	"MongoDB: The Definitive Guide" By: Kristina Chodorow Publisher: O'Reilly Media
R4	"Learning React: Modern Patterns for Developing React Apps" By: Alex Banks and Eve Porcello Publisher: O'Reilly Media

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.	FSD-II & JDBC Introduction	3	04-07-2026		DM5/ DM6	
2.	JDBC Programs	3	11-07-2026		DM5/ DM6	
3.	Servlet Programs	3	18-07-2026		DM5/ DM6	
4.	JSP Introduction	3	25-07-2026		DM5/ DM6	
5.	JSP MVC programs	6	25-07-2026 01-08-2026		DM5/ DM6	
6.	Node JS Introduction	3	08-08-2026		DM5/ DM6	
7.	Express JS Framework	3	15-08-2026		DM5/ DM6	
8.	Node JS & Express JS Programs	6	22-08-2026 5-09-2026		DM5/ DM6	
9.	MangoDB	3	12-09-2026		DM5/ DM6	
10.	MangoDB with Express JS	3	19-9-2026		DM5/ DM6	
11.	React JS	3	26-09-2026		DM5/ DM6	
12.	React JS and Full stack Integration	3	03-10-2026		DM5/ DM6	
13.	Web Application Development	6	10-10-2026 17-10-2026		DM5/ DM6	
14.	Internal Test	3	31-10-2026		DM5/ DM6	

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

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

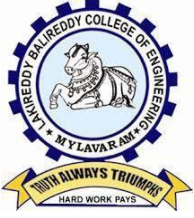
PART-D**PROGRAMME OUTCOMES (POs):**

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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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	Mrs. K. Naga Rajeswari	Dr. K.Devi Priya	Dr. Y.V.B. Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P. Narasimha Rao

Course Name & Code : User Interface Design Using Flutter Lab & 23IT53

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/V/E

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to

1. Learns to Implement Flutter Widgets and Layouts
2. Understands Responsive UI Design and with Navigation in Flutter
3. Knowledge on Widges and customize widgets for specific UI elements, Themes
4. Understand to include animation apart from fetching data

COURSE OUTCOMES (CO):

CO1: Apply Flutter and Dart fundamentals to design and develop interactive user interfaces.

(Apply-L3)

CO2: Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. **(Apply-L3)**

CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical value

COURSE ARTICULATION MATRIX (Correlation between Cos, Pos & PSOs):

Cos	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
CO2	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
CO3	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
CO4	2	2	2	3	2	-	1	-	-	1	-	2	1	2	2

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.	Basic Flutter Programs	02	02-07-2026		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	02	09-07-2026		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	02	16-07-2026		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	02	23-07-2026		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	02	06-08-2026		
6.	Practice Lab	02	13-08-2026		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	02	20-08-2026		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	02	03-09-2026		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	02	10-09-2026		
10.	a) Create a scrollable List Widget in Form & Add items to it. b) Implement the List View & Display the selected item in the prompt window.	02	24-09-2026		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	02	08-10-2026		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	02	22-10-2026		
13.	Internal Exam	02	29-10-2026		

PART - C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART - D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 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.
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PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. P. Narasimha Rao	Mr. A. Koteswara Rao	Dr. Y. Vijaya Bhaskar Reddy	Dr. S. Nagarjuna Reddy
Signature				

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction: AI problems,	1	29-06-2026		TLM1	
2.	Basics of AI	1	30-06-2026		TLM1	
3.	foundation of AI and history of AI	1	04-07-2026		TLM1	
4.	intelligent agents: Agents and Environments,	1	06-07-2026		TLM1	
5.	the concept of rationality,	1	07-07-2026		TLM2	
6.	the nature of environments	1	11-07-2026		TLM2	
7.	structure of agents,	1	13-07-2026		TLM2	
8.	problem solving agents	1	14-07-2026		TLM2	
9.	problem formulation.	1	18-07-2026		TLM2	
No. of classes required to complete UNIT-I: 09				No. of classes taken:		

UNIT-II:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
10.	Searching- Searching for solutions, uniformed search strategies	1	20-07-2026		TLM2	
11.	Breadth first search	1	21-07-2026		TLM2	
12.	Breadth first search	1	25-07-2026		TLM1	
13.	Depth first Search.	1	27-07-2026		TLM1	
14.	Search with partial information (Heuristic search) Hill climbing	1	28-07-2026		TLM2	
15.	Activity Based learning-DFS, BFS	1	01-08-2026		TLM7	
16.	A* Algorithm	1	03-08-2026		TLM1	
17.	A* Algorithm	1	04-08-2026		TLM2	
18.	AO* Algorithm	1	08-08-2026		TLM1	
19.	AO* Algorithm	1	10-08-2026		TLM2	
20.	Problem reduction, Game Playing-Adversial search	1	11-08-2026		TLM2	
21.	mini-max algorithm,	1	17-08-2026		TLM1	
22.	optimal decisions in multiplayer games	1	18-08-2026		TLM2	
23.	Problem in Game playing, Alpha-Beta pruning, Evaluation functions.	1	22-08-2026		TLM1	
No. of classes required to complete UNIT-II: 14				No. of classes taken:		

UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
24.	Representation of Knowledge: Knowledge representation issues,	1	31-08-2026		TLM2	
25.	predicate logic- logic programming	1	01-09-2026		TLM2	
26.	semantic nets- frames and inheritance, constraint propagation	1	05-09-2026		TLM2	
27.	representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty,	1	07-09-2026		TLM2	
28.	review of probability, Bayes' probabilistic interference	1	08-09-2026		TLM2	
29.	dempstershafer theory	1	12-09-2026		TLM2	
No. of classes required to complete UNIT-III: 06				No. of classes taken:		

UNIT-IV:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
30.	Logic concepts: First order logic, Inference in first order logic,	1	15-09-2026		TLM2	
31.	propositional vs. first order inference, unification & lifts forward chaining	1	19-09-2026		TLM2	
32.	Backward chaining	1	21-09-2026		TLM2	
33.	Resolution	1	22-09-2026		TLM2	
34.	Learning from observation	1	26-09-2026		TLM2	
35.	Inductive learning,	1	28-09-2026		TLM2	
36.	Decision trees,	1	29-09-2026		TLM2	
37.	Explanation based learning	1	03-10-2026		TLM2	
38.	Statistical Learning methods	1	05-10-2026		TLM2	
39.	Reinforcement Learning	1	06-10-2026		TLM2	
No. of classes required to complete UNIT-IV: 10				No. of classes taken:		

UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
40.	Expert Systems: Architecture of expert systems,	1	10-10-2026		TLM2	
41.	Roles of expert systems	1	12-10-2026		TLM2	
42.	Knowledge Acquisition Meta knowledge Heuristics.	1	13-10-2026		TLM2	

43.	Typical expert systems – MYCIN	1	17-10-2026		TLM2	
44.	DART, XCON	1	26-10-2026		TLM2	
45.	Expert systems shells.	1	27-10-2026		TLM2	
No. of classes required to complete UNIT-V: 06				No. of classes taken:		

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.	Agentic AI – Introduction, components of AI agents, autonomous decision-making, applications, challenges, and future directions.	01	31-10-2026		TLM2	

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
TLM7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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	Ms. G. Kavya Pavani	Dr.N.V.Maha Lakshmi	Dr.K.Devi Priya	Dr. S. Nagarjuna Reddy



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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An ISO 21001:2018, 14001:2015, 50001:2018 Certified Institution

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

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.B.SWANTH

Course Name & Code : COMPUTER NETWORKS LAB 23CS58

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/III/F

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work

COURSE OUTCOMES (CO):

CO1: Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques. **(Apply - L3)**

CO2: Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation. **(Apply - L3)**

CO3: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(Apply - L3)**

CO4: Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator. **(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	3	2	3	2	3								1	3	
CO2	3	3	3	3	2								1	3	
CO3	3	3	2	3	3								2	3	
CO4								3	3	3			3	2	

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.	Study of Network devices in detail and connect the computers in Local Area Network.	03	29-06-2026		
2.	Write a Program to implement the data link layer framing methods such as i) Character stuffing ii) bit stuffing.	03	06-07-2026		
3.	Write a Program to implement data link layer framing method checksum.	03	13-07-2026		
4.	Write a program for Hamming Code generation for error detection and correction.	03	20-07-2026		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	27-07-2026		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	03-08-2026		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	10-08-2026		
8.	Write a Program to implement Stop and Wait Protocol.	03	17-08-2026		
9.	Write a program for congestion control using leaky bucket algorithm	03	31-08-2026		
10.	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).	03	07-09-2026		
11.	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.	03	14-09-2026, 21-09-2026		
12.	Do the following using NS3 Simulator i. NS3 Simulator-Introduction ii. Simulate to Find the Number of Packets Dropped iii. Simulate to Find the Number of Packets Dropped by TCP/UDP iv. Simulate to Find the Number of Packets Dropped due to Congestion v. Simulate to Compare Data Rate& Throughput.	03	28-09-2026, 5-10-2026		
13.	Internal Exam	03	12-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30

Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

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



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.B.SWANTH

Course Name & Code : COMPUTER NETWORKS 23CS07
23CS07

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /F

A.Y.: 2026-27

PREREQUISITE: -Foundational understanding of basic computer concepts

COURSE EDUCATIONAL OBJECTIVES(CEO):

Course Objectives:

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:

CO1	Understand various network types, topologies, reference models, and transmission media (Understand-L2)
CO2	Examine data link layer design issues, framing techniques, error control, and flow control mechanisms. (Analyze-L4)
CO3	Apply multiple media access control techniques and evaluate Ethernet standards for network communication. (Apply-L3)
CO4	Implement routing algorithms, congestion control techniques, and IP addressing schemes for efficient network communication. (Apply-L3)
CO5	Utilize transport layer protocols (UDP & TCP) and application layer services (HTTP, DNS, Email) to enable secure and reliable data communication. (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	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	1	3	-	-
CO3	2	2	3	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	3	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	3	3	-
	1 - Low			2 - Medium						3 - High					

Text Books:

1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI

2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate

2. Computer Networks, Mayank Dave, CENGAGE

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Introduction & Physical Layer**

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 Computer Networks: Definition, Uses, Advantages	1	29-06-2026		TLM2	
2.	Network Types: LAN, MAN, WAN	1	02-07-2026		TLM2	
3.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid	1	03-07-2026		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer- Tutorial	1	04-07-2026		TLM2	
5.	TCP/IP Reference Model – Layers, Function, Protocols	1	06-07-2026		TLM2	
6.	Comparison: OSI vs TCP/IP	1	09-07-2026		TLM2	
7.	Introduction to Physical Layer	1	11-07-2025		TLM2	
8.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	2	13-07-2026 16-07-2026		TLM2	
9.	Unguided Media: Radio, Microwave, Infrared	2	17-07-2026 18-07-2026		TLM1	
No. of classes required to complete UNIT-I: 11				No. of classes taken:		

UNIT-II: Data Link Layer

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.	Design Issues, Framing Methods: Fixed & Variable Size	1	20-07-2026		TLM1	
11.	Flow Control: Stop-and-wait, Sliding Window	1	25-07-2026		TLM1	
12.	Error Control: Types of Errors, Detection & Correction	2	27-07-2026 30-07-2026		TLM1	
13.	CRC and Checksum (One's complement, Internet checksum)	2	31-07-2026 01-08-2026		TLM1	
14.	Services to Network Layer	2	03-08-2026 06-08-2026		TLM1	
15.	Elementary Protocols: Simplex, Stop-and-Wait	1	10-08-2026		TLM1	
16.	Protocols for Noisy Channels	1	13-08-2026		TLM1	
17.	Sliding Window Protocols: Go-back-N, Selective Repeat	1	17-08-2026		TLM1	
18.	Summary and Protocol Comparison	2	20-08-2026 22-08-2026		TLM1	
No. of classes required to complete UNIT-II: 13				No. of classes taken:		

I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)

UNIT-III: Media Access Control & Wired LANs

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
19.	Media Access – Random Access: ALOHA, CSMA	1	31-08-2026		TLM1	
20.	CSMA/CD & CSMA/CA	1	03-09-2026		TLM1	
21.	Channelization Techniques: FDMA, TDMA, CDMA	1	05-09-2026		TLM1	
22.	Wired LANs: Introduction to Ethernet	1	07-09-2026		TLM1	
23.	Standard Ethernet – Frame Structure	1	10-09-2026		TLM1	
24.	Fast Ethernet – Features, Standards	1	12-09-2026		TLM1	
25.	Gigabit Ethernet and 10 Gigabit Ethernet	1	17-09-2026		TLM1	
26.	Ethernet Summary + Comparison Table	1	19-09-2026		TLM1	
27.	Practice: Frame design and decoding	1	21-09-2026		TLM1	
No. of classes required to complete UNIT-III: 9				No. of classes taken:		

UNIT-IV: – Network Layer

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.	Design Issues – Packet Switching, Store-and-Forward	1	24-09-2026		TLM1	
29.	Connectionless vs Connection-Oriented Services	1	26-09-2026		TLM1	
30.	Datagram vs Virtual Circuit Networks	1	21-09-2026		TLM1	
31.	Routing Algorithms: Optimality, Shortest Path, Flooding	2	28-09-2026 01-10-2026		TLM1	
32.	Distance Vector and Link State Routing	1	03-10-2026		TLM1	
33.	Congestion Control: Principles, Algorithms	1	05-10-2026		TLM1	
34.	Traffic Control: Leaky Bucket, Token Bucket	1	08-10-2026		TLM1	
35.	Internetworking: IPv4, IPv6	1	10-10-2026		TLM1	
No. of classes required to complete UNIT-IV: 9				No. of classes taken:		

UNIT-V: Transport & Application Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
36.	Introduction to Transport Layer – Port Numbers	1	12-10-2026		TLM1	
37.	UDP – Format, Features, Applications	2	15-10-2026		TLM1	
38.	TCP – Services, Connection Establishment, Segments	1	17-10-2026		TLM1	
39.	TCP Features – Flow, Error, Congestion Control	1	16-10-2026		TLM1	
40.	Application Layer: Introduction to WWW & HTTP	1	17-10-2026		TLM1	
41.	Email Architecture: SMTP, POP3, IMAP	1	26-10-2026		TLM1	
42.	Email Security, Web-based Mail	1	29-10-2026		TLM1	
43.	TELNET – Remote Access	1	29-10-2026		TLM1	
44.	DNS – Hierarchy, Resolution Process	1	31-10-2026		TLM2	
No. of classes required to complete UNIT-V: 13				No. of classes taken:		

Content Beyond 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
1.	Overview of how networking works in cloud platforms and IoT	1	31-10-2026					
No. of classes		1		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

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.B.Swanth	Dr. B Sivarama krishna	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



LAKIREDDY BALIREDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

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L.B.REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521230.

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Kamala Priya B, Sr. Assistant Professor

Course Name & Code : Sustainable Energy Technologies- 23ME81

Regulation: R23

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

Credits: 03

Program/Sem/Sec : B.Tech- CSE/V Sem F/S

A.Y.: 2026-27

PREREQUISITE : Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs):

To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-L2)

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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO2	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO3	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO4	3	2	-	-	-	3	3	-	-	-	-	-	-	-
CO5	3	2	-	-	-	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 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: SOLAR RADIATION

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.	Course Outcomes, Role and potential of new and renewable sources	1	30-06-2026		TLM2	
2.	The solar energy option	1	02-07-2027		TLM2	
3.	Environmental impact of solar power	1	04-07-2026		TLM2	
4.	Structure of the Sun, The solar constant	1	07-07-2026		TLM2	
5.	Sun-earth relationships	1	09-07-2026		TLM2	
6.	Coordinate systems and coordinates of the sun, Extraterrestrial and terrestrial solar radiation	1	14-07-2026		TLM2	
7.	Solar radiation on tilted surface	1	16-07-2026		TLM2	
8.	Instruments for measuring solar radiation and sun shine	1	18-07-2026		TLM2	
9.	Solar radiation data	1	21-07-2026		TLM2	
No. of classes required to complete UNIT-I: 09				No. of classes taken:		

UNIT-II: SOLAR PV MODULES AND PV 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.	PV module Circuit Design, Module Structure	1	23-07-2026		TLM2	
2.	Packing Density	1	25-07-2026		TLM2	
3.	Interconnenctions, Mismatch and temperature effects	1	28-07-2026		TLM2	
4.	Electrical and Mechanical Insulation	1	30-07-2026		TLM2	
5.	Lifetime of PV modules	1	01-08-2026		TLM2	
6.	Degradation and failure, PV module parameters, Efficiency of PV Systems	1	04-08-2026		TLM2	
7.	Solar PV Systems	1	06-08-2026		TLM2	
8.	Battery Operation, Types of Batteries, Battery parameters, Applications	1	11-08-2026		TLM2	
9.	Selection of batteries for Solar PV System	1	13-08-2026		TLM2	
No. of classes required to complete UNIT-II: 09				No. of classes taken:		

UNIT-III: SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors, Classification of concentrating collectors	1	18-08-2026		TLM4	
2.	Solar Energy Storage and Applications: Different methods	1	20-08-2026		TLM2	
3.	Sensible latent heat and stratified storage	1	22-08-2026		TLM2	
4.	Solar ponds, Solar Applications	1	01-09-2026		TLM2	
5.	solar heating cooling technique	1	03-09-2026		TLM2	
6.	Solar distillation	1	05-09-2026		TLM2	
7.	Solar drying, Solar cookers	1	08-09-2026		TLM2	
8.	Central power tower concept	1	10-09-2026		TLM2	
9.	Solar chimney	1	15-09-2026		TLM2	
No. of classes required to complete UNIT-III: 09				No. of classes taken:		

UNIT-IV : WIND ENERGY, BIO-MASS

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.	Wind energy: Sources and potential, Horizontal axis wind mill	1	17-09-2026		TLM4	
2.	Vertical Axis wind mill	1	19-09-2026		TLM2	
3.	Performance characteristics, Betz criteria	1	22-09-2026		TLM2	
4.	Types of winds	1	24-09-2026		TLM2	
5.	Wind data measurement	1	26-09-2026		TLM2	
6.	Bio-mass: Principles of bio-conversion, Anaerobic/aerobic digestion	1	29-09-2026		TLM2	
7.	Types of biogas digesters	1	01-10-2026		TLM2	
8.	Gas yield, Gasifiers	1	03-10-2026		TLM2	
9.	Applications	1	06-10-2026		TLM2	
No. of classes required to complete UNIT-IV:09				No. of classes taken:		

UNIT-V : GEOTHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS

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.	Geothermal Energy: Origin, Applications, Types of Geothermal Resources	1	08-10-2026		TLM2	
2.	Geothermal power generation, Relative merits and demerits,	1	13-10-2026		TLM2	

	energy				
3.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	15-10-2026		TLM4
4.	Challenges and applications, Fuel Cells: Introduction, Applications	1	17-10-2026		TLM2
5.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell	1	27-10-2026		TLM2
6.	Alkaline fuel cell, PEM fuel cell	1	29-10-2026		TLM2
7.	MC fuel cell	1	31-10-2026		TLM2
No. of classes required to complete UNIT-V: 07				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	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	7
II Phase of Instructions..Continued	26-10-2026	31-10-2026	1
II MID Examinations	02-11-2026	07-11-2026	1
Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

PART-C

EVALUATION PROCESS (R23 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
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PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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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.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor

Course Coordinator

Module Coordinator

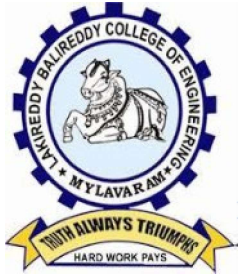
HOD

Kamala Priya B

Dr. K. Dilip Kumar

Dr. K. Dilip Kumar

Dr. M B S Sreekara
Reddy



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iocse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. S. Srinivasa Reddy

Course Name & Code : Data Warehousing and Data Mining & 23AD04

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

Credits: 3

Program/Sem/Sec : III B.tech/V-sem/F-Sec

A.Y.: 2026-27

PREREQUISITE: DBMS, Probability, and Statistics

Course Objectives: The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of algorithms.

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

CO1	Design data warehouses to support effective data modeling, integration, and analytical processing. (Level- 3)
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications. (Level-2)
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance. (Level-3)
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets. (Level-3)
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively. (Level-2)

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 0	PO 11	PO1 2	PS O1	PS O2	PSO 3
CO1	3	-	2	-	3	-	-	-	-	-	-	2	2	-	3
CO2	3	2	-	-	3	-	-	-	-	-	-	2	2	-	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	2
CO4	2	2	-	2	3	-	-	-	-	-	-	2	3	-	2
CO5	2	2	-	2	3	-	-	-	-	-	-	2	3	1	2
	1 - Low					2 - Medium					3 - High				

TEXT BOOKS:

- T1** Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.
- T2** Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

Reference Books:

R1	Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
R2	Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.
R3	(NPTEL course by Prof. Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/previe
R4	http://www.saedsayad.com/data_mining_map.htm

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Data Warehousing and Online Analytical Processing:**

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.	Data Warehousing and Online Analytical Processing: Basic concepts	2	30-06-2026 & 02-07-2026		TLM1&2	
2.	Data Warehouse Modeling: Data Cube and OLAP	2	04-07-2026 & 07-07-2026		TLM1&2	
3.	Data Warehouse Design and Usage	1	09-07-2026		TLM1&2	
4.	Data Warehouse Implementation,	2	11-07-2026 & 14-07-2026		TLM1&2	
5.	Cloud Data Warehouse	1	16-07-2026		TLM1&2	
6.	Data Mining and Patten Mining, Technologies, Applications, Major issues	2	18-07-2026 & 21-07-2026		TLM1&2	
7.	Data Objects & Attribute Types	1	23-07-2026		TLM1&2	
8.	Basic Statistical Descriptions of Data	2	25-07-2026 & 28-07-2026		TLM1&2	
9.	Data Visualization, Measuring Data Similarity and Dissimilarity.	1	30-07-2026		TLM1&2	
No. of classes required to complete UNIT-I: 14				No. of classes taken:		

UNIT-II: 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
10.	Data Preprocessing: An Overview	1	31-07-2026		TLM1&2	
11.	Data Cleaning	1	01-08-2026		TLM1&2	
12.	Data Integration	1	04-08-2026		TLM1&2	
13.	Tutorial	1	06-08-2026			

15.	Data Transformation and Data Discretization.	1	11-08-2026		TLM1&2	
No. of classes required to complete UNIT-II: 06				No. of classes taken:		

UNIT-III: Classification:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Classification: Basic Concepts,	1	13-08-2026		TLM1&2	
17.	General Approach to solving a classification problem	1	14-08-2026		TLM1&2	
18.	Decision Tree Induction: Attribute Selection Measures,	1	18-08-2026		TLM1&2	
19.	Tree Pruning	1	20-08-2026		TLM1&2	
20.	Scalability and Decision Tree Induction	1	22-08-2026		TLM1&2	
21.	Visual Mining for Decision Tree Induction	1	01-09-2026		TLM1&2	
22.	Bayesian Classification Methods: Bayes Theorem	1	03-09-2026		TLM1&2	
23.	Naïve Bayes Classification	1	05-09-2026		TLM1&2	
24.	Rule-Based Classification	1	08-09-2026		TLM1&2	
25.	Model Evaluation and Selection	1	10-09-2026		TLM1&2	
No. of classes required to complete UNIT-III: 10				No. of classes taken:		

UNIT-IV: Association Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Problem Definition,	1	12-09-2026		TLM1&2	
27.	Frequent Item set Generation	1	15-09-2026		TLM1&2	
28.	Rule Generation: Confident Based Pruning	1	17-09-2026		TLM1&2	
29.	Rule Generation in Apriori Algorithm	1	19-09-2026		TLM1&2	
30.	Compact Representation of frequent item sets	1	22-09-2026		TLM1&2	
31.	FP-Growth Algorithm	1	24-09-2026		TLM1&2	
No. of classes required to complete UNIT-IV: 06				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
32.	Overview	1	01-10-2026		TLM1&2	

	Cluster Analysis				
34.	Clustering techniques	1	29-09-2026		TLM1&2
35.	Different Types of Clusters	1	03-10-2026		TLM1&2
36.	K-means: The Basic K-means Algorithm	1	06-10-2026		TLM1&2
37.	K-means Additional Issues	1	08-10-2026		TLM1&2
38.	Bi-secting K Means	1			TLM1&2
39.	Agglomerative Hierarchical Clustering	1	10-10-2026		TLM1&2
40.	DBSCAN: Traditional Density Center-Based Approach	1	13-10-2026		TLM1&2
41.	DBSCAN Algorithm, Strengths and Weaknesses	1	15-10-2026		TLM1&2
No. of classes required to complete UNIT-V: 10				No. of classes taken:	

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

Content Beyond Syllabus

S. No.	Topics to be Covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes (COs)	Text Book Followed	HOD Sign
1	Explainable Artificial Intelligence (XAI) in Data Mining	2	29-10-2026 & 27-10-2026		TLM1,2,5 &6	CO4, CO5	T1	
No. of Classes		2		No. of classes taken:				

Use Cases

S. No.	Topics to be Covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcomes (COs)	HOD Sign
1	Student Placement Prediction	1	30-10-2026		Hands-on	CO4, CO5	
2	Retail Sales Analysis	1	31-10-2026		Hands-on	CO4, CO5	

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Units-III, IV & V)	A2=5
II- Descriptive Examination (UNITS-III, IV & V)	M2=15
II-Quiz Examination (UNITS-III, 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

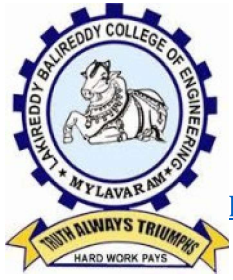
PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and 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 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.
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PO 12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web application 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. S Srinivasa Reddy	Dr. D. Venkata Subbaiah	Dr. K. Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(An Autonomous Institution since 2010)

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hodcse@lbrce.ac.in, cseoffice@lbrce.ac.in, Phone: 08659-222 933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. S. Srinivasa Reddy
Course Name & Code : DATA MINING LAB-23AD55
L-T-P Structure : 0-0-3
Program/Sem/Sec : B.Tech. – CSE-V/F
Credits:1.5
A.Y.:2026-27

PREREQUISITE: Data Base Management Systems, Python Programming/R Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of this lab is to provide practical exposure to the implementation of widely used data mining algorithms and to develop the ability to evaluate their performance in both supervised and unsupervised learning environments.

Software Requirements: Python/R-Tool

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

CO1	Apply data preprocessing, similarity measures, and machine learning models using Python for solving data mining tasks. (Apply – L3)
CO2	Develop and evaluate classification, clustering, and association rule mining techniques using appropriate algorithms. (Apply – L3)
CO3	Analyze performance of data mining models using validation techniques and interpret results for decision-making. (Apply – L3)
CO4	Improve individual/teamwork skills, communication, report writing, and practice ethical responsibilities in project work.

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	3	2	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	-	2	2	-	-
			1 - Low					2 -Medium				3 - High			

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.	Introduction- Practice on Python Programming	3	03-07-2026		DM5	
2.	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	10-07-2026		DM5	
3.	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	17-07-2026		DM5	
4.	Similarity and Dissimilarity Measures using python	3	24-07-2026		DM5	
5.	Build a model using linear regression algorithm on any dataset.	3	31-07-2026		DM5	
6.	Build a classification model using Decision Tree algorithm on iris dataset	3	07-08-2026		DM5	
7.	Apply Naïve Bayes Classification algorithm on any dataset	3	14-08-2026		DM5	
8.	Generate frequent item sets using Apriori Algorithm in python	3	21-08-2026		DM5	
9.	Generate association rules for any market basket data.	3	11-09-2026		DM5	
10.	Apply K- Means clustering algorithms on any dataset.	3	18-09-2026		DM5	
11.	Apply Hierarchical Clustering algorithm on any dataset	3	25-09-2026		DM5	
12.	Apply DBSCAN clustering algorithm on any dataset.	3	09-10-2026		DM5	
13.	Apply DBSCAN clustering algorithm on any dataset.	3	16-10-2026		DM5	
14.	Internal exam	3	30-10-2026		DM5	

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

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day-to-day work	A1 = 15
Internal test	A3 = 15
CIE Total:	M1 = 30
Procedure/Algorithm	B1 = 20
Program execution and Result/Inference	B2 = 30
Viva voce	B = 20
SEE Total:	M2 = 70
Total Marks = CIE + SEE = (M1+M2)	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. S Srinivasa Reddy	Dr. D. Venkata Subbaiah	Dr. K. Devi Priya	Dr. S. Nagarjuna Reddy
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 : FORMAL LANGUAGES AND AUTOMATA THEORY
23CS08

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /F

A.Y.: 2026-27

PREREQUISITE: -Discrete Mathematics Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

To learn fundamentals of Regular and Context Free Grammars and Languages

- To understand the relation between Regular Language and Finite

Automata and machines

- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators

- To understand the relation between Contexts free Languages, PDA and TM

- To learn how to design PDA as acceptor and TM as Calculators

CO1	Construct finite automata and demonstrate their equivalence & minimization for language recognition. (Apply-L3)
CO2	Implement regular expressions and finite automata, and apply closure properties & pumping lemma for language validation. (Apply-L3)
CO3	Develop context-free grammars and apply simplification techniques & normal forms for formal language processing. (Apply-L3)
CO4	Design pushdown automata and demonstrate their equivalence with context-free grammars. (Apply-L3)
CO5	Construct Turing machines and apply computational techniques to solve decision problems and complexity analysis. (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	1	2								1	3		2
CO2	3	3		2								1	3		2
CO3	3	3	3	2								1	3	1	3
CO4	3	1	1	2								1	3	1	3
CO5	3	3	1	2								2	3	1	2
	1 - Low			2 -Medium				3 - High							

TEXTBOOKS:

- T1** Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R.

T2 Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

REFERENCE BOOKS:

- R1** Elements of Theory of Computation, Lewis H.P. & Papadimitriou C.H., Pearson /PHI
- R2** Theory of Computation, V. Kulkarni, Oxford University Press, 2013
- R3** Theory of Automata, Languages and Computation, Rajendra kumar, McGraw Hill,2014

E-Resources

- 1) <https://nptel.ac.in/courses/106/104/106104028/>

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Finite Automata

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- Course Objective & Outcomes Need of Automata theory, Central Concepts of Automata Theory	1	29-06-2026		TLM2	
2.	Finite Automata, Transition Systems	1	02-07-2026		TLM2	
3.	Acceptance of a String, DFA, Design of DFAs,	1	04-07-2026		TLM1	
4.	NFA, Design of NFA	1	06-07-2026		TLM1	
5.	Equivalence of DFA and NFA	1	09-07-2026		TLM1	
6.	Finite Automata with ϵ Transitions	1	11-07-2026		TLM1	
7	Minimization of Finite Automata- Tutorial	1	13-07-2026		TLM3	
8	Finite Automata with output-Mealy and Moore Machines	1	16-07-2026		TLM7	
9.	Applications and Limitation of Finite Automata	1	18-07-2026		TLM1	
10.	Activity Based learning- Finite Automata with output-Mealy and Moore Machines	1	20-07-2026		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Regular Expressions

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Regular Expressions	1	25-07-2026		TLM2	
12.	Regular Sets, Identity Rules					
13.	Equivalence of two RE	1	27-07-2026		TLM1	
14.	Simplification of REs, Finite Automata and Regular Expressions	1	30-07-2026		TLM1	
15.	Simplification of REs, Finite Automata and Regular Expression	1	01-08-2026		TLM3	
16.	Inter Conversion, Equivalence Between FA and RE	1	03-08-2026		TLM1	
17.	Pumping Lemma of Regular Sets	1	06-08-2026		TLM1	
18.	Closure Properties of Regular Sets, Grammars	1	10-08-2026		TLM1	
19.	Activity Based learning on Regular Expressions	1	13-08-2026		TLM7	
20.	Classification of Grammars	1	17-08-2026		TLM1	
21.	Chomsky Hierarchy	1	20-08-2026		TLM1	
22.	Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion	1	22-08-2026		TLM1	
No. of classes required to complete UNIT-II: 12				No. of classes taken:		
I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)						

UNIT-III: Context Free Grammar

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.	Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees,	1	31-08-2026		TLM2		
24.	Ambiguous Grammars	1	03-09-2026		TLM1		
25.	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	05-09-2026		TLM1		
26.	ε- Productions, Unit Productions	1	07-09-2026		TLM3		
27.	Normal Forms-Chomsky Normal Form	1	10-09-2026		TLM1		
28.	Greibach Normal Form	1	12-09-2026		TLM1		
29.	Pumping Lemma,	1	17-09-2026		TLM1		
30.	Closure Properties, Applications of ContextFree Grammars.	1	19-09-2026		TLM1		
No. of classes required to complete UNIT-III: 08				No. of classes taken:			

UNIT-IV:Push down Automata

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.	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description	1	21-09-2026		TLM2	
32	Language Acceptance of Push Down Automata	1	24-09-2026		TLM1	
33.	Design of Pushdown Automata	1	26-09-2026		TLM1	
34.	Deterministic and Non – Deterministic Pushdown Automata	1	28-09-2026		TLM1	
35.	Equivalence of Pushdown Automata and Context Free Grammar	1	01-10-2026		TLM3	
36.	Conversion	1	03-10-2026		TLM1	
37.	Two Stack Pushdown Automata	1	05-10-2026			
38.	Application of Pushdown Automata	1	08-10-2026		TLM1	
39	Activity based learning on Pushdown Automata	1	10-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

UNIT-V: Turning Machine

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.	Turning Machine: Definition, Model, Representation of TMs- Instantaneous Descriptions	1	12-10-2026		TLM2	
41.	Transition Tables and Transition Diagrams, Language of a TM, Design of TMs	1	15-10-2026		TLM1	
42.	Types of TMs, Church's Thesis, Universal and Restricted TM	1	17-10-2026		TLM1	
43.	Decidable and Un-decidable Problems, Halting Problem of TMs	1	26-10-2026		TLM1	
44.	Post's Correspondence Problem, Modified PCP	1	29-10-2026		TLM1	
45.	Classes of P and NP	1	31-10-2026		TLM1	
46.	NP-Hard and NP-Complete Problems	1	31-10-2026		TLM3	
No. of classes required to complete UNIT-V: 06				No. of classes taken:		

Content Beyond 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
1.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2026					
No. of classes		1	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
TLM 7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

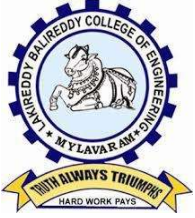
PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. D.Veeraiah	Dr. D. Venkata Subbaiah	Dr S. Nagarjuna Reddy



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. D. Sainath

Course Name & Code : User Interface Design Using Flutter Lab & 23IT53

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

Credits: 2

Program/Sem/Sec : B.Tech/CSE/V/F

A.Y.: 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to

- 1.Learns to Implement Flutter Widgets and Layouts
- 2.Understands Responsive UI Design and with Navigation in Flutter
- 3.Knowledge on Widges and customize widgets for specific UI elements, Themes
- 4.Understand to include animation apart from fetching data

COURSE OUTCOMES (CO):

CO1: Apply Flutter and Dart fundamentals to design and develop interactive user interfaces.

(Apply-L3)

CO2: Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. **(Apply-L3)**

CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical value

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
CO2	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
CO3	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
CO4	2	2	2	3	2	-	1	-	-	1	-	2	1	2	2

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.	Basic Flutter Programs	03	01-07-2026		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	03	08-07-2026		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	03	15-07-2026		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	03	22-07-2026		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	03	29-07-2026		
6.	Practice Lab	03	05-08-2026		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	03	12-08-2026		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	03	19-08-2026		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	03	02-09-2026		
10.	a) Create a scrollable List Widget in Form & Add items to it. b) Implement the List View & Display the selected item in the prompt window.	03	09-09-2026		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	03	30-09-2026		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	03	07-10-2026		
13.	Internal Exam	03	14-10-2026		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO 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.
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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.
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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. D. Sainath	Mr. A. Koteswara Rao	Dr. Y. Vijaya Bhaskar Reddy	Dr. S. Nagarjuna Reddy
Signature				

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.	FSD-II & JDBC Introduction	3	30/06/2026		DM5	
2.	JDBC Programs	3	07/07/2026		DM5	
3.	Servlet Programs	3	14/07/2026		DM5	
4.	JSP Introduction	3	21/07/2026		DM5	
5.	JSP MVC programs	6	28/07/2026 04/08/2026		DM5	
6.	Node JS Introduction	3	11/08/2026		DM5	
7.	Express JS Framework	3	18/08/2026		DM5	
8.	Node JS & Express JS Programs	6	01/09/2026 08/09/2026		DM5	
9.	MangoDB	3	15/09/2026		DM5	
10.	MangoDB with Express JS	3	22/09/2026		DM5	
11.	React JS	3	29/09/2026		DM5	
12.	React JS and Full stack Integration	3	06/10/2026		DM5	
13.	Web Application Development	3	13/10/2026		DM5	
14.	Internal Test	3	27/10/2026		DM4	

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

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70

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 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	Mr. N. SrinivasaRao	Dr. K. Devi Priya	Dr. Y.V.B. Reddy	Dr. S. Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Dr. G.Minni
Course Name & Code : COMPUTER NETWORKS & 23CS07
L-T-P Structure : 3-0-0 Credits: 3
Program/Sem/Sec : B.Tech./V Sem./G Section A.Y.: 2026-27
PRE-REQUISITE: : Basic Computer fundamental concepts

COURSE EDUCATIONAL OBJECTIVE (CEO):

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

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

CO1:	Understand various network types, topologies, reference models, and transmission media	Understand - L2
CO2:	Examine data link layer design issues, framing techniques, error control, and flow control mechanisms.	Analyze-L4
CO3:	Apply multiple media access control techniques and evaluate Ethernet standards for network communication.	Apply - L3
CO4:	Implement routing algorithms, congestion control techniques, and IP addressing schemes for efficient network communication.	Apply - L3
CO5:	Utilize transport layer protocols (UDP & TCP) and application layer services (HTTP, DNS, Email) to enable secure and reliable data communication.	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	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	1	3	-	-
CO3	2	2	3	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	3	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	3	3	-
	1 - Low				2 - Medium				3 - High						

TEXTBOOKS:

- 1..Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks, Behrouz A. Forouzan, F Fifth Edition TMH.

REFERENCE BOOKS:

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT – I: Introduction to Computer Network & Physical Layer**

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Discussion of CEO's and CO's	1	29-06-2026		TLM1	
2.	Introduction to Computer Networks:	1	02-07-2026		TLM1	
3.	Definition, Uses, Advantages Network Types: LAN, MAN, WAN Mesh, Hybrid	1	04-07-2026		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer	1	06-07-2026		TLM1	
5.	OSI Reference Model Layers, Role of each layer	1	09-07-2026		TLM1	
6.	TCP/IP Reference Model – Layers	1	10-07-2026		TLM1	
7.	TCP/IP Reference Model Function, Protocols	1	11-07-2026		TLM1	
8.	Comparison: OSI vs TCP/IP	1	13-07-2026		TLM1	
9.	Introduction to Physical Layer Guided Media: Twisted Pair, Coaxial, Fiber Optic	1	16-07-2026		TLM1	
10.	Unguided Media: Radio, Microwave, Infrared	1	18-07-2026		TLM1	
11.	Revision	1	20-07-2026		TLM1	
12.	Tutorial	1	23-07-2026		TLM1	
No. of classes required to complete UNIT – I: 12				No. of classes taken:		

UNIT – II: Data Link Layer

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
13.	Design Issues, Framing Methods: Fixed size	1	25-07-2026		TLM1	

	framing				
14.	Variable size framing error control Flow Control: Stop-and-wait, Sliding	1	27-07-2026		TLM1
15.	Error Control: Types of Errors, Detection & Correction	1	30-07-2026		TLM1
16.	CRC, Checksum: idea, one's complement internet checksum	1	03-08-2026		TLM1
17	services provided to Network Layer	1	06-08-2026		TLM1
18.	Elementary Data Link Layer protocols: simplex protocol Simplex stop and wait protocol	1	08-08-2026		TLM1
19.	Simplex protocol for Noisy Channel	1	10-08-2026		TLM1
20.	sliding window protocol: One bit	1	13-08-2026		TLM1
21.	Go back N, Selective repeat-Stop and wait protocol	1	17-08-2026		TLM1
22.	Comparison of all protocols				
23.	Recap+ quiz, assignment	1	20-08-2026		TLM1
No. of classes required to complete UNIT – II: 9				No. of classes taken:	

UNIT-III: Media Access Control & Wired LANs

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.	Media Access Control: Random Access: ALOHA Carrier sense multiple access (CSMA)	1	22-08-2026		TLM1	
25.	CSMA with Collision Detection, CSMA with Collision Avoidance	1	31-08-2026		TLM1	
26.	Channelization: frequency division multiple Access(FDMA),TDMA,CDMA	1	03-09-2026		TLM1	
27.	Wired LANs: Ethernet Protocol	1	05-09-2026		TLM1	
28.	Standard Ethernet, Fast Ethernet(100 Mbps)	1	07-09-2026		TLM1	
29.	Gigabit Ethernet, 10 Gigabit Ethernet	1	10-09-2026		TLM1	
30.	Ethernet Summary					
31.	Tutorial	1	12-09-2026		TLM1	
No. of classes required to complete UNIT – III: 7				No. of classes taken:		

UNIT – IV: Network Layer

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.	Design Issues – Packet Switching, Store-and-Forward Implementation of Connectionless and Connection Oriented Service	1	17-09-2025		TLM1	

33..	Comparison of Virtual Circuit and Datagram Networks Routing Algorithms-The Optimality principle-Shortest path Flooding Distance vector link state	1	19-09-2026		TLM1
34.	Hierarchical, congestion Control algorithms	1	21-09-2026		TLM1
35.	General principles of congestion control Congestion prevention polices, Traffic Control Algorithm	1	24-09-2026		TLM1 TLM1
36.	Leaky bucket & Token bucket Internet Working: Network layer in the internet – IP protocols	1	26-09-2026		TLM1
37	IP Version 4 protocol-IPV4 Header Format	1	28-09-2026		TLM1
38	IP addresses, Class full Addressing,	1	01-10-2026		TLM1
39	CIDR, Subnets-IP Version 6- The main IPV6 header	1	03-10-2026		
No. of classes required to complete UNIT – IV: 7				No. of classes taken:	

UNIT – V: The Transport Layer & Application Layer

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.	Introduction to Transport Layer – Port Numbers	1	05-10-2026		TLM1	
40.	UDP – Format, Features, Applications	1	08-10-2026		TLM1	
41.	TCP – Services, Connection Establishment, Segments TCP Features – Flow, Error, Congestion Control	1	10-10-2026		TLM1	
42	TCP – Services, Connection Establishment Segments	1	12-10-2026		TLM1	
43.	TCP Features – Flow, Error, Application Layer: Introduction to WWW & HTTP	1	15-10-2026		TLM1	
44.	Email Architecture: SMTP, POP3, IMAP Email Security, Web-based Mail	1	17-10-2026		TLM1	
45.	TELNET – local versus Remote Access DNS – Hierarchy , Resolution Process	1	26-10-2026		TLM1	
46.	Tutorial+ Assessment	1	29-10-2026		TLM1	
No. of classes required to complete UNIT – V:8				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
47.	Software Defined Networking (SDN). Internet of Things (IoT) Networking	1	31-10-2026		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 (R23 Regulation):

Evaluation Task	Marks
Assignment – I (Units-I, II)	A1 = 5
I – Descriptive Examination (Units-I, II)	M1 = 15
I – Quiz Examination (Units-I, II)	Q1 = 10
Assignment – II (Unit-III, IV & V)	A2 = 5
II – Descriptive Examination (UNIT-III, IV & V)	M2 = 15
II – Quiz Examination (UNIT-III, 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):

P01	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
P02	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.
P03	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.
P04	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.
P05	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
P06	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
P07	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.
P08	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
P09	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
P010	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.
P011	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.
P012	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):

PS01	The ability to apply Software Engineering practices and strategies in software project development using open-source programming environment for the success of organization.
PS02	The ability to design and develop computer programs in networking, web applications and IoT as per the society needs.
PS03	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. G. Minni	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSEHANDOUT

PART-A

Name of Course Instructor	: Dr. G.Minni	
Course Name & Code	: COMPUTER NETWORKS LAB & 23CS58	
L-T-P Structure	: 0-0-3	Credits:1.5
Program/Sem/Sec	: B.Tech.–CSE /V-Sem/G	A.Y. :2026-27

PRE-REQUISITE : Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE (CEO): The objectives of the course is to learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

COURSE OUTCOMES (COs):

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

CO1:	Apply fundamental networking concepts by configuring network devices, analyzing protocols, and implementing data link layer techniques.	Apply–Level3
CO2:	Implement various network algorithms, including error detection, congestion control, routing, and shortest path computation.	Apply–Level3
CO3:	Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator.	Apply–Level3
CO4:	Analyze network traffic, security vulnerabilities, and performance metrics using tools like Wireshark, Nmap, and NS2 Simulator.	Apply–Level3

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

Cos	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
CO1	3	2	3	2	3	-	-	-	-	-	-	-	1	3	-
CO2	3	3	3	3	2	-	-	-	-	-	-	-	1	3	-
CO3	3	3	2	3	3	-	-	-	-	-	-	-	2	3	-
CO4	-	-	-	-	-	-	-	3	3	3	-	-	3	2	-
CO5	-	-	-	-	-	-	-	2	2	2	2	2	-	-	-
1 -Low		2 -Medium					3- High								

PART-B

COURSE DELIVERY PLAN -LESSONPLAN:

S No.	Programs to be covered	No. of Classes		Actual Date of Completion	Delivery Method	HOD Sign.
		Required as per the Schedule	Tentative Date of Completion			
1.	Revision of C programs on loops, strings and functions	03	01-07-2026		TLM4	
2.	Study of Network devices in detail and connect the computers in Local Area Network.	03	08-07-2026		TLM4	
3.	Write a Program to implement the data link layer framing methods such as i) Character stuffing ii) bit stuffing.	03	15-07-2026		TLM4	
4.	Write a Program to implement data link layer framing method checksum.	03	22-07-2026		TLM4	
5.	Write a program for Hamming Code generation for error detection and correction.	03	29-07-2026		TLM4	
6.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	05-08-2026		TLM4	
7.	Write a Program to implement Sliding window protocol for Goback N.	03	12-08-2026		TLM4	
8.	Write a Program to implement Sliding window protocol for Selective repeat.	03	19-08-2026		TLM4	
9.	Write a Program to implement Stop and Wait Protocol.	03	02-09-2026		TLM4	
10.	Write a program for congestion control using leaky bucket algorithm	03	09-09-2026		TLM4	
11.	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indica	03	16-09-2026		TLM4	
12.	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.	03	23-09-2026		TLM4	
13.	Do the following using NS3Simulator i.. NS3 Simulator- Introduction ii. Simulate to Find the Number of Packets Dropped	03	30-09-2026		TLM4	

14.	iii. Simulate to Find the Number of Packets Dropped by TCP/UDP iv..Simulate to Find the Number of Packets Dropped due to v.. Congestion Simulate to Compare Data Rate& Throughput.	03	07-10-2026		TLM4	
15.	Review	03	14-10-2026		TLM4	
16	Lab Internal Test	03	28-10-2026		TLM4	

Delivery 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):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
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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	Communication: Design and develop modern communication technologies for building the inter disciplinary skills to meet current and future needs of industry.
PSO 2	VLSI and Embedded Systems: 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	Signal Processing: 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	Dr. G.Minni	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction: AI problems,	1	29/06/2026		TLM2	
2.	Basics of AI	1	30/06/2026		TLM2	
3.	Foundation of AI and history of AI	1	01/07/2026		TLM2	
4.	Intelligent agents: Agents and Environments,	1	03/07/2026		TLM3	
5.	the concept of rationality,	1	06/07/2026		TLM2	
6.	The nature of environments	1	08/07/2026		TLM2	
7.	Structure of agents,	1	10/07/2026		TLM3	
8.	Problem solving agents	1	13/07/2026		TLM2	
9.	Problem formulation.	1	14/07/2026		TLM2	
10.	Revision	1	15/07/2026		TLM2	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Searching- Searching for solutions, uniformed search strategies	1	17/07/2026		TLM2	
12.	Breadth first search	1	20/07/2026		TLM2	
13.	Breadth first search	1	21/07/2026		TLM2	
14.	Depth First Search.	1	22/07/2026		TLM2	
15.	Search with partial information	1	24/07/2026		TLM3	
16.	(Heuristic search) Hill climbing	1	24/07/2026		TLM3	
17.	A* Algorithm	1	27/07/2026		TLM2	
18.	A* Algorithm	1	28/07/2026		TLM2	
19.	AO* Algorithm	1	29/07/2026		TLM2	
20.	AO* Algorithm	1	31/07/2026		TLM3	
21.	Problem reduction, Game Playing-	1	03/08/2026		TLM2	
22.	Adversial search, Games	1	04/08/2026		TLM2	
23.	Mini-max algorithm,	1	05/08/2026		TLM2	
24.	Optimal decisions in multiplayer games	1	07/08/2026		TLM3	
25.	Problem in Game playing	1	10/08/2026		TLM2	
26.	Alpha-Beta pruning	1	11/08/2026		TLM3	
27.	Evaluation functions.	1	12/08/2026		TLM3	
28.	Revision	1	14/08/2026		TLM2	
No. of classes required to complete UNIT-II:18				No. of classes taken:		

UNIT-III:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
29.	Representation of Knowledge: Knowledge representation issues,	1	17/08/2026		TLM3	
30.	predicate logic- logic programming	1	18/08/2026		TLM2	
31.	Semantic nets- frames and inheritance	1	19/08/2026		TLM3	
32.	Constraint propagation	1	21/08/2026		TLM2	
33.	Representing knowledge using rules,	1	31/09/2026		TLM2	
34.	Rules based deduction systems. Reasoning under uncertainty,	1	01/09/2026		TLM2	
35.	Review of probability, Bayes' probabilistic interference	1	02/09/2026		TLM2	
36.	Dempster Shafer theory	1	07/09/2026		TLM3	
No. of classes required to complete UNIT-III: 08				No. of classes taken:		

UNIT-IV:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Logic concepts: First order logic.	1	08/09/2026		TLM2	
38.	First order logic	1	09/09/2026		TLM3	
39.	Inference in first order logic,	1	11/09/2026		TLM2	
40.	Propositional vs. first order inference,	1	15/09/2026		TLM3	
41.	unification & lifts forward chaining	1	16/09/2026		TLM2	
42.	Backward chaining	1	18/09/2026		TLM2	
43.	Resolution	1	21/09/2026		TLM2	
44.	Learning from observation	1	22/09/2026		TLM2	
45.	Inductive learning,	1	23/09/2026		TLM3	
46.	Decision trees,	1	25/09/2026		TLM2	
47.	Decision trees,	1	28/09/2026		TLM2	
48.	Explanation based learning	1	29/09/2026		TLM2	
49.	Statistical Learning methods	1	30/09/2026		TLM2	
50.	Reinforcement Learning	1	05/10/2026		TLM2	
No. of classes required to complete UNIT-IV: 14				No. of classes taken:		

UNIT-V:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
51.	Expert Systems: Architecture of expert systems	1	06/10/2026		TLM2	
52.	Roles of expert systems	1	07/10/2026		TLM2	
53.	Knowledge Acquisition Meta	1	09/10/2026		TLM2	
54.	Knowledge Heuristics.	1	12/10/2026		TLM2	
55.	Typical expert systems – MYCIN	1	13/10/2026		TLM3	
56.	DART	1	14/10/2026		TLM2	
57.	XCON	1	16/10/2026		TLM2	
58.	Expert systems shells.	1	26/10/2026		TLM2	
59.	Revision	1	27/10/2026		TLM2	
No. of classes required to complete UNIT-V: 09				No. of classes taken:		

Contents beyond the Syllabus:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Generative AI and Large Language Models (LLMs)	1	28/10/2026		TLM6	
2.	AI in Cybersecurity	1	30/10/2026		TLM6	

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 (R23 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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.Ch. Srinivasa Rao	Dr. N. V. Maha Lakshmi	Dr. K. Devi Priya	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.T.N.V.S PRAVEEN

Course Name & Code : CYBER SECURITY LAB
23CSH6

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

Credits: 1.5

Program/Sem/Sec : B.Tech/CSE/V/A to G

A.Y.: 2026-27

PREREQUISITE: -Information Security

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

- Student to get the knowledge about audit and information security management, which makes the student to get the real world experience.
- To learn and implement Data leakage in a website database.

C01	Analyze and implement Audit security policy in windows environment, create a Demilitarized zone (Analyze-L4)
C02	Illustrate the Resource harvesting attack and mitigation, Window Patch management policy (Understand-L2)
C03	Apply knowledge of metasploit, Access control list creation and content filtering limiting the traffic (Apply - L3)
C04	Explain the Data leakage in a website database, Password policy and verification (Understand-L2)
C05	Build an Audit Policy management, Media handling policy and event log analysis (Create-L6)

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	3	3	2	3	1	-	-	1	1	-	1	3	3	2
C02	2	3	2	2	3	1	-	-	1	1	-	1	3	2	2
C03	3	3	3	2	3	1	-	-	1	1	-	1	3	3	3
C04	2	3	2	2	3	1	-	-	1	1	-	1	3	2	2
C05	3	3	3	3	3	1	-	-	1	1	1	1	3	3	3
	1 - Low			2 -Medium			3 - High								

TEXTBOOKS:

T1 NASSCOM: Security Analyst Student Hand Book Dec 2015

T2 Information Security Management Principles Updated Edition by David Alexander, Amanda Finch, David Sutton ,Published by BCS, June 2013.

REFERENCE BOOKS:

R1 cyber security fundamentals 2 nd edition, Published by ISACA, Cyber security, Network Security, Data Governance Security

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.	Exercise 1	3	03-07-2026		DM5	
2.	Exercise 2	3	10-07-2026		DM5	
3.	Exercise 3	3	17-07-2026		DM5	
4.	Exercise 4	3	24-07-2026		DM5	
5.	Exercise 5	3	31-07-2026		DM5	
6.	Exercise 6	3	07-08-2026		DM5	
7.	Exercise 7	3	14-08-2026		DM5	
8.	Exercise 8	3	21-08-2026		DM5	
9.	Exercise 9	3	11-09-2026		DM5	
10.	Exercise 10	3	18-09-2026		DM5	
11.	Exercise 11	3	25-09-2026		DM5	
12.	Exercise 12	3	09-11-2026		DM5	
13.	Exercise 13	3	16-11-2026		DM5	
14.	Exercise 14	3	30-11-2026		DM5	

PART-C

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-D

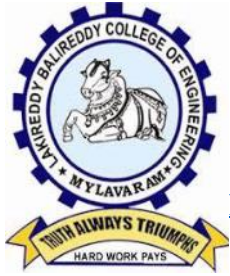
PROGRAMME OUTCOMES (POs):

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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.
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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.T.N.V.S PRAVEEN	Mr.T.N.V.S PRAVEEN	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs. D. Jyothi
Course Name & Code : DATA MINING LAB-23AD55
L-T-P Structure : 0-0-3 **Credits:1.5**
Program/Sem/Sec : B.Tech. – CSE-V/G **A.Y.:2026-27**

PREREQUISITE: Data Base Management Systems, Python Programming/R Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of this lab is to provide practical exposure to the implementation of widely used data mining algorithms and to develop the ability to evaluate their performance in both supervised and unsupervised learning environments.

Software Requirements: Python/R-Tool

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

CO1	Apply data preprocessing, similarity measures, and machine learning models using Python for solving data mining tasks. (Apply – L3)
CO2	Develop and evaluate classification, clustering, and association rule mining techniques using appropriate algorithms. (Apply – L3)
CO3	Analyze performance of data mining models using validation techniques and interpret results for decision-making. (Apply – L3)
CO4	Improve individual/teamwork skills, communication, report writing, and practice ethical responsibilities in project work.

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	3	2	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	-	2	2	-	-
			1 - Low					2 -Medium				3 - High			

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.	Introduction- Practice on Python Programming	3	30-06-2026		DM5	
2.	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	7-07-2026		DM5	
3.	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	14-07-2026		DM5	
4.	Practice Session	3	21-07-2026		DM5	
5.	Similarity and Dissimilarity Measures using python	3	28-07-2026		DM5	
6.	Build a model using linear regression algorithm on any dataset.	3	4-08-2026		DM5	
7.	Build a classification model using Decision Tree algorithm on iris dataset	3	11-08-2026		DM5	
8.	Apply Naïve Bayes Classification algorithm on any dataset	3	18-08-2026		DM5	
9.	Lab Cycle-4	3	01-09-2026		DM5	
10.	Generate frequent item sets using Apriori Algorithm in python	3	08-09-2026		DM5	
11.	Generate association rules for any market basket data.	3	15-09-2026		DM5	
12.	Apply K- Means clustering algorithm on any dataset.	3	22-09-2026		DM5	
13.	Apply Hierarchical Clustering algorithm on any dataset	3	29-09-2026		DM5	
14.	Apply DBSCAN clustering algorithm on any dataset.	3	06-10-2026		DM5	
15.	Apply DBSCAN clustering algorithm on any dataset.	3	13-10-2026		DM5	
16.	Internal exam	3	27-10-2026		DM5	

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

EVALUATION PROCESS (R23 Regulations):

Evaluation Task	Marks
Day-to-day work	A1 = 15
Internal test	A3 = 15
CIE Total:	M1 = 30
Procedure/Algorithm	B1 = 20
Program execution and Result/Inference	B2 = 30
Viva voce	B = 20
SEE Total:	M2 = 70
Total Marks = CIE + SEE = (M1+M2)	100

PART-D

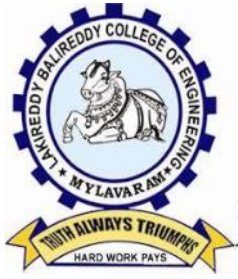
PROGRAMME OUTCOMES (POs):

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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs.D.Jyothi	Dr. D.Venkata Subbaiah	Dr. D.Venkata Subbaiah	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs. D. Jyothi

Course Name & Code : Data Warehousing and Data mining & 23AD04

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

Program/Sem/Sec : III B.tech/V-sem/G-Sec A.Y.: 2026-27

PREREQUISITE: DBMS, Probability, and Statistics

Course Objectives: The main objective of the course is to

- Introduce basic concepts and techniques of data warehousing and data mining
- Examine the types of data to be mined and apply pre-processing methods on raw data
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

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

CO1	Design data warehouses to support effective data modeling, integration, and analytical processing. (Level-3)
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications. (Level-2)
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance. (Level-3)
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets. (Level-3)
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively. (Level-2)

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	PO10	PO 11	PO12	PS O1	PS O2	PSO 3
CO1	3	-	2	-	3	-	-	-	-	-	-	2	2	-	3
CO2	3	2	-	-	3	-	-	-	-	-	-	2	2	-	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	2
CO4	2	2	-	2	3	-	-	-	-	-	-	2	3	-	2
CO5	2	2	-	2	3	-	-	-	-	-	-	2	3	1	2
	1 - Low					2 -Medium					3 - High				

TEXT BOOKS:

- T1** Data Mining concepts and Techniques, 3rd edition, Jiawei Han, MichelKamber, Elsevier, 2011.
- T2** Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, VipinKumar, Pearson, 2012.

Reference Books:

R1	Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher.
R2	Data Mining Techniques, Arun K Pujari, 3rd edition, UniversitiesPress,2013.
R3	(NPTEL course by Prof. Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/previe
R4	http://www.saedsayad.com/data_mining_map.htm

PART-B**COURSE DELIVERY PLAN (LESSON PLAN):****UNIT-I: Data Warehousing and Online Analytical Processing:**

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.	Data Warehousing and Online Analytical Processing: Basic concepts	3	30-06-2026, 03-07-2026& 04-07-2026		TLM2	
2.	Data Warehouse Modeling: Data Cube and OLAP	2	07-07-2026& 10-07-2026		TLM2	
3.	Data Warehouse Design and Usage	1	11-07-2026		TLM2	
4.	Data Warehouse Implementation,	2	14-07-2026& 17-07-2026		TLM2	
5.	Cloud Data Warehouse	1	18-07-2026		TLM2	
6.	Data Mining and Patten Mining, Technologies, Applications, Major issues	2	21-07-2026& 24-07-2026		TLM2	
7.	Data Objects &Attribute Types	1	25-07-2026		TLM2	
8.	Basic Statistical Descriptions of Data	2	28-07-2026& 31-07-2026			
9.	Data Visualization, Measuring Data Similarity and Dissimilarity.	2	01-08-2026& 04-08-2026		TLM2	
No. of classes required to complete UNIT-I: 16				No. of classes taken:		

UNIT-II: 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
10.	Data Preprocessing: An Overview	1	07-08-2026		TLM2	
11.	Data Cleaning	2	08-08-2026,		TLM2	

			11-08-2026			
12.	Data Integration	1	14-08-2026		TLM2	
13.	Data Reduction	1	18-08-2026		TLM2	
14.	Data Transformation and Data Discretization.	1	21-08-2026		TLM2	
15.	ABL	1	22-08-2026		TML7	
No. of classes required to complete UNIT-II: 7				No. of classes taken:		

UNIT-III: Classification:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
16.	Classification: Basic Concepts,	1	01-09-2026		TLM1	
17.	General Approach to solving a classification problem	1	05-09-2026		TLM1	
18.	Decision Tree Induction: Attribute Selection Measures,	1	05-09-2026		TLM1	
19.	Tree Pruning	1	08-09-2026		TLM1	
20.	Scalability and Decision Tree Induction	1	11-09-2026		TLM1	
21.	Visual Mining for Decision Tree Induction	1	12-09-2026		TLM1	
22.	Bayesian Classification Methods: Bayes Theorem	1	15-09-2026		TLM1	
23.	Naïve Bayes Classification	1	18-09-2026		TLM1	
24.	Rule-Based Classification	1	19-09-2026		TLM1	
25.	Model Evaluation and Selection	1	22-09-2026		TLM1	
No. of classes required to complete UNIT-III: 10						

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
26.	Problem Definition	1	25-09-2026		TLM1	
27.	Frequent Item set Generation	2	26-09-2026 & 29-09-2026		TLM1	
28.	Rule Generation: Confident Based Pruning	1	03-10-2026		TLM1	
29.	Rule Generation in Apriori Algorithm	1	06-10-2026		TLM1	
30.	Compact Representation of frequent item sets	2	09-10-2026& 10-10-2026		TLM1	

31.	FP-Growth Algorithm	1	13-10-2026		TLM1	
32.	ABL	1	16-10-2026		TLM7	
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

UNIT-V: Cluster Analysis:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
33.	Overview	1	09-10-2026		TLM2	
34.	Basics and Importance of Cluster Analysis	1	10-10-2026		TLM2	
35.	Clustering techniques	1	13-10-2026		TLM2	
36.	Different Types of Clusters	1	16-10-2026		TLM2	
37.	K-means: The Basic K-means Algorithm, K-means Additional Issues	1	17-10-2026		TLM2	
38.	Bi-secting K Means Agglomerative Hierarchical Clustering	1	27-10-2026		TLM2	
39.	DBSCAN: Traditional Density Center-Based Approach DBSCAN Algorithm, Strengths and Weaknesses	1	30-10-2026		TLM2	
No. of classes required to complete UNIT-V: 07				No. of classes taken:		

Content Beyond Syllabus:

Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
Explainable Artificial Intelligence (XAI) in Data Mining	1	31-10-2026		TLM2	

Content Beyond Syllabus: "Explainable Artificial Intelligence (XAI) in Data Mining"

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
TLM7	ABL		

PART-C

EVALUATION PROCESS (R23 Regulation):

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

PART-D

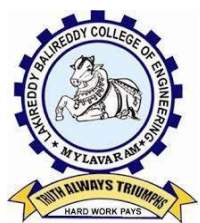
PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	The ability to apply Software Engineering practices and strategies in software development using open-source programming environment for the success of organization.
PSO 2	The ability to design and develop computer programs in networking, web application 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	Mrs.D.Jyothi	Dr. D. Venkata Subbaiah	Dr. D. Venkata Subbaiah	Dr. S.Nagarjuna Reddy
Signature				



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr S.Nagarjuna Reddy

Course Name & Code : FORMAL LANGUAGES AND AUTOMATA THEORY
23CS08

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

Credits: 3

Program/Sem/Sec : B.Tech/CSE/V /G

A.Y.: 2026-27

PREREQUISITE: -Discrete Mathematics Structures

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

To learn fundamentals of Regular and Context Free Grammars and Languages

- To understand the relation between Regular Language and Finite Automata and machines

- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators

- To understand the relation between Contexts free Languages, PDA and TM

- To learn how to design PDA as acceptor and TM as Calculators

C01	Construct finite automata and demonstrate their equivalence & minimization for language recognition. (Apply-L3)
C02	Implement regular expressions and finite automata, and apply closure properties & pumping lemma for language validation. (Apply-L3)
C03	Develop context-free grammars and apply simplification techniques & normal forms for formal language processing. (Apply-L3)
C04	Design pushdown automata and demonstrate their equivalence with context-free grammars. (Apply-L3)
C05	Construct Turing machines and apply computational techniques to solve decision problems and complexity analysis. (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
C01	3	3	1	2								1	3		2
C02	3	3		2								1	3		2
C03	3	3	3	2								1	3	1	3
C04	3	1	1	2								1	3	1	3
C05	3	3	1	2								2	3	1	2
	1 - Low			2 -Medium				3 - High							

TEXTBOOKS:

- T1** Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008

T2 Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

REFERENCE BOOKS:

- R1** Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
- R2** Theory of Computation, V. Kulkarni, Oxford University Press, 2013
- R3** Theory of Automata, Languages and Computation, Rajendra kumar, McGraw Hill,2014

E-Resources

- 1) <https://nptel.ac.in/courses/106/104/106104028/>

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Finite Automata

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- Course Objective & Outcomes Need of Automata theory, Central Concepts of Automata Theory	1	01-07-2026		TLM2	
2.	Finite Automata, Transition Systems	1	03-07-2026		TLM2	
3.	Acceptance of a String, DFA, Design of DFAs,	1	04-07-2026		TLM1	
4.	NFA, Design of NFA	1	08-07-2026		TLM1	
5.	Equivalence of DFA and NFA	1	10-07-2026		TLM1	
6.	Finite Automata with ϵ Transitions	1	11-07-2026		TLM1	
7.	Minimization of Finite Automata- Tutorial	1	15-07-2026		TLM3	
8.	Finite Automata with output-Mealy and Moore Machines	1	17-07-2026		TLM7	
9.	Applications and Limitation of Finite Automata	1	18-07-2026		TLM1	
10.	Activity Based learning- Finite Automata with output-Mealy and Moore Machines	1	22-07-2026		TLM1	
No. of classes required to complete UNIT-I: 10				No. of classes taken:		

UNIT-II: Regular Expressions

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
11.	Regular Expressions	1	24-07-2026		TLM2	
12.	Regular Sets, Identity Rules					
13.	Equivalence of two RE	1	25-07-2026		TLM1	
14.	Simplification of REs, Finite Automata and Regular Expressions	1	29-07-2026		TLM1	
15.	Simplification of REs, Finite Automata and Regular Expression	1	31-07-2026		TLM3	
16.	Inter Conversion, Equivalence Between FA and RE	2	01-08-2026		TLM1	
			05-08-2026			
17.	Pumping Lemma of Regular Sets	1	07-08-2026		TLM1	
18.	Closure Properties of Regular Sets, Grammars	1	08-08-2026		TLM1	
19.	Activity Based learning on Regular Expressions	1	12-08-2026		TLM7	
20.	Classification of Grammars	1	14-08-2026		TLM1	
21.	Chomsky Hierarchy	1	19-08-2026		TLM1	
22.	Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion	2	21-08-2026		TLM1	
			22-08-2026			
No. of classes required to complete UNIT-II: 13				No. of classes taken:		
I MID EXAMINATIONS (24-08-2026 TO 29-08-2026)						

UNIT-III: Context Free Grammar

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.	Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees,	1	02-08-2026		TLM2	
24.	Ambiguous Grammars	1	05-09-2026		TLM1	
25.	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	09-09-2026		TLM1	
26.	ε- Productions, Unit Productions	1	11-09-2026		TLM3	
27.	Normal Forms-Chomsky Normal Form	1	12-09-2026		TLM1	
28.	Greibach Normal Form	1	16-09-2026		TLM1	
29.	Pumping Lemma,	1	18-09-2026		TLM1	
30.	Closure Properties, Applications of ContextFree Grammars.	1	19-09-2026		TLM1	
No. of classes required to complete UNIT-III: 08				No. of classes taken:		

UNIT-IV:Push down Automata

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.	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description	1	23-09-2026		TLM2	
32	Language Acceptance of Push Down Automata	1	25-09-2026		TLM1	
33.	Design of Pushdown Automata	1	26-09-2026		TLM1	
34.	Deterministic and Non – Deterministic Pushdown Automata	1	30-09-2026		TLM1	
35.	Equivalence of Pushdown Automata and Context Free Grammar	1	03-10-2026		TLM3	
36.	Conversion	1	07-10-2026		TLM1	
37.	Two Stack Pushdown Automata	1	09-10-2026			
38.	Application of Pushdown Automata	1	10-10-2026		TLM1	
39	Activity based learning on Pushdown Automata	1	14-10-2026		TLM3	
No. of classes required to complete UNIT-IV: 09				No. of classes taken:		

UNIT-V: Turning Machine

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.	Turning Machine: Definition, Model, Representation of TMs- Instantaneous Descriptions	1	16-10-2026		TLM2	
41.	Transition Tables and Transition Diagrams, Language of a TM, Design of TMs	1	17-10-2026		TLM1	
42.	Types of TMs, Church's Thesis, Universal and Restricted TM	1	28-10-2026		TLM1	
43.	Decidable and Un-decidable Problems, Halting Problem of TMs	1	30-10-2026		TLM1	
44.	Post's Correspondence Problem, Modified PCP	1	30-10-2026		TLM1	
45.	Classes of P and NP	1	31-10-2026		TLM1	
46.	NP-Hard and NP-Complete Problems	1	31-10-2026		TLM3	
No. of classes required to complete UNIT-V: 06				No. of classes taken:		

Content Beyond 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
1.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2026					
No. of classes		1	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
TLM 7	Activity Based Learning		

PART-C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Assignment-I (Units-I, II)	A1=5
I-Descriptive Examination (Units-I, II)	M1=15
I-Quiz Examination (Units-I, II)	Q1=10
Assignment-II (Unit-III, IV & V)	A2=5
II- Descriptive Examination (Unit-III, IV & V)	M2=15
II-Quiz Examination (Unit-III, 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

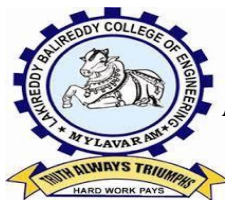
PROGRAMME OUTCOMES (POs):

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.
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PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
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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.
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PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. D.Veeraiah	Dr. D. Venkata Subbaiah	Dr S. Nagarjuna Reddy
Signature				



LAKIREDDY BALIREDDY COLLEGE OF ENGINEERING

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L.B.REDDY NAGAR, MYLAVARAM, NTR DIST., A.P.-521230.

Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. K.Sai Babu, Assistant Professor

Course Name & Code : Sustainable Energy Technologies- 23ME81 Regulation: R23

L-T-P Structure : 3-0-0 Credits: 03

Program/Sem/Sec : B.Tech- CSE V Sem G/S A.Y.: 2026-27

PREREQUISITE : Nil

COURSE EDUCATIONAL OBJECTIVES (CEOs): To provide the insights on different sustainable energy sources, potential, salient features and utilization of solar, wind, geothermal, ocean thermal energy, bio energy and fuel cell systems.

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

CO 1	Demonstrate the importance, the impact of solar radiation. (Understanding-L2)
CO 2	Understand the principles of solar PV modules and storage in PV systems. (Understanding-L2)
CO 3	Discuss solar energy storage systems and their applications. (Understanding-L2)
CO 4	Describe power extraction from wind and bio-mass. (Understanding-L2)
CO5	Illustrate the working of geothermal, ocean energy and fuel cells. (Understanding-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	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO2	2	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO3	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO4	1	1	-	-	-	3	3	-	-	-	-	2	2	-	-
CO5	1	1	-	-	-	3	3	-	-	-	-	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).

TEXT BOOKS:

T1 Renewable Energy Technologies -Ramesh & Kumar /Narosa

T2 Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

REFERENCE BOOKS:

R1. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.

R2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

R3. Non-conventional Energy Source- G S Sawhney- PHI, New Delhi, 2012

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I:

SOLAR RADIATION

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.	Course Outcomes	1	29-06-2026		TLM2	
2.	Role and potential of new and renewable sources	1	30-06-2026		TLM1	
3.	The solar energy option, Environmental impact of solar power	1	02-07-2026		TLM1	
4.	Structure of the Sun, The solar constant	2	04-07-2026		TLM2	
5.	Sun-earth relationships	2	07-07-2026		TLM2	
6.	Coordinate systems and coordinates of the sun	1	09-07-2026		TLM2	
7.	Extraterrestrial and terrestrial solar radiation	3	14-07-2026		TLM2	
8.	Solar radiation on tilted surface	1	16-07-2026		TLM2	
9.	Instruments for measuring solar radiation and sun shine, Solar radiation data	2	18-07-2026		TLM2	
10.	ABL	1	20-07-2026		TLM6	
11.	Lab visit	1	21-07-2026		TLM4	
12.	Tutorial	1	23-07-2026		TLM3	
No. of classes required to complete UNIT-I: 17				No. of classes taken:		

UNIT-II:

SOLAR PV MODULES AND PV 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.	PV module Circuit Design, Module Structure, Packing Density	3	27-07-2026		TLM2	
2.	Interconnections, Mismatch and temperature effects	3	03-07-2026		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules, Degradation and failure	3	07-08-2026		TLM2	
4.	PV module parameters, Efficiency of PV Systems	1	10-08-2026		TLM1	
5.	Tutorial	1	13-08-2026		TLM3	
6.	Solar PV Systems	2	17-08-2026		TLM2	
7.	Battery Operation, Types of Batteries, Battery parameters, Applications,	3	21-08-2026		TLM2	

	Selection of batteries for Solar PV System					
8.	ABL	1	22-08-2026		TLM6	
No. of classes required to complete UNIT-II: 17				No. of classes taken:		

UNIT-III:

SOLAR ENERGY COLLECTION, SOLAR ENERGY STORAGE AND APPLICATIONS

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.	Solar Energy Collection: Flat plate and concentrating collectors	1	31-08-2026		TLM2	
2.	Classification of concentrating collectors	1	01-09-2026			
3.	Tutorial	1	03-09-2026		TLM3	
4.	Solar Energy Storage and Applications: Different methods	1	05-09-2026		TLM2	
5.	Sensible latent heat and stratified storage, Solar ponds	1	08-09-2026		TLM2	
6.	Solar Applications-solar heating cooling technique	1	10-09-2026		TLM2	
7.	Solar distillation and drying, Solar cookers	1	11-09-2026		TLM2	
8.	Central power tower concept, Solar chimney	1	15-09-2026		TLM2	
9.	ABL	1	17-09-2026		TLM6	
No. of classes required to complete UNIT-III: 9				No. of classes taken:		

UNIT-IV :

WIND ENERGY, BIO-MASS

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.	Wind energy: Sources and potential	1	18-09-2026		TLM2	
2.	Horizontal and Vertical axis wind mill	1	19-09-2026		TLM2	
3.	Performance characteristics, Betz criteria	1	21--09-2026		TLM2	
4.	Types of winds, Wind data measurement	1	22-09-2026		TLM2	
5.	Tutorial	1	24-09-2026		TLM3	
6.	Bio-mass: Principles of bio-conversion	1	25-09-2026		TLM2	
7.	Anaerobic/aerobic digestion	1	26-09-2026		TLM2	
8.	Types of biogas digesters	1	28-09-2026		TLM2	

9.	Gas yield, Gasifiers	1	29-09-2026		TLM1
10.	Applications	1	01-10-2026		TLM2
11.	ABL	1	03-10-2026		TLM6
No. of classes required to complete UNIT-IV:11				No. of classes taken:	

UNIT-V :

GEOTHERMAL ENERGY, OCEAN ENERGY, FUEL CELLS

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.	Geothermal Energy: Origin, Applications	1	08-10-2026		TLM2	
2.	Types of Geothermal Resources, Geothermal power generation	1	09-10-2026		TLM2	
3.	Relative merits and demerits, Ocean Energy: Ocean Thermal energy	1	12-10-2026		TLM2	
4.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	13-10-2026		TLM2	
5.	Challenges and applications, Fuel Cells: Introduction, Applications	2	16-10-2026		TLM2	
6.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell	2	26-10-2026		TLM2	
7.	Alkaline fuel cell, PEM fuel cell,	2	29-10-2026		TLM2	
8.	MC fuel cell	1	30-10-2026		TLM1	
9.	ABL	1	31-10-2026		TLM6	
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	29-06-2026	22-08-2026	8
I MID Examinations	24-08-2026	29-08-2026	1
II Phase of Instructions	31-08-2026	17-10-2026	9
II MID Examinations	02-11-2026	07-11-2026	1

Preparation and Practicals	09-11-2026	14-11-2026	1
Semester End Examinations	16-11-2026	28-11-2026	2

PART-C
EVALUATION PROCESS (R23 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):

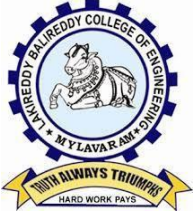
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching 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.
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PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the principles of thermal sciences to design and develop various thermal systems.
PSO 2	To apply the principles of manufacturing technology, scientific management towards improvement of quality and optimization of engineering systems in the design, analysis and manufacturability of products.
PSO 3	To apply the basic principles of mechanical engineering design for evaluation of performance of various systems relating to transmission of motion and power, conservation of energy and other process equipment.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr. K. Sai Babu	Dr. P.Vijaya Kumar	Dr. P.Vijaya Kumar	Dr. M B S Sreekar Reddy



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr. P. Narasimha Rao
Course Name & Code : User Interface Design Using Flutter Lab & 23IT53
L-T-P Structure : 1-0-2 **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/V/G **A.Y.:** 2026-27

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVE:

The objectives of the course is to

1. Learns to Implement Flutter Widgets and Layouts
2. Understands Responsive UI Design and with Navigation in Flutter
3. Knowledge on Widges and customize widgets for specific UI elements, Themes
4. Understand to include animation apart from fetching data

COURSE OUTCOMES (CO):

- CO1:** Apply Flutter and Dart fundamentals to design and develop interactive user interfaces. **(Apply-L3)**
CO2: Implement UI layouts, navigation, state management, and responsive design principles for mobile applications. **(Apply-L3)**
CO3: Integrate animations, API data fetching, form validation, and debugging techniques to enhance application performance and usability. **(Apply-L3)**
CO4: Improve individual / teamwork skills, communication & report writing skills with ethical value

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
C01	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
C02	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
C03	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
C04	2	2	2	3	2	-	1	-	-	1	-	2	1	2	2

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.	Basic Flutter Programs	02	04-07-2026		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	02	18-07-2026		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	02	25-07-2026		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	02	01-07-2026		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	02	22-08-2026		
6.	Practice Lab	02	29-08-2026		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	02	05-09-2026		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	02	19-09-2026		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	02	26-09-2026		
10.	a) Create a scrollable List Widget in Form & Add items to it. b) Implement the List View & Display the selected item in the prompt window.	02	03-10-2026		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	02	17-10-2026		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	02	24-10-2026		
13.	Internal Exam	02	31-10-2026		

PART - C

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART - D

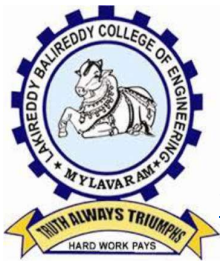
PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	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. P. Narasimha Rao	Mr. A. Koteswara Rao	Dr. Y. Vijaya Bhaskar Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs. K. Naga Rajeswari

Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS3)

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

Credits: 2

Program/Sem/Sec : B.Tech. – CSE/V/G

A.Y.: 2026-27

PREREQUISITE: Object oriented programming, Full stack development-I

COURSE EDUCATIONAL OBJECTIVES (CEOs): The objective of this course is to equip students with hands-on skills in developing full stack web applications using Java, Node.js, and React. It focuses on building backend services using JDBC, Servlets, and Express.js, along with frontend development using React.js. Students will learn to integrate databases like MySQL and MongoDB for real-time data handling. The course emphasizes applying MVC architecture, REST APIs, and deployment practices for complete web solutions.

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

C01	Apply JDBC and Servlet technologies to develop web applications that interact with relational databases. (Apply-L3)
C02	Apply the MVC architecture using JSP, Servlets, and JavaBeans to design structured and maintainable web applications. (Apply-L3)
C03	Apply Node.js and Express.js to create RESTful services and perform backend operations with MongoDB. (Apply-L3)
C04	Apply React.js to develop dynamic user interfaces and integrate them with backend APIs for full stack web solutions. (Apply-L4)

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	3		3							2	2	2	3
C02	3	2	3		3							2	3	3	2
C03	3	2	3		3							2	2	3	2
C04	3	2	3		3							2	2	3	2
	1 - Low			2 -Medium						3 - High					

REFERENCE BOOKS:

R1	"Head First Servlets and JSP" By: Bryan Basham, Kathy Sierra, Bert Bates Publisher: O'Reilly Media
R2	"Learning Node.js Development" By: Andrew Mead Publisher: Packt Publishing
R3	"MongoDB: The Definitive Guide" By: Kristina Chodorow Publisher: O'Reilly Media
R4	"Learning React: Modern Patterns for Developing React Apps" By: Alex Banks and Eve Porcello Publisher: O'Reilly Media

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.	FSD-II & JDBC Introduction	3	29-06-2026		DM5/ DM6	
2.	JDBC Programs	3	06-07-2026		DM5/ DM6	
3.	Servlet Programs	3	13-07-2026		DM5/ DM6	
4.	JSP Introduction	3	20-07-2026		DM5/ DM6	
5.	JSP MVC programs	6	27-07-2026 03-08-2026		DM5/ DM6	
6.	Node JS Introduction	3	10-08-2026		DM5/ DM6	
7.	Express JS Framework	3	17-08-2026		DM5/ DM6	
8.	Node JS & Express JS Programs	6	31-08-2026 7-09-2026		DM5/ DM6	
9.	MangoDB	3	14-09-2026		DM5/ DM6	
10.	MangoDB with Express JS	3	21-9-2026		DM5/ DM6	
11.	React JS	3	28-09-2026		DM5/ DM6	
12.	React JS and Full stack Integration	3	05-10-2026		DM5/ DM6	
13.	Web Application Development	6	12-10-2026		DM5/ DM6	
14.	Internal Test	3	26-10-2026		DM5/ DM6	

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

EVALUATION PROCESS (R23 Regulation):

Evaluation Task	Marks
Day to Day Work:	15
Internal Test	15
Continuous Internal Assessment	30
Procedure	20
Execution & Results	30
Viva-voce	20
Semester End Examination (SEE)	70
Total Marks = CIE + SEE	100

PART-D**PROGRAMME OUTCOMES (POs):**

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PROGRAMME SPECIFIC OUTCOMES (PSOs):

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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mrs. K. Naga Rajeswari	Dr. K DeviPriya	Dr. Y.V.B. Reddy	Dr. S. Nagarjuna Reddy
Signature				



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mr.T.N.V.S PRAVEEN

Course Name & Code : CYBER SECURITY LAB
23CSH6

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

Credits: 1.5

Program/Sem/Sec : B.Tech/CSE/V/A to G

A.Y.: 2026-27

PREREQUISITE: -Information Security

COURSE EDUCATIONAL OBJECTIVES(CEO):

The main objectives of the course is to

- Student to get the knowledge about audit and information security management, which makes the student to get the real world experience.
- To learn and implement Data leakage in a website database.

C01	Analyze and implement Audit security policy in windows environment, create a Demilitarized zone (Analyze-L4)
C02	Illustrate the Resource harvesting attack and mitigation, Window Patch management policy (Understand-L2)
C03	Apply knowledge of metasploit, Access control list creation and content filtering limiting the traffic (Apply - L3)
C04	Explain the Data leakage in a website database, Password policy and verification (Understand-L2)
C05	Build an Audit Policy management, Media handling policy and event log analysis (Create-L6)

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	3	3	2	3	1	-	-	1	1	-	1	3	3	2
C02	2	3	2	2	3	1	-	-	1	1	-	1	3	2	2
C03	3	3	3	2	3	1	-	-	1	1	-	1	3	3	3
C04	2	3	2	2	3	1	-	-	1	1	-	1	3	2	2
C05	3	3	3	3	3	1	-	-	1	1	1	1	3	3	3
	1 - Low			2 -Medium				3 - High							

TEXTBOOKS:

T1 NASSCOM: Security Analyst Student Hand Book Dec 2015

T2 Information Security Management Principles Updated Edition by David Alexander, Amanda Finch, David Sutton ,Published by BCS, June 2013.

REFERENCE BOOKS:

R1 cyber security fundamentals 2 nd edition, Published by ISACA, Cyber security, Network Security, Data Governance Security

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.	Exercise 1	3	03-07-2026		DM5	
2.	Exercise 2	3	10-07-2026		DM5	
3.	Exercise 3	3	17-07-2026		DM5	
4.	Exercise 4	3	24-07-2026		DM5	
5.	Exercise 5	3	31-07-2026		DM5	
6.	Exercise 6	3	07-08-2026		DM5	
7.	Exercise 7	3	14-08-2026		DM5	
8.	Exercise 8	3	21-08-2026		DM5	
9.	Exercise 9	3	11-09-2026		DM5	
10.	Exercise 10	3	18-09-2026		DM5	
11.	Exercise 11	3	25-09-2026		DM5	
12.	Exercise 12	3	09-11-2026		DM5	
13.	Exercise 13	3	16-11-2026		DM5	
14.	Exercise 14	3	30-11-2026		DM5	

PART-C

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-D

PROGRAMME OUTCOMES (POs):

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Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	Mr.T.N.V.S PRAVEEN	Mr.T.N.V.S PRAVEEN	Dr. D. Venkata Subbaiah	Dr .Nagarjuna Reddy
Signature				