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: 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/A-Sec **A.Y.:** 2025-26

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. (**Leevel-3**)
CO2	Understand data preprocessing techniques required to convert raw data into a suitable format for effective machine learning applications. (**Leevel-2**)
CO3	Apply classification techniques using different algorithms to solve real-world problems and evaluate their performance. (**Leevel-3**)
CO4	Apply Apriori and FP-Growth algorithms to analyze frequent patterns and uncover insights from large datasets. (**Leevel-3**)
CO5	Understand clustering concepts and various cluster analysis methods to group similar data points effectively. (**Leevel-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	PO1 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	3	01-06-25, 2-07-25& 03-07-25		TLM2	
2.	Data Warehouse Modeling: Data Cube and OLAP	2	04-07-25& 08-07-25		TLM2	
3.	Data Warehouse Design andUsage	2	09-07-25& 10-07-25		TLM2	
4.	Data Warehouse Implementation,	2	11-07-25& 15-07-25		TLM2	
5.	Cloud Data Warehouse	2	16-07-25& 17-07-25		TLM2	
6.	Data Miningand Patten Mining, Technologies, Applications, Major issues	2	18-07-25& 22-07-25		TLM2	
7.	Data Objects &Attribute Types	2	23-07-25& 24-07-25		TLM2	
8.	Basic Statistical Descriptions of Data	2	25-07-25& 29-07-25			
9.	Data Visualization,Measuring Data Similarity and Dissimilarity.	2	30-07-25& 31-07-25		TLM2	
No. of classes required to complete UNIT-I: 19				**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	1-08-25&		TLM2	

			05-08-25			
11.	Data Cleaning	3	6-8-25,7-08-25 & 08-08-25		TLM2	
12.	Data Integration	2	12-08-25& 13-08-25		TLM2	
13.	Data Reduction	2	14-08-25& 19-08-25		TLM2	
14.	Data Transformation and Data Discretization.	3	20-8-25, 21-08-25&22-08-25		TLM2	
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
15.	Classification: Basic Concepts,	1	02-09-2025		TLM1	
16.	General Approach to solving a classification problem	1	03-09-2025		TLM1	
17.	Decision Tree Induction: Attribute Selection Measures,	1	04-09-2025		TLM1	
18.	Tree Pruning	1	05-09-2025		TLM1	
19.	Scalability and Decision Tree Induction	1	09-09-2025		TLM1	
20.	Visual Mining for Decision Tree Induction	1	10-09-2025		TLM1	
21.	Bayesian Classification Methods: Bayes Theorem	1	11-09-2025		TLM1	
22.	Naïve Bayes Classification	1	12-09-2025		TLM1	
23.	Rule-Based Classification	1	16-09-2025		TLM1	
24.	Model Evaluation and Selection	2	17-09-2025&18-09-2025		TLM1	
No. of classes required to complete UNIT-III: 11						

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
25.	Problem Definition,	1	19-09-2025		TLM1	
26.	Frequent Item set Generation	2	23-09-2025 & 24-09-2025		TLM1	
27.	Rule Generation: Confident Based Pruning	1	25-09-2025		TLM1	

28.	Rule Generation in Apriori Algorithm	2	26-09-2025&07-10-2025		TLM1	
29.	Compact Representation of frequent item sets	2	08-10-2025& 09-10-2025		TLM1	
30.	FP-Growth Algorithm	2	10-10-2025 & 14-10-2025		TLM1	
No. of classes required to complete UNIT-IV: 10				**No. of classes taken:**		

UNIT-V: Cluster Analysis:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
31.	Overview	1	15-10-2025		TLM2	
32.	Basics and Importance of Cluster Analysis	1	16-10-2025		TLM2	
33.	Clustering techniques	1	17-10-2025		TLM2	
34.	Different Types of Clusters	1	22-10-2025		TLM2	
35.	K-means: The Basic K-means Algorithm	1	23-10-2025		TLM2	
36.	K-means Additional Issues	1	24-10-2025		TLM2	
37.	Bi-secting K Means	1	28-10-2025		TLM2	
38.	Agglomerative Hierarchical Clustering	1	29-10-2025		TLM2	
39.	DBSCAN: Traditional Density Center-Based Approach	1	30-10-2025		TLM2	
40.	DBSCAN Algorithm, Strengths and Weaknesses	1	31-10-2025		TLM2	
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

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				

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr CH V NARAYANA
Course Name & Code **:** COMPUTER NETWORKS & **23CS07**

L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/CSE/V /A **A.Y.:** 2025-26

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 Networksm, 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	30-06-2025		TLM2	
2.	Network Types: LAN, MAN, WAN	1	02-07-2025		TLM2	
3.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid	1	03-07-2025		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer	1	04-07-2025		TLM1	
5.	TCP/IP Reference Model – Layers, Function, Protocols	1	07-07-2025		TLM1	
6.	Comparison: OSI vs TCP/IP	2	09-07-2025 10-07-2025		TLM1	
7.	Introduction to Physical Layer	2	11-07-2025 14-07-2025		TLM1	
8.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	2	16-07-2025 17-07-2025		TLM1	
9.	Unguided Media: Radio, Microwave, Infrared	2	18-07-2025 21-07-2025		TLM1	
10.	Recap + Quiz + Discussion	1	23-07-2025		TLM1	
11.	tutorial	1	24-07-2025		TLM1	
No. of classes required to complete UNIT-I: 15				**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	25-07-2025		TLM1	
13.	Flow Control: Stop-and-wait, Sliding Window	1	28-07-2025		TLM1	
14.	Error Control: Types of Errors, Detection & Correction	2	30-07-2025 31-07-2025		TLM1	
15.	CRC and Checksum (One's complement, Internet checksum)	2	01-08-2025 04-08-2025		TLM1	
16.	Services to Network Layer	2	06-08-2025 07-08-2025		TLM1	
17.	Elementary Protocols: Simplex, Stop-and-Wait	1	08-08-2025		TLM1	
18.	Protocols for Noisy Channels	1	11-08-2025		TLM1	
19.	Sliding Window Protocols: Go-back-N, Selective Repeat	1	13-08-2025		TLM1	
20.	Summary and Protocol Comparison	1	14-08-2025		TLM1	

21.	Recap + Hands-on Simulation + Quiz	1	18-08-2025		TLM1	
22.	tutorial	1	20-08-2025		TLM1	
No. of classes required to complete UNIT-II: 14				**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	21-08-2025		TLM1	
24.	CSMA/CD & CSMA/CA	1	22-08-2025		TLM1	
25.	Channelization Techniques: FDMA, TDMA, CDMA	1	01-09-2025		TLM1	
26.	Wired LANs: Introduction to Ethernet	1	03-09-2025		TLM1	
27.	Standard Ethernet – Frame Structure	1	04-09-2025		TLM1	
28.	Fast Ethernet – Features, Standards	1	05-09-2025		TLM1	
29.	Gigabit Ethernet and 10 Gigabit Ethernet	1	08-09-2025		TLM1	
30.	Ethernet Summary + Comparison Table	1	13-09-2025		TLM1	
31.	Practice: Frame design and decoding	1	10-09-2025		TLM1	
32.	Recap + tutorial	1	11-09-2025		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	12-09-2025		TLM1	
34.	Connectionless vs Connection-Oriented Services	1	15-09-2025		TLM1	
35.	Datagram vs Virtual Circuit Networks	1	17-09-2025		TLM1	
36.	Routing Algorithms: Optimality, Shortest Path, Flooding	2	18-09-2025 19-09-2025		TLM1	
37.	Distance Vector and Link State Routing	2	22-09-2025 24-09-2025		TLM1	
38.	Congestion Control: Principles, Algorithms	1	25-09-2025		TLM1	
39.	Traffic Control: Leaky Bucket, Token Bucket	1	26-09-2025		TLM1	
40.	Internetworking: IPv4, IPv6	2	29-09-2025 01-10-2025		TLM1	
41.	Recap + tutorial	1	03-10-2025		TLM1	
No. of classes required to complete UNIT-IV: 12				**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	06-10-2025		TLM1	
43.	UDP – Format, Features, Applications	2	08-10-2025 09-10-2025		TLM1	
44.	TCP – Services, Connection Establishment, Segments	1	10-10-2025		TLM1	
45.	TCP Features – Flow, Error, Congestion Control	1	13-10-2025		TLM1	
46.	Application Layer: Introduction to WWW & HTTP	1	15-10-2025		TLM1	
47.	Email Architecture: SMTP, POP3, IMAP	1	16-10-2025		TLM1	
48.	Email Security, Web-based Mail	1	17-10-2025		TLM1	
49.	TELNET – Remote Access	1	20-10-2025		TLM1	
50.	DNS – Hierarchy, Resolution Process	2	22-10-2025 23-10-2025		TLM2	
51.	Recap + Assessment	2	24-10-2025		TLM2	
52.	tutorial		27-10-2025		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	29-10-2025 30-10-2025 31-10-2025					
No. of classes		3			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.
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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.
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.
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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 CH V NARAYANA**	**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: Mrs Swathi Buragadda
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.:** 2025-26

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. 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	30-06-2025		TLM2	
2.	Need of Automata theory, Central Concepts of Automata Theory	1	01-07-2025		TLM2	
3.	Finite Automata, Transition Systems	1	03-07-2025		TLM1	
4.	Acceptance of a String, DFA, Design of DFAs,	1	04-07-2025		TLM1	
5.	NFA, Design of NFA	1	07-07-2025		TLM1	
6.	Equivalence of DFA and NFA	2	08-07-2025 10-07-2025		TLM1	
7.	Conversion of NFA into DFA	2	11-07-2025 14-07-2025		TLM1	
8.	Finite Automata with Є Transitions	2	15-07-2025 17-07-2025		TLM1	
9.	Minimization of Finite Automata	2	18-07-2025 21-07-2025		TLM1	
10.	Finite Automata with output-Mealy and Moore Machines	1	22-07-2025		TLM1	
11.	Applications and Limitation of Finite Automata	1	24-07-2025		TLM1	
No. of classes required to complete UNIT-I: 15				**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	25-07-2025		TLM1	
13.	Regular Sets, Identity Rules	1	28-07-2025		TLM1	
14.	Equivalence of two RE	2	29-07-2025 31-07-2025		TLM1	
15.	Manipulations of REs, Finite Automata and Regular Expressions	2	01-08-2025 04-08-2025		TLM1	
16.	Inter Conversion, Equivalence between FA and RE	2	05-08-2025 07-08-2025		TLM1	
17.	Pumping Lemma of Regular Sets	2	08-08-2025 11-08-2025		TLM1	
18.	Closure Properties of Regular Sets, Grammars	1	12-08-2025		TLM1	
19.	Classification of Grammars	1	14-08-2025		TLM1	
20.	Chomsky Hierarchy	1	18-08-2025		TLM1	
21.	Right and Left Linear Regular Grammars,	1	19-08-2025		TLM1	
22.	Equivalence between RG and FA, Inter Conversion.	2	21-08-2025 22-08-2025		TLM1	

No. of classes required to complete UNIT-II: 16	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
23.	Context Free Grammar, Leftmost and Rightmost Derivations	1	01-09-2025		TLM1	
24.	Parse Trees,	1	02-09-2025		TLM1	
25.	Ambiguous Grammars	1	04-09-2025		TLM1	
26.	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	05-09-2025		TLM1	
27.	€- Productions	1	08-09-2025		TLM1	
28.	Unit Productions	1	09-09-2025		TLM1	
29.	Normal Forms-Chomsky Normal Form	1	11-09-2025		TLM1	
30.	Greibach Normal Form	1	12-09-2025		TLM1	
31.	Pumping Lemma,	1	15-09-2025		TLM1	
32.	Closure Properties, Applications of Context Free Grammars.	1	16-09-2025		TLM1	
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
33.	Pushdown Automata, Definition, Model, Graphical Notation	1	18-09-2025		TLM1	
34.	Instantaneous Description	1	19-09-2025		TLM1	
35.	Language Acceptance of Pushdown Automata	1	16-09-2025		TLM1	
36.	Design of Pushdown Automata	2	22-09-2025 23-09-2025		TLM1	
37.	Deterministic and Non – Deterministic Pushdown Automata	2	25-09-2025 26-09-2025		TLM1	
38.	Equivalence of Pushdown Automata and Context Free Grammar	1	03-10-2025		TLM1	
39.	Conversion	1	06-10-2025		TLM1	
40.	Two Stack Pushdown Automata	2	07-10-2025 09-10-2025		TLM1	
41.	Application of Pushdown Automata	1	10-10-2025		TLM1	
No. of classes required to complete UNIT-IV: 12				**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
42.	Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions	1	13-10-2025		TLM1	
43.	Transition Tables and Transition Diagrams	2	14-10-2025 16-10-2025		TLM1	
44.	Language of a TM, Design of TMs	1	17-10-2025		TLM1	
45.	Types of TMs, Church's Thesis,	1	20-10-2025		TLM1	
46.	Universal and Restricted TM	1	23-10-2025		TLM1	
47.	Decidable and Un-decidable Problems,	1	24-10-2025		TLM1	
48.	Halting Problem of TMs	1	27-10-2025		TLM1	
49.	Post's Correspondence Problem	1	28-10-2025		TLM1	
50.	Modified PCP	1	30-10-2025		TLM2	
51.	Classes of P and NP	1	31-10-2025		TLM2	
52.	NP-Hard and NP-Complete Problems				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.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2025					
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	**Mrs B.Swathi**	**Dr. D.Veeraiah**	**Dr. D. Venkata Subbaiah**	**Dr .Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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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.N.V.Maha Lakshmi
Course Name & Code **:** Artificial Intelligence & 23AD02
L-T-P Structure **:3-0-0** **Credits:** 3
Program/Sem/Sec :BTECH/V/A **A.Y.:** 2025-26

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,"Artifical 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	30-06-2025		TLM1	
2.	Basics of AI	1	01-07-2025		TLM1	
3.	foundation of AI and history of AI	1	02-07-2025		TLM1	
4.	intelligent agents: Agents and Environments,	1	04-07-2025		TLM1	
5.	the concept of rationality,	1	07-07-2025		TLM2	
6.	the nature of environments	1	08-07-2025		TLM2	
7.	structure of agents,	1	09-07-2025		TLM2	
8.	problem solving agents	1	11-07-2025		TLM2	
9.	problem formulation.	1	14-07-2025		TLM2	
10.	Revision	1	15-07-2025			
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	16-07-2025		TLM2	
12.	Breadth first search	1	18-07-2025		TLM2	
13.	Breadth first search	1	21-07-2025		TLM2	
14.	depth first Search.	1	22-07-2025		TLM2	
15.	Search with partial information (Heuristic search) Hill climbing	1	23-07-2025		TLM2	
16.	Search with partial information (Heuristic search) Hill climbing	1	25-07-2025		TLM2	
17.	A* Algorithm	1	28-07-2025		TLM2	
18.	A* Algorithm	1	29-07-2025		TLM2	
19.	AO* Algorithm	1	30-07-2025		TLM2	
20.	AO* Algorithm	1	01-08-2025		TLM2	
21.	Problem reduction, Game Playing-Adversial search	1	04-08-2025		TLM2	
22.	Problem reduction, Game Playing-Adversial search, Games,	1	05-08-2025		TLM2	
23.	mini-max algorithm,	1	06-08-2025		TLM2	
24.	optimal decisions in multiplayer games	1	08-08-2025		TLM2	
25.	Problem in Game playing	1	11-08-2025		TLM2	
26.	Alpha-Beta pruning	1	12-08-2025		TLM2	
27.	Evaluation functions.	1	13-08-2025		TLM2	
28.	Revision	1	18-08-2025			
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	19-08-2025		TLM2	
30.	predicate logic- logic programming	1	20-08-2025		TLM2	
31.	semantic nets- frames and inheritance	1	22-08-2025		TLM2	
32.	constraint propagation	1	01-09-2025		TLM2	
33.	representing knowledge using rules,	1	02-09-2025		TLM2	
34.	rules based deduction systems. Reasoning under uncertainty,	1	03-09-2025		TLM2	
35.	review of probability, Bayes' probabilistic interference	1	05-09-2025		TLM2	
36.	dempstershafer theory	1	08-09-2025		TLM2	
37.	Revision	1	09-09-2025			
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
38.	Logic concepts: First order logic.	1	10-09-2025		TLM2	
39.	First order logic	1	12-09-2025		TLM2	
40.	Inference in first order logic,	1	15-09-2025		TLM2	
41.	propositional vs. first order inference,	1	16-09-2025		TLM2	
42.	unification & lifts forward chaining	1	17-09-2025		TLM2	
43.	Backward chaining	1	19-09-2025		TLM2	
44.	Resolution	1	22-09-2025		TLM2	
45.	Learning from observation	1	23-09-2025		TLM2	
46.	Inductive learning,	1	24-09-2025		TLM2	
47.	Decision trees,	1	26-09-2025		TLM2	
48.	Decision trees,	1	06-10-2025		TLM2	
49.	Explanation based learning	1	07-10-2025		TLM2	
50.	Statistical Learning methods	1	08-10-2025		TLM2	
51.	Reinforcement Learning	1	10-10-2025		TLM2	
52.	Revision	1	13-10-2025			
No. of classes required to complete UNIT-IV: 15				**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
53.	Expert Systems: Architecture of expert systems,	1	14-10-2025		TLM2	
54.	Roles of expert systems	1	15-10-2025		TLM2	
55.	Knowledge Acquisition Meta knowledge Heuristics.	1	17-10-2025		TLM2	
56.	Knowledge Acquisition Meta knowledge Heuristics.	1	20-10-2025		TLM2	
57.	Typical expert systems – MYCIN	1	22-10-2025		TLM2	

58.	DART	1	24-10-2025		TLM2	
59.	XCON	1	27-10-2025		TLM2	
60.	Expert systems shells.	1	28-10-2025		TLM2	
61.	Revision	1	29-10-2025			
62.	Revision	1	31-10-2025			
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

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 engineer**ing 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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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 A/S	**A.Y.:** 2025-26

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	02-07-2025		TLM2	
2.	Role and potential of new and renewable sources	1	04-07-2025		TLM2	
3.	The solar energy option, Environmental impact of solar power	1	05-07-2025		TLM2	
4.	Structure of the Sun, The solar constant	1	09-07-2025		TLM2	
5.	Sun-earth relationships	1	11-07-2025		TLM2	
6.	Coordinate systems and coordinates of the sun	1	16-07-2025		TLM2	
7.	Extraterrestrial and terrestrial solar radiation	1	18-07-2025		TLM2	
8.	Solar radiation on tilted surface	1	19-07-2025		TLM2	
9.	Instruments for measuring solar radiation and sun shine, Solar radiation data	1	23-07-2025		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, Packing Density	1	24-07-2025		TLM2	
2.	Interconnenctions, Mismatch and temperature effects	1	26-07-2025		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules, Degradation and failure	1	30-07-2025		TLM2	
4.	PV module parameters, Efficiency of PV Systems	1	01-08-2025		TLM2	
5.	Solar PV Systems	1	02-08-2025		TLM2	
6.	Battery Operation, Types of Batteries, Battery parameters, Applications, Selection of batteries for Solar PV System	1	06-08-2025		TLM2	
No. of classes required to complete UNIT-II: 06				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	08-08-2025		TLM2	
2.	Classification of concentrating collectors	1	13-08-2025		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	14-08-2025		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	16-08-2025		TLM2	
5.	Solar Applications-solar heating cooling technique	1	20-08-2025		TLM2	
6.	Solar distillation and drying	1	21-08-2025		TLM2	
7.	Solar cookers	1	22-08-2025		TLM2	
8.	Central power tower concept	1	23-08-2025		TLM2	
9.	Solar chimney	1	03-09-2025		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	1	05-09-2025		TLM2	
2.	Horizontal and Vertical axis wind mill	1	06-09-2025		TLM2	
3.	Performance characteristics	1	10-09-2025		TLM2	
4.	Betz criteria	1	12-09-2025		TLM2	
5.	Types of winds	1	17-09-2025		TLM2	
6.	Wind data measurement	1	19-09-2025		TLM2	
7.	Bio-mass: Principles of bio-conversion	1	20-09-2025		TLM2	
8.	Anaerobic/aerobic digestion	1	24-09-2025		TLM2	
9.	Types of biogas digesters	1	26-09-2025		TLM2	
10.	Gas yield, Gasifiers	1	27-09-2025		TLM2	
11.	Applications	1	30-09-2025		TLM2	
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	01-10-2025		TLM2	
2.	Types of Geothermal Resources	1	03-10-2025		TLM2	
3.	Geothermal power generation	2	08-10-2025		TLM2	
4.	Relative merits and demerits	1	10-10-2025		TLM2	
5.	Ocean Energy: Ocean Thermal energy	1	15-10-2025		TLM2	
6.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	17-10-2025		TLM2	
7.	Challenges and applications, Fuel Cells: Introduction, Applications	2	22-10-2025		TLM2	
8.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell	2	24-10-2025		TLM2	
9.	Alkaline fuel cell	1	25-10-2025		TLM2	
10.	PEM fuel cell	1	29-10-2025		TLM2	
11.	MC fuel cell	1	30-10-2025		TLM2	
No. of classes required to complete UNIT-V: 14				No. of classes taken:		

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

Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	30-06-2025	23-08-2025	8
I MID Examinations	25-08-2025	30-08-2025	1
II Phase of Instructions	01-09-2025	01-11-2025	9
II MID Examinations	03-11-2025	08-11-2025	1
Preparation and Practicals	10-11-2025	15-11-2025	1
Semester End Examinations	17-11-2025	25-11-2025	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.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the 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.Vijay Kumar	Dr. P.Vijay Kumar	Dr. M B S Sreekar Reddy

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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 MINING LAB-23AD55
L-T-P Structure :0-0-3 **Credits:1.5**
Program/Sem/Sec : B.Tech. – CSE-V/A **A.Y.:**2025-26

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	30-06-2025		**DM5**	
2.	Data preprocessing tasks using python libraries – Loading, Dealing with Missing Data	3	7-07-2025		**DM5**	
3.	Data preprocessing tasks using python libraries – Dealing with Categorical Data, Scaling data, Splitting data	3	14-07-2025		**DM5**	
4.	Practice Session	3	21-07-2025		**DM5**	
5.	Similarity and Dissimilarity Measures using python	3	28-07-2025		**DM5**	
6.	Build a model using linear regression algorithm on any dataset.	3	4-08-2025		**DM5**	
7.	Build a classification model using Decision Tree algorithm on iris dataset	3	11-08-2025		**DM5**	
8.	Apply Naïve Bayes Classification algorithm on any dataset	3	18-08-2025		**DM5**	
9.	Lab Cycle-4	3	01-09-2025		**DM5**	
10.	Generate frequent item sets using Apriori Algorithm in python	3	8-09-2025		**DM5**	
11.	Generate association rules for any market basket data.	3	15-09-2025		**DM5**	
12.	Apply K- Means clustering algorithm on any dataset.	3	22-09-2025		**DM5**	
13.	Apply Hierarchical Clustering algorithm on any dataset	3	29-09-2025		**DM5**	
14.	Apply DBSCAN clustering algorithm on any dataset.	3	6-10-2025		**DM5**	
15.	Apply DBSCAN clustering algorithm on any dataset.	3	13-10-2025		**DM5**	
16.	Practice Session	3	20-10-2025		**DM5**	

17.	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.
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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 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 CH V NARAYANA
Course Name & Code : COMPUTER NETWORKS LAB & **23CS58**
L-T-P Structure : **1-0-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/A **A.Y.:** 2025-26

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	03-07-2025		
2.	Write a Program to implement the data link layer farming methods such as i) Character stuffing ii) bit stuffing.	03	10-07-2025		
3.	Write a Program to implement data link layer farming method checksum.	03	17-07-2025		
4.	Write a program for Hamming Code generation for error detection and correction.	03	24-07-2025		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	31-07-2025		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	07-08-2025		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	14-08-2025		
8.	Write a Program to implement Stop and Wait Protocol.	03	21-08-2025		
9.	Write a program for congestion control using leaky bucket algorithm	03	04-09-2025		
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	11-09-2025		
11.	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.	06	18-09-2025 25-09-2025		
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.	06	9-10-2025 16-10-2025		
	review	03	23-10-2025		
	Internal exam		30-10-2025		

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.
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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.
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 oforganization.
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 CH V NARAYANA**	**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 (23CSS3)
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech. – CSE/V/A **A.Y.:** 2025-26

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	01-07-2025		DM5/ DM6	
2.	JDBC Programs	3	8-07-2025		DM5/ DM6	
3.	Servlet Programs	3	15-07-2025		DM5/ DM6	
4.	JSP Introduction	3	22-07-2025		DM5/ DM6	
5.	JSP MVC programs	6	29-07-2025 05-08-2025		DM5/ DM6	
6.	Node JS Introduction	3	12-08-2025		DM5/ DM6	
7.	Express JS Framework	3	19-08-2025		DM5/ DM6	
8.	Node JS & Express JS Programs	6	2-09-2025 9-09-2025		DM5/ DM6	
9.	MangoDB	3	16-09-2025		DM5/ DM6	
10.	MangoDB with Express JS	3	23-9-2025		DM5/ DM6	
11.	React JS	3	07-10-2025		DM5/ DM6	
12.	React JS and Full stack Integration	3	14-10-2025		DM5/ DM6	
13.	Web Application Development	6	14-10-2025		DM5/ DM6	
14.	Internal Test	3	28-10-2025		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.
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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	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	Mr. N. SrinivasaRao	Dr. Y.V.B. Reddy	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: Dr. J.Nageswara 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/III/A **A.Y.:** 2025-26

PREREQUISITE: Computer Programming Lab

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 : Implement basic concepts of the java programming language. **(Apply-L3)**
CO2 : Implement object-oriented programming concepts and exception handling**(Apply-L3)**
CO3 : Design multithreaded, database and GUI based applications. **(Apply-L3)**
CO4 : Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply-L3)**
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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	02-07-2025		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	03	09-07-2025		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	03	16-07-2025		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	03	23-07-2025		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	03	30-07-2025		
6.	Practice Lab	03	06-08-2025		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	03	13-08-2025		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	03	20-08-2025		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	03	03-09-2025		
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	10-09-2025		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	03	24-09-2025		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	03	15-10-2025		
13.	Internal Exam	03	04-10-2025		

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 oforganization.
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Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr. J.Nageswara Rao**	**Dr. B. Siva Rama Krishna**	**Dr. B. Siva Rama Krishna**	**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** **Credits:** 3
Program/Sem/Sec :BTECH/V/B **A.Y.:** 2025-26

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,"Artifical 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	30-06-2025		TLM1	
2.	Basics of AI	1	01-07-2025		TLM1	
3.	foundation of AI and history of AI	1	02-07-2025		TLM1	
4.	intelligent agents: Agents and Environments,	1	05-07-2025		TLM1	
5.	the concept of rationality,	1	07-07-2025		TLM2	
6.	the nature of environments	1	08-07-2025		TLM2	
7.	structure of agents,	1	09-07-2025		TLM2	
8.	problem solving agents	1	14-07-2025		TLM2	
9.	problem formulation.	1	15-07-2025		TLM2	
10.	Revision	1	16-07-2025			
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	19-07-2025		TLM2	
12.	Breadth first search	1	21-07-2025		TLM2	
13.	Breadth first search	1	22-07-2025		TLM2	
14.	depth first Search.	1	23-07-2025		TLM2	
15.	Search with partial information (Heuristic search) Hill climbing	1	28-07-2025		TLM2	
16.	Search with partial information (Heuristic search) Hill climbing	1	29-07-2025		TLM2	
17.	A* Algorithm	1	30-07-2025		TLM2	
18.	A* Algorithm	1	02-08-2025		TLM2	
19.	AO* Algorithm	1	04-08-2025		TLM2	
20.	AO* Algorithm	1	05-08-2025		TLM2	
21.	Problem reduction, Game Playing- Adversial search	1	06-08-2025		TLM2	
22.	Problem reduction, Game Playing- Adversial search, Games,	1	11-08-2025		TLM2	
23.	mini-max algorithm,	1	12-08-2025		TLM2	
24.	optimal decisions in multiplayer games	1	13-08-2025		TLM2	
25.	Problem in Game playing	1	18-08-2025		TLM2	
26.	Alpha-Beta pruning	1	19-08-2025		TLM2	
27.	Evaluation functions.	1	20-08-2025		TLM2	
28.	Revision	1	23-08-2025			
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	01-09-2025		TLM2	
30.	predicate logic- logic programming	1	02-09-2025		TLM2	
31.	semantic nets- frames and inheritance	1	03-09-2025		TLM2	
32.	constraint propagation	1	06-09-2025		TLM2	
33.	representing knowledge using rules,	1	08-09-2025		TLM2	
34.	rules based deduction systems. Reasoning under uncertainty,	1	09-09-2025		TLM2	
35.	review of probability, Bayes' probabilistic interference	1	10-09-2025		TLM2	
36.	dempstershafer theory	1	13-09-2025		TLM2	
37.	Revision	1	15-09-2025			
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
38.	Logic concepts: First order logic.	1	16-09-2025		TLM2	
39.	First order logic	1	17-09-2025		TLM2	
40.	Inference in first order logic,	1	20-09-2025		TLM2	
41.	propositional vs. first order inference,	1	22-09-2025		TLM2	
42.	unification & lifts forward chaining	1	23-09-2025		TLM2	
43.	Backward chaining	1	24-09-2025		TLM2	
44.	Resolution	1	27-09-2025		TLM2	
45.	Learning from observation	1	06-10-2025		TLM2	
46.	Inductive learning,	1	07-10-2025		TLM2	
47.	Decision trees,	1	08-10-2025		TLM2	
48.	Decision trees,	1	11-10-2025		TLM2	
49.	Explanation based learning	1	13-10-2025		TLM2	
50.	Statistical Learning methods	1	14-10-2025		TLM2	
51.	Reinforcement Learning	1	15-10-2025		TLM2	
52.	Revision	1	18-10-2025			
No. of classes required to complete UNIT-IV: 15				**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
53.	Expert Systems: Architecture of expert systems,	1	20-10-2025		TLM2	
54.	Roles of expert systems	1	22-10-2025		TLM2	
55.	Knowledge Acquisition Meta knowledge Heuristics.	1	25-10-2025		TLM2	
56.	Knowledge Acquisition Meta knowledge Heuristics.	1	27-10-2025		TLM2	
57.	Typical expert systems – MYCIN	1	28-10-2025		TLM2	

58.	DART	1	29-10-2025		TLM2	
59.	XCON	1	31-10-2025		TLM2	
60.	Expert systems shells.	1	01-11-2025		TLM2	
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

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):

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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 COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PROGRAM	**: B. TECH-CSE**-V-Sem - B Sec
ACADEMIC YEAR	**:** 2025-26
COURSE NAME & CODE	**: COMPUTER NETWORKS & 23CS07**
L-T-P STRUCTURE	**:** 3-0-0
COURSE CREDITS	**:** 3
COURSE INSTRUCTOR	**: Mr. P. Nagababu**
COURSE COORDINATOR	**: Dr.B. Sivaramakrishna**

1. Pre-requisites: Foundational understanding of basic computer concepts.

2. Course Educational Objectives (CEOs):

- 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 layer's in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

3. 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)**

4. 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	-	-	-	-	-	-	-	-	-	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**	-

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

SYLLABUS

UNIT I:

Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP.
Physical Layer -Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and introduction about unguided media.

UNIT II:

Data link layer: Design issues, Framing: fixed size framing, variable size framing, flow Control,error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer,
Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, go back N, Selective Repeat-Stop and wait protocol, Data
link layer in HDLC, Point to point protocol (PPP)

UNIT III:

Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA). Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet (100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

UNIT IV:

The Network Layer Design Issues Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality Principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control Algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.
Internet Working: How networks differ- How networks can be connected- Tunneling, internetwork routing-, Fragmentation, network layer in the internet IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, Subnets-IP Version 6- The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6.

UNIT V:

The Transport Layer: Transport layer protocols: Introduction-services- port Number-User data gram Protocol-User datagram-UDP services-UDP Applications-Transmission control protocol: TCP services-TCP features- Segment- A TCP connection- windows in TCP- flow Control-Error control, Congestion control in TCP.
Application Layer - World Wide Web: HTTP, Electronic Mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System.

TEXT BOOKS:

T1	Computer Networksm, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
T2	Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

REFERENCE BOOKS:

R1	Data Communications and Networks- Achut S Godbole, AtulKahate
R2	Computer Networks, Mayank Dave, CENGAGE

Course Delivery Plan

UNIT-I: Introduction to Computer Networks

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
1.	Introduction-Network Types	01	30-06-2025		TLM1	CO1	
2.	LAN, MAN, WAN	01	01-07-2025		TLM1	CO1	
3.	Network Topologies Reference models	01	03-07-2025		TLM1	CO1	
4.	The OSI Reference Mode	01	05-07-2025		TLM1	CO1	
5.	the TCP/IP Reference Mode	01	07-07-2025		TLM1	CO1	
6.	A Comparison of the OSI and TCP/IP Reference Models	01	08-07-2025		TLM1	CO1	
7.	OSI Vs TCP/IP.	01	10-07-2025		TLM1	CO1	
8.	Physical Layer - Introduction to Guided Media	01	12-07-2025		TLM1	CO1	
9.	Twisted-pair cable, Coaxial cable	01	14-07-2025		TLM1	CO1	
10.	Fiber optic cable and introduction about unguided media.	01	15-07-2025		TLM1	CO1	
	No. of classes required to complete UNIT-I	**10**			**No. of classes taken:**		

UNIT-II: Data link layer, Framing.

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
11.	Data link layer: Design issues	1	17-07-2025		TLM1	CO2	
12.	Framing: fixed size framing, variable size framing	1	19-07-2025		TLM1	CO2	

13.	flow Control ,error control, error detection and correction codes.	1	21-07-2025		TLM1	CO2	
14.	CRC, Checksum: idea	1	22-07-2025		TLM1	CO2	
15.	one's complement internet checksum, services provided to Network Layer	1	24-07-2025		TLM1	CO2	
16.	Elementary Data Link Layer protocols: simplex protocol	1	28-07-2025		TLM1	CO2	
17.	Simplex stop and wait, Simplex protocol for Noisy Channel.	2	29-07-2025 & 31-07-2025		TLM1	CO2	
18.	Sliding window protocol: One bit, Go back N	2	02-08-2025 & 04-08-2025			CO2	
19.	selective repeat-Stop and wait protocol, Data link layer in HDLC, Point to point protocol (PPP)	2	05-08-2025 & 07-08-2025			CO2	
	No. of classes required to complete UNIT-II	**11**			**No. of classes taken:**		

UNIT-III: Media Access Control

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
20.	Random Access: ALOHA	1	09-08-2025		TLM1	CO3	
21.	Carrier sense multiple access (CSMA), CSMA with Collision Detection	1	11-08-2025		TLM1	CO3	
22.	CSMA with Collision Avoidance	1	12-08-2025		TLM1	CO3	
23.	Controlled Access: Reservation, Polling, Token Passing,	1	14-08-2025		TLM1	CO3	
24.	Channelization: frequency division multiple Access(FDMA)	1	18-08-2025		TLM1	CO3	
25.	time division multiple	1	19-08-2025		TLM1	CO3	

	access(TDMA), code division multiple access(CDMA)						
26.	Wired LANs: Ethernet, Ethernet Protocol,	2	21-08-2025 & 23-08-2025		TLM1	CO3	
27.	Standard Ethernet, Fast Ethernet(100 Mbps)	1	01-09-2025		TLM1	CO3	
28.	Gigabit Ethernet	1	02-09-2025		TLM1	CO3	
29.	10 Gigabit Ethernet	1	04-09-2025		TLM1	CO3	
	No. of classes required to complete UNIT-III	**12**			**No. of classes taken:**		

UNIT-IV: The Network Layer Design Issues

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
30.	Store and Forward Packet Switching	1	06-09-2025		TLM1	CO4	
31.	Services Provided to the Transport layer, Implementation of Connectionless Service	1	08-09-2025		TLM1	CO4	
32.	Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks	2	09-09-2025 & 11-09-2025		TLM1	CO4	
33.	Routing Algorithms-The Optimality principle-Shortest path	1	13-09-2025		TLM1	CO4	
34.	Flooding, Distance vector, Link state, Hierarchical	1	15-09-2025		TLM1	CO4	
35.	Congestion Control algorithms-General principles of congestion control	1	16-09-2025		TLM1	CO4	
36.	Congestion prevention polices, Approaches to Congestion Control	1	18-09-2025		TLM1	CO4	
37.	Traffic Aware Routing- Admission	1	20-09-2025		TLM1	CO4	

	Control-Traffic Throttling						
38.	Load Shedding. Traffic Control Algorithm	1	22-09-2025		TLM1	CO4	
39.	Leaky bucket & Token bucket.	1	23-09-2025		TLM1	CO4	
40.	Internet Working: How networks differ- How networks can be connected	1	25-09-2025		TLM1	CO4	
41.	Tunneling, internetwork routing-, Fragmentation, network layer in the internet	2	27-09-2025 & 29-09-2025		TLM1	CO4	
42.	IP protocols-IP Version 4 protocol-IPV4 Header Forma	1	04-10-2025		TLM1	CO4	
43.	IP addresses, Class full Addressing, CIDR, Subnets	1	06-10-2025		TLM1	CO4	
44.	IP Version 6- The main IPV6 header	1	07-10-2025		TLM1	CO4	
45.	Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6	1	09-10-2025		TLM1	CO4	
	No. of classes required to complete UNIT-IV	**18**			**No. of classes taken:**		

UNIT-V: The Transport Layer

S.No	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	Learning Outcome COs	HOD Sign Weekly
46.	Transport layer protocols: Introduction- services- port number	1	11-10-2025		TLM1	CO5	
47.	User data gram protocol-User datagram-UDP services-	1	13-10-2025		TLM1	CO5	
48.	UDP Applications- Transmission control protocol:	1	14-10-2025		TLM1	CO5	

	TCP services						
49.	TCP features- Segment- A TCP connection	1	16-10-2025		TLM1	CO5	
50.	windows in TCP- flow control	1	18-10-2025		TLM1	CO5	
51.	-Error control, Congestion control in TCP.	2	20-10-2025 & 23-10-2025		TLM1	CO5	
52.	Application Layer - World Wide Web: HTTP, Electronic mail	1	25-10-2025		TLM1	CO5	
53.	Architecture- web based mail-	1	27-10-2025		TLM1	CO5	
54.	email security- TELENET	1	28-10-2025		TLM1	CO5	
55.	local versus remote Logging-Domain Name System.	1	30-1-2025		TLM1	CO5	
	No. of classes required to complete UNIT-V	**11**			**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	Learning Outcome COs	HOD Sign Weekly
1.	Overview of how networking works in cloud platforms and IoT	1	01-11-2025		TLM1	CO1	

Teaching Learning Methods

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

ACADEMIC CALENDAR:

Description	From	To	Weeks
I Phase of Instructions-1	30-06-2025	23-08-2025	8W
I Mid Examinations	**25-08-2025**	**30-08-2025**	**1W**
II Phase of Instructions	01-09-2025	01-11-2025	9W
II Mid Examinations	**03-11-2025**	**08-11-2025**	**1W**
Preparation and Practical's	10-11-2025	15-11-2025	1W
Semester End Examinations	17-11-2025	29-11-2025	2W

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

POs:(Program Outcomes)

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.P.Nagababu**	**Dr. B Sivarama krishna**	**Dr. D. Venkata Subbaiah**	**Dr. S .Nagarjuna Reddy**
Signature				

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
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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

PROGRAM	**: B. TECH-CSE**-V-Sem-B Sec
ACADEMIC YEAR	**:** 2025-26
COURSE NAME & CODE	**: COMPUTER NETWORKS LAB & 23CS58**
L-T-P STRUCTURE	**:** 0-0-3
COURSE CREDITS	**:** 1.5
COURSE INSTRUCTOR	**: Mr.P. NAGABABU**
COURSE COORDINATOR	**: Dr B SIVARAMAKRISHNA**

PREREQUISITE: Basics of Computer Programming

COURSE EDUCATIONAL OBJECTIVES (CEOs):

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, student will be able to

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	Improve individual / teamwork skills, communication & report writing skills with ethical values.

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

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

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	01-07-2025		
2.	Write a Program to implement the data link layer farming methods such as i) Character stuffing ii) bit stuffing.	03	08-07-2025		
3.	Write a Program to implement data link layer farming method checksum.	03	15-07-2025		
4.	Write a program for Hamming Code generation for error detection and correction.	03	22-07-2025		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	29-07-2025		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	05-08-2025		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	12-08-2025		
8.	Write a Program to implement Stop and Wait Protocol.	03	19-08-2025		
9.	Write a program for congestion control using leaky bucket algorithm	03	02-09-2025		
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	09-09-2025 & 16-09-2025		
11.	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.	03	23-09-2025 & 07-10-2025		
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	14-10-2025		
13.	Internal Exam	03	28-10-2025		

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 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.P.Nagababu	Dr. B. Siva Rama Krishna	Dr. D. Venkata Subbiah	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: 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/V/CSE-B **A.Y.:** 2025-26

PREREQUISITE: Object-Oriented 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 : Implement basic concepts of the java programming language. **(Apply-L3)**
CO2 : Implement object-oriented programming concepts and exception handling**(Apply-L3)**
CO3 : Design multithreaded, database and GUI based applications. **(Apply-L3)**
CO4 : Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply-L3)**

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
CO 1	3	2	-	-	-	-	1	-	1	1	1	3	3	2	1
CO 2	2	2	3	-	2	-	-	2	-	-	-	2	2	2	2
CO 3	2	3	2	-	2	2	-	-	-	2	-	2	2	2	3
CO 4	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	30-06-2025		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	03	07-07-2025		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	03	14-07-2025		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	03	21-07-2025		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	03	28-07-2025		
6.	Practice Lab	03	04-08-2025		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	03	11-08-2025		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	03	18-08-2025		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	03	01-09-2025		
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	08-09-2025		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	03	22-09-2025		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	03	13-10-2025		
13.	Internal Exam	03	03-11-2025		

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 oforganization.
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**	**Dr. B. Siva Rama Krishna**	**Dr. B. Siva Rama Krishna**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALIREDDYCOLLEGE 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 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 A/S	**A.Y.:** 2025-26

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	01-07-2025		TLM2	
2.	Role and potential of new and renewable sources	1	04-07-2025		TLM2	
3.	The solar energy option, Environmental impact of solar power	1	05-07-2025		TLM2	
4.	Structure of the Sun, The solar constant	1	08-07-2025		TLM2	
5.	Sun-earth relationships	1	11-07-2025		TLM2	
6.	Coordinate systems and coordinates of the sun	1	15-07-2025		TLM2	
7.	Extraterrestrial and terrestrial solar radiation	1	18-07-2025		TLM2	
8.	Solar radiation on tilted surface	1	19-07-2025		TLM2	
9.	Instruments for measuring solar radiation and sun shine, Solar radiation data	1	22-07-2025		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, Packing Density	1	25-07-2025		TLM2	
2.	Interconnections, Mismatch and temperature effects	1	26-07-2025		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules, Degradation and failure	1	29-07-2025		TLM2	
4.	PV module parameters, Efficiency of PV Systems	1	01-08-2025		TLM2	
5.	Solar PV Systems	1	02-08-2025		TLM2	
6.	Battery Operation, Types of Batteries, Battery parameters, Applications, Selection of batteries for Solar PV System	1	05-08-2025		TLM2	
No. of classes required to complete UNIT-II: 06				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	08-08-2025		TLM2	
2.	Classification of concentrating collectors	1	12-08-2025		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	15-08-2025		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	16-08-2025		TLM2	
5.	Solar Applications-solar heating cooling technique	1	19-08-2025		TLM2	
6.	Solar distillation and drying	1	22-08-2025		TLM2	
7.	Solar cookers	1	23-08-2025		TLM2	
8.	Central power tower concept	1	02-09-2025		TLM2	
9.	Solar chimney	1	05-09-2025		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	1	06-09-2025		TLM2	
2.	Horizontal and Vertical axis wind mill	1	09-09-2025		TLM2	
3.	Performance characteristics	1	12-09-2025		TLM2	
4.	Betz criteria	1	13-09-2025		TLM2	
5.	Types of winds	1	16-09-2025		TLM2	
6.	Wind data measurement	1	19-09-2025		TLM2	
7.	Bio-mass: Principles of bio-conversion	1	20-09-2025		TLM2	
8.	Anaerobic/aerobic digestion	1	23-09-2025		TLM2	
9.	Types of biogas digesters	1	26-09-2025		TLM2	
10.	Gas yield, Gasifiers	1	27-09-2025		TLM2	
11.	Applications	1	30-09-2025		TLM2	
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	03-10-2025		TLM2	
2.	Types of Geothermal Resources	1	04-10-2025		TLM2	
3.	Geothermal power generation	2	07-10-2025		TLM2	
4.	Relative merits and demerits	1	10-10-2025		TLM2	
5.	Ocean Energy: Ocean Thermal energy	1	14-10-2025		TLM2	
6.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	17-10-2025		TLM2	
7.	Challenges and applications, Fuel Cells: Introduction, Applications	2	21-10-2025		TLM2	
8.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell	1	24-10-2025		TLM2	
9.	Alkaline fuel cell	1	25-10-2025		TLM2	
10.	PEM fuel cell	1	28-10-2025		TLM2	
11.	MC fuel cell	1	31-10-2025		TLM2	
No. of classes required to complete UNIT-V: 13				No. of classes taken:		

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

Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	30-06-2025	23-08-2025	8
I MID Examinations	25-08-2025	30-08-2025	1
II Phase of Instructions	01-09-2025	01-11-2025	9
II MID Examinations	03-11-2025	08-11-2025	1
Preparation and Practicals	10-11-2025	15-11-2025	1
Semester End Examinations	17-11-2025	25-11-2025	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.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the 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.Vijay Kumar	Dr. P.Vijay Kumar	Dr. M B S Sreekar Reddy

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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. O.V.SIVA
Course Name & Code **:** THEORY OF COMPUTATION & 23CS08
L-T-P Structure **: 3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/V/B **A.Y.:** 2025-26

PREREQUISITE: Discrete Mathematical Structures

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to provide a formal connection between algorithmic problem solving and the theory of automata and languages, and develop them into a mathematical view towards algorithmic design and in general computation itself.

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

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):

CO	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	A	1	2

TEXTBOOKS:

1. Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008

2. 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

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	02-07-2025		TLM1	
2.	Basic Concepts of Finite Automata	1	03-07-2025		TLM1	
3.	Finite automata Classification	1	04-07-2025		TLM1	
4.	DFA Construction	2	07-07-2025 09-07-2025		TLM1	
5.	NFA Construction	1	10-07-2025		TLM1	
6.	Equivalence of NFA & DFA	1	11-07-2025		TLM1	
7.	NFA with epsilon to NFA without epsilon	1	14-07-2025		TLM1	
8.	Minimization of Finite Automata	2	16-07-2025 17-07-2025		TLM1	
9.	Finite Automata with output	1	18-07-2025		TLM1	
10.	Construction of Moore and Melay Machine	2	21-07-2025 23-07-2025		TLM1	
11.	Equivalence of Moore and Melay	2	24-07-2025 25-07-2025		TLM1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Regular Expression and Regular Languages

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
12.	Introduction to Regular Expressions	1	28-07-2025		TLM1	
13.	Construction of RE	2	30-07-2025 31-07-2025		TLM1	
14.	RE to Finite Automata	2	01-08-2025 04-08-2025		TLM1	
15.	FA to Regular expressions	2	06-08-2025 07-08-2025		TLM1	
16.	Regular grammar, Construction	2	08-08-2025 11-08-2025		TLM1	
17.	Parse Trees	2	13-08-2025 14-08-2025		TLM1	
18.	Equivalence of grammar to Finite Automata	1	18-08-2025		TLM1	
19.	Pumping Lemma for regular languages	2	20-08-2025 21-08-2025		TLM1	
20.	Closure Properties for Regular Language	1	22-08-2025		TLM1	
No. of classes required to complete UNIT-II: 15				**No. of classes taken:**		

UNIT-III: CONTEXT FREE GRAMMER

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.	Context Free Grammar	1	01-09-2025		TLM1	
22.	Leftmost and Rightmost Derivations, Parse Trees	1	03-09-2025		TLM1	
23.	Ambiguous Grammars	1	04-09-2025		TLM1	
24.	Simplification of Context Free Grammars	1	05-09-2025		TLM1	
25.	Elimination of Useless Symbols, Є-Productions	2	08-09-2025 10-09-2025		TLM1	
26.	Unit Productions	1	11-09-2025		TLM1	
27.	Normal Forms	1	12-09-2025		TLM1	
28.	Chomsky Normal Form	1	15-09-2025		TLM1	
29.	Greibach Normal Form	1	17-09-2025		TLM1	
30.	Pumping Lemma	1	18-09-2025		TLM1	
31.	Closure Properties	1	19-09-2025		TLM1	
32.	Applications of CFG	1	22-09-2025		TLM1	
No. of classes required to complete UNIT-III: 13				**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
33.	Pushdown Automata	1	24-09-2025		TLM1	
34.	Graphical Notation, Instantaneous Description	1	25-09-2025		TLM1	
35.	Language Acceptance of Pushdown Automata, Design of Pushdown Automata	3	26-09-2025 29-09-2025 01-10-2025		TLM1	
36.	Deterministic and Non – Deterministic Pushdown Automata	2	03-10-2025 06-10-2025		TLM1	
37.	Equivalence of Pushdown Automata and Context Free Grammars	2	08-10-2025 09-10-2025		TLM1	
38.	Conversion, Two Stack Pushdown Automata	1	10-10-2025		TLM1	
39.	Applications of PDA	2	13-10-2025 14-10-2025			
No. of classes required to complete UNIT-IV: 12				**No. of classes taken:**		

UNIT-V: Turing 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	1	15-10-2025		TLM1	
41.	Representation of TMs-Instantaneous Descriptions,	1	16-10-2025		TLM1	

	Transition Tables and Transition Diagrams					
42.	Language of a TM, Design of TMs	1	17-10-2025		TLM1	
43.	Types of TMs, Church's Thesis, Universal and Restricted TM	1	20-10-2025		TLM1	
44.	Decidable and Un-decidable Problems, Halting Problem of TMs	1	22-10-2025		TLM1	
45.	Post's Correspondence Problem, Modified PCP	2	23-10-2025 24-10-2025		TLM1	
46.	Classes of P and NP	2	27-10-2025 29-10-2025		TLM1	
47.	NP-Hard and NP-Complete Problems	2	30-10-2025 31-10-2025		TLM1	
No. of classes required to complete UNIT-V: 11				**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.	Phases of Compiler	1	31-10-2025		**TLM1**	

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	**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.Y.V.B.Reddy**	**Dr. S.Nagarjuna R**
Signature				

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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 – B Section **A.Y.:** 2025-26

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: DW&DM 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.	Data Warehousing and Online Analytical Processing: Basic concepts	1	30-06-25		1 & 2	
2.	Data Warehouse Modeling	1	02-07-25		1 & 2	
3.	Data Cube and OLAP	1	04-07-25		1 & 2	
4.	Data Warehouse Design and Usage	1	05-07-25		1 & 2	
5.	Data Warehouse Implementation	1	07-07-25		1 & 2	
6.	Cloud Data Warehouse	1	09-07-25		1 & 2	
7.	Data Mining and Patten Mining	1	11-07-25		1 & 2	
8.	Technologies	1	14-07-25		1 & 2	
9.	Applications	1	16-07-25		1 & 2	
10.	Major issues	1	18-07-25		1 & 2	
11.	Data Objects &Attribute Types	1	19-07-25		1 & 2	
12.	Basic Statistical Descriptions of Data	1	21-07-25		1 & 2	
13.	Data Visualization,	1	23-07-25		1 & 2	
14.	Measuring Data Similarity and Dissimilarity	1	25-07-25		1 & 2	
15.	Unit-1 Revision	1	26-07-25		1 & 2	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Entity Relationship Model and Relational Model

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.	Data Preprocessing: An Overview	1	28-07-25		1 & 2	
17.	Data Cleaning	1	30-07-25		1 & 2	
18.	Data Cleaning	1	01-08-25		1 & 2	
19.	Data Integration	1	02-08-25		1 & 2	
20.	Data Integration	1	04-08-25		1 & 2	
21.	Data Reduction	1	06-08-25		1 & 2	

22.	Data Reduction	1	08-08-25		1 & 2	
23.	Data Reduction	1	11-08-25		1 & 2	
24.	Data Transformation	1	13-08-25		1 & 2	
25.	Data Transformation	1	18-08-25		1 & 2	
26.	Data Discretization.	1	20-08-25		1 & 2	
27.	Data Discretization.	1	22-08-25		1 & 2	
28.	Unit-II revision	1	23-08-25		1 & 2	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: BASIC SQL

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.	Classification: Basic Concepts	1	01-09-25		1 & 2	
30.	General Approach to solving a classification problem	1	03-09-25		1 & 2	
31.	Decision Tree Induction	1	06-09-25		1 & 2	
32.	Attribute Selection Measures	1	08-09-25		1 & 2	
33.	Tree Pruning	1	10-09-25		1 & 2	
34.	Scalability and Decision Tree Induction	1	12-09-25		1 & 2	
35.	Visual Mining for Decision Tree Induction	1	15-09-25		1 & 2	
36.	Bayesian Classification Methods: Bayes Theorem	1	17-09-25		1 & 2	
37.	Naïve Bayes Classification	1	19-09-25		1 & 2	
38.	Rule-Based Classification	1	20-09-25		1 & 2	
39.	Model Evaluation and Selection	1	22-09-25		1 & 2	
40.	Unit-III Revision	1	24-09-25		1 & 2	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Schema Refinement (Normalization)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Association Analysis : Problem Definition	1	26-09-25		1 & 2	
42.	Frequent Item set Generation	1	26-09-25		1 & 2	
43.	Rule Generation	1	27-09-25		1 & 2	
44.	Confident Based Pruning	1	29-09-25		1 & 2	
45.	Rule Generation in Apriori Algorithm	1	06-10-25		1 & 2	
46.	Compact Representation of frequent item sets	1	08-10-25		1 & 2	
47.	FP-Growth Algorithm	1	10-10-25		1 & 2	

48.	Unit-IV revision	1	13-10-25		1 & 2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Transaction Processing and Concurrency Control, Introduction to Recovery Protocols and Introduction to Indexing

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49.	Cluster Analysis: Overview	1	15-10-25		1 & 2	
50.	Basics and Importance of Cluster Analysis	1	17-10-25		1 & 2	
51.	Clustering techniques, Different Types of Clusters	1	18-10-25		1 & 2	
52.	K-means: The Basic K-means Algorithm	1	22-10-25		1 & 2	
53.	K-means Additional Issues, Bi-secting K Means	1	24-10-25		1 & 2	
54.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	25-10-25		1 & 2	
55.	DBSCAN: Traditional Density Center-Based Approach	1	27-10-25		1 & 2	
56.	DBSCAN Algorithm	1	29-10-25		1 & 2	
57.	Strengths and Weaknesses	1	31-10-25		1 & 2	
58.	Unit-5 revision	1	01-11-25		1 & 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.	Model-Based Clustering Methods	1	01-11-2025					
No. of Classes		1			No. of classes taken:			
II MID EXAMINATIONS 03-11-2025 TO 08-11-2025								

PART-C

EVALUATION PROCESS (R20 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. 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: Ms. P. SARALA
Course Name & Code : Data Mining Lab (23AD55)
L-T-P Structure :0-0-3 **Credits:**1.5
Program/Sem/Sec : B. Tech V Sem CSE – B Section **A.Y.:** 2025-26

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	02-07-25		TLM4	
2	Data preprocessing tasks using python libraries: c) Dealing with missing data	3	09-07-25		TLM4	
3	Data preprocessing tasks using python libraries: a) Dealing with categorical data	3	16-07-25		TLM4	
4	Data preprocessing tasks using python libraries: b) Scaling the features. c) Splitting dataset into Training and Testing Sets	3	23-07-25		TLM4	
5	Similarity and Dissimilarity Measures using python: a) Pearson's Correlation b) Cosine Similarity	3	30-07-25		TLM4	
6	Similarity and Dissimilarity Measures using python: c) Jaccard Similarity d) Euclidean Distance	3	06-08-25		TLM4	
7	Similarity and Dissimilarity Measures using python: d) Euclidean Distance e) Manhattan Distance	3	13-08-25		TLM4	
8	Build a model using linear regression algorithm on any dataset.	3	20-08-25		TLM4	
9	Build a classification model using Decision Tree algorithm on iris dataset.	3	03-09-25		TLM4	
10	Apply Naïve Bayes Classification algorithm on any dataset.	3	10-09-25		TLM4	
11	Generate frequent item set using Apriori Algorithm in python.	3	17-09-25		TLM4	
12	Generate association rules for any market basket data.	3	24-09-25		TLM4	
13	Apply K- Means clustering algorithm on any dataset.	3	08-10-25		TLM4	
14	Apply Hierarchical Clustering algorithm on any dataset.	3	15-10-25		TLM4	
15	Apply DBSCAN clustering algorithm on any dataset.	3	22-10-25			

16	Internal Exam	3	29-10-25		

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

PART-C

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Ms. P. Sarala**	**Dr. D. Venkata Subbaiah**	**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. Md. Amanatulla
Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS3)
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech. – CSE/V/B **A.Y.:** 2025-26

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	03-07-2025		**DM5**	
2.	JDBC Programs	3	10-07-2025		**DM5**	
3.	Servlet Programs	3	17-07-2025		**DM5**	
4.	JSP Introduction	3	24-07-2025		**DM5**	
5.	JSP MVC programs	6	31-07-2025 07-08-2025		**DM5**	
6.	Node JS Introduction	3	14-08-2025		**DM5**	
7.	Express JS Framework	3	21-08-2025		**DM5**	
8.	Node JS & Express JS Programs	6	04-09-2025 11-09-2025		**DM5**	
9.	MangoDB	3	18-09-2025		**DM5**	
10.	MangoDB with Express JS	3	25-09-2025		**DM5**	
11.	React JS	3	09-10-2025		**DM5**	
12.	React JS and Full stack Integration	3	16-10-2025		**DM5**	
13.	Web Application Development	3	23-10-2025		**DM5**	
14.	Internal Test	3	30-10-2025		**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. Md. Amanatulla	Mr. N. SrinivasaRao	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. N.Srikanth
Course Name & Code **:** PAI & 20CS16
L-T-P Structure **:3-0-0** **Credits:** 3
Program/Sem/Sec :BTECH/V/A **A.Y.:** 2024-25

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	Understand the fundamentals of Artificial Intelligence types of AI agents and their structures to solve engineering problems. (**Understand – L2**)
CO2	Identify different search algorithms to find and optimise the solution for the given problem. (**Understand-L2**)
CO3	Apply different gaming algorithms and identify the importance of knowledge representations in Artificial Intelligence. (**Apply-L3**)
CO4	Make use of predicate logic and rule-based system to represent the knowledge in AI domain. (**Understand-L2**)
CO5	Interpret the forms of learning in the AI domain as well as present efficient technologies to remove uncertainty in knowledge domain. (**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	1	-	-	-	-	-	-	-	-	1	-	2	-
CO2	2	3	1	1	-	-	-	-	-	-	-	-	-	2	-
CO3	2	3	1	1	-	-	-	-	-	-	-	1	-	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
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	Ronald Brachman, "Knowledge representation and Reasoning", Morgan Kaufmann,2004.
R4	Frank van Harmelen,Vladimir Lifschitz,Bruce Porter(Eds),"Handbook of Knowledge representation",Elsevier,2008.
R5	Ivan Bratko," Prolog Programming for Artificial Intelligence",4th Ed., Addition-Wesley,2011.

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.	AI Introduction	2	1-07-2024 3-07-2024		TLM1	
2.	Applications of AI	1	4-07-2024		TLM1	
3.	History of AI	1	6-07-2024		TLM1	
4.	Types of AI	1	8-07-2024		TLM1	
5.	Agents and rationality	1	10-07-2024		TLM2	
6.	Structure of the agents	1	11-07-2024		TLM2	
7.	Agent environment and nature of the environment	1	15-07-2024		TLM2	
8.	Types of agents-Simple reflex agents and model-based agents	1	18-07-2024		TLM2	
9.	Types of agents-Goal based agents and Utility-based agents	1	20-07-2024		TLM2	
10.	Types of agents-Learning agents	1	22-07-2024		TLM2	
11.	Problems, search spaces	1	24-07-2024		TLM2	
12.	Defining the problem as state space search	1	25-07-2024		TLM2	
13.	Production system	1	27-07-2024		TLM2	
14.	Problem characteristics	1	29-07-2024		TLM2	
15.	Issues in the design of search programs.	1	31-07-2024		TLM2	
No. of classes required to complete UNIT-I: 16				**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
16.	Problem solving agents and search algorithm terminologies	2	01-08-2024 03-08-2024		TLM2	
17.	Properties of search algorithms and types of search algorithms	1	05-08-2024		TLM2	
18.	Uninformed search algorithms: Breadth-first Search	1	07-08-2024		TLM2	
19.	Depth-first Search and Depth-limited Search	1	08-08-2024		TLM2	
20.	Iterative deepening depth-first search.	1	12-08-2024		TLM2	
21.	Uniform cost search, Bidirectional search.	1	14-08-2024		TLM2	
22.	Informed/Heuristic Search algorithms: Greedy best-first search algorithm	1	17-08-2024		TLM2	
23.	A* Search algorithm	1	19-08-2024		TLM2	
24.	Hill climbing algorithm	1	21-08-2024		TLM2	
25.	Constraint satisfaction problem	1	22-08-2024		TLM2	
26.	Means-Ends Analysis	1	24-08-2024		TLM2	
No. of classes required to complete UNIT-II: 12				**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
27.	Adversarial search/Game playing: Introduction	1	28-08-2024		TLM2	
28.	Minmax Algorithm	1	29-08-2024		TLM2	
29.	Alpha-Beta Pruning	1	31-08-2024		TLM2	
30.	Knowledge representation: Representations and mappings	2	02-09-2024 04-09-2024		TLM2	
31.	Approaches of Knowledge representation	2	05-09-2024 09-09-2024		TLM2	
32.	Issues in Knowledge Representation	2	11-09-2024 12-09-2024		TLM2	
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
33.	Knowledge Representation Using predicate logic: Representing simple facts in logic.	1	14-09-2024		TLM2	
34.	Representing instance and Isa relationships	1	18-09-2024		TLM2	
35.	Computable functions and predicates	1	19-09-2024		TLM2	
36.	Resolution	1	21-09-2024		TLM2	
37.	Natural deduction	1	23-09-2024		TLM2	
38.	Representing knowledge using Rules: Procedural verses declarative knowledge	1	25-09-2024		TLM2	
39.	Logic programming	1	26-09-2024		TLM2	
40.	Forward verses backward reasoning	1	28-09-2024		TLM2	
41.	Matching	1	30-09-2024		TLM2	
42.	Control knowledge	1	03-10-2024		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
43.	Uncertain knowledge and Reasoning: Probability and Bayes theorem	2	05-10-2024 07-10-2024		TLM2	
44.	Certainty factors and rule-based systems	1	09-10-2024		TLM2	
45.	Bayesian networks	1	10-10-2024		TLM2	
46.	Dempster – Shafer Theory	2	14-10-2024 16-10-2024		TLM2	
47.	Fuzzy logic	1	17-10-2024		TLM2	
48.	Learning: Overview of different forms of learning	1	19-10-2024		TLM2	
49.	Learning Decision Trees	2	21-10-2024 23-10-2024		TLM2	
50.	Neural networks	2	24-10-2024 26-10-2024		TLM2	

51.	Advanced TOPIC in API	2	28-10-2024 30-10-2024			
52.	Revision	1	02-11-2024			
No. of classes required to complete UNIT-V: 15				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and 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 engineer**ing 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**	**Mr.N.Srikanth**	**Dr.K.Devi Priya**	**Dr.D Veeraiah**
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 LAB **23CS58**
L-T-P Structure : **1-0-2** **Credits:** 2
Program/Sem/Sec : B.Tech/CSE/III/C **A.Y.:** 2025-26

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	01-07-2025		
2.	Write a Program to implement the data link layer farming methods such as i) Character stuffing ii) bit stuffing.	03	08-07-2025		
3.	Write a Program to implement data link layer farming method checksum.	03	15-07-2025		
4.	Write a program for Hamming Code generation for error detection and correction.	03	22-07-2025		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	29-07-2025		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	05-08-2025		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	12-08-2025		
8.	Write a Program to implement Stop and Wait Protocol.	03	19-08-2025		
9.	Write a program for congestion control using leaky bucket algorithm	03	02-09-2025		
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	09-09-2025		
11.	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.	03	23-09-2025		
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	14-10-2025		
13.	Internal Exam	03	03-11-2025		

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 oforganization.
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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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.B. Sivaramakrishna
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.:** 2025-26

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 Networksm, 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	02-07-2025		TLM2	
2.	Network Types: LAN, MAN, WAN	1	0-07-2025		TLM2	
3.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid	1	04-07-2025		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer	1	05-07-2025		TLM1	
5.	TCP/IP Reference Model – Layers, Function, Protocols	1	09-07-2025		TLM1	
6.	Comparison: OSI vs TCP/IP	2	10-07-2025 11-07-2025		TLM1	
7.	Introduction to Physical Layer	2	12-07-2025 16-07-2025		TLM1	
8.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	2	17-07-2025 18-07-2025		TLM1	
9.	Unguided Media: Radio, Microwave, Infrared	2	19-07-2025 23-07-2025		TLM1	
10.	Recap + Quiz + Discussion	1	24-07-2025		TLM1	
11.	tutorial	1	25-07-2025		TLM1	
No. of classes required to complete UNIT-I: 15				**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	30-07-2025		TLM1	
13.	Flow Control: Stop-and-wait, Sliding Window	1	31-07-2025		TLM1	
14.	Error Control: Types of Errors, Detection & Correction	2	01-08-2025 02-08-2025		TLM1	
15.	CRC and Checksum (One's complement, Internet checksum)	2	06-08-2025 07-08-2025		TLM1	
16.	Services to Network Layer	2	08-08-2025 09-08-2025		TLM1	
17.	Elementary Protocols: Simplex, Stop-and-Wait	1	13-08-2025		TLM1	
18.	Protocols for Noisy Channels	1	14-08-2025		TLM1	
19.	Sliding Window Protocols: Go-back-N, Selective Repeat	1	20-08-2025		TLM1	

20.	Summary and Protocol Comparison	1	21-08-2025		TLM1	
21.	Recap + Hands-on Simulation + Quiz	1	22-08-2025		TLM1	
22.	tutorial	1	23-08-2025		TLM1	
No. of classes required to complete UNIT-II: 14				**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	03-09-2025		TLM1	
24.	CSMA/CD & CSMA/CA	1	04-09-2025		TLM1	
25.	Channelization Techniques: FDMA, TDMA, CDMA	1	05-09-2025		TLM1	
26.	Wired LANs: Introduction to Ethernet	1	06-09-2025		TLM1	
27.	Standard Ethernet – Frame Structure	1	10-09-2025		TLM1	
28.	Fast Ethernet – Features, Standards	1	11-09-2025		TLM1	
29.	Gigabit Ethernet and 10 Gigabit Ethernet	1	12-09-2025		TLM1	
30.	Ethernet Summary + Comparison Table	1	13-09-2025		TLM1	
31.	Practice: Frame design and decoding	1	17-09-2025		TLM1	
32.	Recap + tutorial	1	18-09-2025		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	19-09-2025		TLM1	
34.	Connectionless vs Connection-Oriented Services	1	20-09-2025		TLM1	
35.	Datagram vs Virtual Circuit Networks	1	22-09-2025		TLM1	
36.	Routing Algorithms: Optimality, Shortest Path, Flooding	2	24-09-2025 25-09-2025		TLM1	
37.	Distance Vector and Link State Routing	2	26-09-2025 27-09-2025		TLM1	
38.	Congestion Control: Principles, Algorithms	1	03-10-2025		TLM1	
39.	Traffic Control: Leaky Bucket, Token Bucket	1	04-10-2025		TLM1	
40.	Internetworking: IPv4, IPv6	2	08-10-2025 09-10-2025		TLM1	
41.	Recap + tutorial	1	10-10-2025		TLM1	
No. of classes required to complete UNIT-IV: 12				**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	11-10-2025		TLM1	
43.	UDP – Format, Features, Applications	2	15-10-2025 16-10-2025		TLM1	
44.	TCP – Services, Connection Establishment, Segments	1	17-10-2025		TLM1	
45.	TCP Features – Flow, Error, Congestion Control	1	18-10-2025		TLM1	
46.	Application Layer: Introduction to WWW & HTTP	1	22-10-2025		TLM1	
47.	Email Architecture: SMTP, POP3, IMAP	1	23-10-2025		TLM1	
48.	Email Security, Web-based Mail	1	24-10-2025		TLM1	
49.	TELNET – Remote Access	1	25-10-2025		TLM1	
50.	DNS – Hierarchy, Resolution Process	1	29-10-2025		TLM2	
51.	Recap + Assessment	2	30-10-2025		TLM2	
52.	tutorial		31-10-2025		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	31-10-2025					
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				

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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 – C Section **A.Y.:** 2025-26

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: DW&DM 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.	Data Warehousing and Online Analytical Processing: Basic concepts	1	30-06-25		1 & 2	
2.	Data Warehouse Modeling	1	01-07-25		1 & 2	
3.	Data Cube and OLAP	1	04-07-25		1 & 2	
4.	Data Warehouse Design and Usage	1	05-07-25		1 & 2	
5.	Data Warehouse Implementation	1	07-07-25		1 & 2	
6.	Cloud Data Warehouse	1	08-07-25		1 & 2	
7.	Data Mining and Patten Mining	1	11-07-25		1 & 2	
8.	Technologies	1	14-07-25		1 & 2	
9.	Applications	1	15-07-25		1 & 2	
10.	Major issues	1	18-07-25		1 & 2	
11.	Data Objects &Attribute Types	1	19-07-25		1 & 2	
12.	Basic Statistical Descriptions of Data	1	21-07-25		1 & 2	
13.	Data Visualization,	1	22-07-25		1 & 2	
14.	Measuring Data Similarity and Dissimilarity	1	25-07-25		1 & 2	
15.	Unit-1 Revision	1	26-07-25		1 & 2	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Entity Relationship Model and Relational Model

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.	Data Preprocessing: An Overview	1	28-07-25		1 & 2	
17.	Data Cleaning	1	29-07-25		1 & 2	
18.	Data Cleaning	1	01-08-25		1 & 2	
19.	Data Integration	1	02-08-25		1 & 2	
20.	Data Integration	1	04-08-25		1 & 2	
21.	Data Reduction	1	05-08-25		1 & 2	

22.	Data Reduction	1	08-08-25		1 & 2	
23.	Data Reduction	1	11-08-25		1 & 2	
24.	Data Transformation	1	12-08-25		1 & 2	
25.	Data Transformation	1	18-08-25		1 & 2	
26.	Data Discretization.	1	19-08-25		1 & 2	
27.	Data Discretization.	1	22-08-25		1 & 2	
28.	Unit-II revision	1	23-08-25		1 & 2	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: BASIC SQL

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.	Classification: Basic Concepts	1	01-09-25		1 & 2	
30.	General Approach to solving a classification problem	1	02-09-25		1 & 2	
31.	Decision Tree Induction	1	06-09-25		1 & 2	
32.	Attribute Selection Measures	1	08-09-25		1 & 2	
33.	Tree Pruning	1	09-09-25		1 & 2	
34.	Scalability and Decision Tree Induction	1	12-09-25		1 & 2	
35.	Visual Mining for Decision Tree Induction	1	15-09-25		1 & 2	
36.	Bayesian Classification Methods: Bayes Theorem	1	16-09-25		1 & 2	
37.	Naïve Bayes Classification	1	19-09-25		1 & 2	
38.	Rule-Based Classification	1	20-09-25		1 & 2	
39.	Model Evaluation and Selection	1	22-09-25		1 & 2	
40.	Unit-III Revision	1	23-09-25		1 & 2	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Schema Refinement (Normalization)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Association Analysis : Problem Definition	1	26-09-25		1 & 2	
42.	Frequent Item set Generation	1	26-09-25		1 & 2	
43.	Rule Generation	1	27-09-25		1 & 2	
44.	Confident Based Pruning	1	29-09-25		1 & 2	
45.	Rule Generation in Apriori Algorithm	1	06-10-25		1 & 2	
46.	Compact Representation of frequent item sets	1	07-10-25		1 & 2	
47.	FP-Growth Algorithm	1	10-10-25		1 & 2	

48.	Unit-IV revision	1	13-10-25		1 & 2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Transaction Processing and Concurrency Control, Introduction to Recovery Protocols and Introduction to Indexing

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
49.	Cluster Analysis: Overview	1	14-10-25		1 & 2	
50.	Basics and Importance of Cluster Analysis	1	17-10-25		1 & 2	
51.	Clustering techniques, Different Types of Clusters	1	18-10-25		1 & 2	
52.	K-means: The Basic K-means Algorithm	1	21-10-25		1 & 2	
53.	K-means Additional Issues, Bi-secting K Means	1	24-10-25		1 & 2	
54.	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	25-10-25		1 & 2	
55.	DBSCAN: Traditional Density Center-Based Approach	1	27-10-25		1 & 2	
56.	DBSCAN Algorithm	1	28-10-25		1 & 2	
57.	Strengths and Weaknesses	1	31-10-25		1 & 2	
58.	Unit-5 revision	1	01-11-25		1 & 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.	Model-Based Clustering Methods	1	01-11-2025					
No. of Classes		1			No. of classes taken:			
II MID EXAMINATIONS 03-11-2025 TO 08-11-2025								

PART-C

EVALUATION PROCESS (R20 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.
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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. 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: Ms. P. SARALA
Course Name & Code **:** Data Mining Lab (23AD55)
L-T-P Structure **:**0-0-3 **Credits:**1.5
Program/Sem/Sec : B. Tech V Sem CSE – C Section **A.Y.:** 2025-26

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	03-07-25		TLM4	
2	Data preprocessing tasks using python libraries: c) Dealing with missing data	3	10-07-25		TLM4	
3	Data preprocessing tasks using python libraries: a) Dealing with categorical data	3	17-07-25		TLM4	
4	Data preprocessing tasks using python libraries: b) Scaling the features. c) Splitting dataset into Training and Testing Sets	3	24-07-25		TLM4	
5	Similarity and Dissimilarity Measures using python: a) Pearson's Correlation b) Cosine Similarity	3	31-07-25		TLM4	
6	Similarity and Dissimilarity Measures using python: c) Jaccard Similarity d) Euclidean Distance	3	07-08-25		TLM4	
7	Similarity and Dissimilarity Measures using python: d) Euclidean Distance e) Manhattan Distance	3	14-08-25		TLM4	
8	Build a model using linear regression algorithm on any dataset.	3	21-08-25		TLM4	
9	Build a classification model using Decision Tree algorithm on iris dataset.	3	04-09-25		TLM4	
10	Apply Naïve Bayes Classification algorithm on any dataset.	3	11-09-25		TLM4	
11	Generate frequent item set using Apriori Algorithm in python.	3	18-09-25		TLM4	
12	Generate association rules for any market basket data.	3	25-09-25		TLM4	
13	Apply K- Means clustering algorithm on any dataset.	3	09-10-25		TLM4	
14	Apply Hierarchical Clustering algorithm on any dataset.	3	16-10-25		TLM4	
15	Apply DBSCAN clustering algorithm on any dataset.	3	23-10-25			

16	Internal Exam	3	30-10-25		

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

PART-C

EVALUATION PROCESS (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.
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 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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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. 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 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.:** 2025-26

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. 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	30-06-2025		TLM2	
2.	Need of Automata theory, Central Concepts of Automata Theory	1	01-07-2025		TLM2	
3.	Finite Automata, Transition Systems	1	04-07-2025		TLM1	
4.	Acceptance of a String, DFA, Design of DFAs,	1	05-07-2025		TLM1	
5.	NFA, Design of NFA	1	07-07-2025		TLM1	
6.	Equivalence of DFA and NFA	2	08-07-2025 11-07-2025		TLM1	
7.	Conversion of NFA into DFA	2	12-07-2025 14-07-2025		TLM1	
8.	Finite Automata with Є Transitions	2	15-07-2025 18-07-2025		TLM1	
9.	Minimization of Finite Automata	2	19-07-2025 21-07-2025		TLM1	
10.	Finite Automata with output-Mealy and Moore Machines	1	22-07-2025		TLM1	
11.	Applications and Limitation of Finite Automata	1	25-07-2025		TLM1	
No. of classes required to complete UNIT-I: 15				**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	28-07-2025		TLM1	
13.	Regular Sets, Identity Rules	1	29-07-2025		TLM1	
14.	Equivalence of two RE	2	01-08-2025 02-08-2025		TLM1	
15.	Manipulations of REs, Finite Automata and Regular Expressions	2	04-08-2025 05-08-2025		TLM1	
16.	Inter Conversion, Equivalence between FA and RE	2	08-08-2025 09-08-2025		TLM1	
17.	Pumping Lemma of Regular Sets	1	11-08-2025		TLM1	
18.	Closure Properties of Regular Sets, Grammars	1	12-08-2025		TLM1	
19.	Classification of Grammars	1	18-08-2025		TLM1	
20.	Chomsky Hierarchy	1	19-08-2025		TLM1	
21.	Right and Left Linear Regular Grammars,	1	22-08-2025		TLM1	

22.	Equivalence between RG and FA, Inter Conversion.	1	23-08-2025		TLM1	
No. of classes required to complete UNIT-II: 14				**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
23.	Context Free Grammar, Leftmost and Rightmost Derivations	1	01-09-2025		TLM1	
24.	Parse Trees,	1	02-09-2025		TLM1	
25.	Ambiguous Grammars	1	05-09-2025		TLM1	
26.	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	06-09-2025		TLM1	
27.	Є- Productions	1	08-09-2025		TLM1	
28.	Unit Productions	1	09-09-2025		TLM1	
29.	Normal Forms-Chomsky Normal Form	1	12-09-2025		TLM1	
30.	Greibach Normal Form	1	13-09-2025		TLM1	
31.	Pumping Lemma,	1	15-09-2025		TLM1	
32.	Closure Properties, Applications of Context Free Grammars.	1	16-09-2025		TLM1	
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
33.	Pushdown Automata, Definition, Model, Graphical Notation	1	19-09-2025		TLM1	
34.	Instantaneous Description	1	20-09-2025		TLM1	
35.	Language Acceptance of Pushdown Automata	1	22-09-2025		TLM1	
36.	Design of Pushdown Automata	2	23-09-2025 26-09-2025		TLM1	
37.	Deterministic and Non – Deterministic Pushdown Automata	2	27-09-2025 03-10-2025		TLM1	
38.	Equivalence of Pushdown Automata and Context Free Grammar	1	04-10-2025		TLM1	
39.	Conversion	1	06-10-2025		TLM1	
40.	Two Stack Pushdown Automata	2	07-10-2025 10-10-2025		TLM1	
41.	Application of Pushdown Automata	1	11-10-2025		TLM1	
No. of classes required to complete UNIT-IV: 12				**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
42.	Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions	1	13-10-2025		TLM1	
43.	Transition Tables and Transition Diagrams	2	14-10-2025 17-10-2025		TLM1	
44.	Language of a TM, Design of TMs	1	18-10-2025		TLM1	
45.	Types of TMs, Church's Thesis,	1	20-10-2025		TLM1	
46.	Universal and Restricted TM	1	24-10-2025		TLM1	
47.	Decidable and Un-decidable Problems,	1	25-10-2025		TLM1	
48.	Halting Problem of TMs	1	27-10-2025		TLM1	
49.	Post's Correspondence Problem	1	28-10-2025		TLM1	
50.	Modified PCP	1	31-10-2025		TLM2	
51.	Classes of P and NP	1	31-10-2025		TLM2	
52.	NP-Hard and NP-Complete Problems				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.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2025					
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. D.Veeraiah**	**Dr. D.Veeraiah**	**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. N. SrinivasaRao
Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS3)
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech. – CSE/V/C **A.Y.:** 2025-26

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	02-07-2025		**DM5**	
2.	JDBC Programs	3	09-07-2025		**DM5**	
3.	Servlet Programs	3	16-07-2025		**DM5**	
4.	JSP Introduction	3	23-07-2025		**DM5**	
5.	JSP MVC programs	6	30-07-2025 06-08-2025		**DM5**	
6.	Node JS Introduction	3	13-08-2025		**DM5**	
7.	Express JS Framework	3	20-08-2025		**DM5**	
8.	Node JS & Express JS Programs	6	03-09-2025 10-09-2025		**DM5**	
9.	MangoDB	3	17-09-2025		**DM5**	
10.	MangoDB with Express JS	3	24-09-2025		**DM5**	
11.	React JS	3	01-10-2025		**DM5**	
12.	React JS and Full stack Integration	3	08-10-2025		**DM5**	
13.	Web Application Development	6	15-10-2025 22-10-2025		**DM5**	
14.	Internal Test	3	29-10-2025		**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	Mr. N. SrinivasaRao	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. 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/III/C **A.Y.:** 2025-26

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 Widgets 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	PO 10	PO 11	PO 12	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	01-07-2025		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	03	08-07-2025		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	03	15-07-2025		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	03	22-07-2025		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	03	29-07-2025		
6.	Practice Lab	03	05-08-2025		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	03	12-08-2025		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	03	19-08-2025		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	03	02-09-2025		
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	09-09-2025		
11.	a) Add animations to UI elements using Flutter's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	03	23-09-2025		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	03	14-10-2025		
13.	Internal Exam	03	03-11-2025		

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 oforganization.
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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**	**Dr. B. Siva Rama Krishna**	**Dr. Y. Vijaya Bhaskar Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.K.DILIP KUMAR, 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.:** 2025-26

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	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO2	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO3	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO4	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO5	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-

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

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

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	02-07-2025		TLM2	
2.	Role and potential of new and renewable sources	1	03-07-2025		TLM2	
3.	The solar energy option, Environmental impact of solar power	1	05-07-2025		TLM2	
4.	Structure of the Sun, The solar constant	1	09-07-2025		TLM2	
5.	Sun-earth relationships	1	10-07-2025		TLM2	
6.	Coordinate systems and coordinates of the sun	1	12-07-2025		TLM2	
7.	Extraterrestrial and terrestrial solar radiation	1	16-07-2025		TLM2	
8.	Solar radiation on tilted surface	1	17-07-2025		TLM2	
9.	Instruments for measuring solar radiation and sun shine, Solar radiation data	1	19-07-2025		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, Packing Density	1	23-07-2025		TLM2	
2.	Interconnenctions, Mismatch and temperature effects	1	24-07-2025		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules, Degradation and failure	1	26-07-2025		TLM2	
4.	PV module parameters, Efficiency of PV Systems	1	30-07-2025		TLM2	
5.	Solar PV Systems	1	31-07-2025		TLM2	
6.	Battery Operation, Types of Batteries, Battery parameters, Applications, Selection of batteries for Solar PV System	1	02-08-2025		TLM2	
No. of classes required to complete UNIT-II: 06				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	06-08-2025		TLM2	
2.	Classification of concentrating collectors	1	07-08-2025		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	09-08-2025		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	13-08-2025		TLM2	
5.	Solar Applications-solar heating cooling technique	1	14-08-2025		TLM2	
6.	Solar distillation and drying	1	16-08-2025		TLM2	
7.	Solar cookers	1	20-08-2025		TLM2	
8.	Central power tower concept	1	21-08-2025		TLM2	
9.	Solar chimney	1	23-08-2025		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	1	03-09-2025		TLM2	
2.	Horizontal and Vertical axis wind mill	1	04-09-2025		TLM2	
3.	Performance characteristics	1	06-09-2025		TLM2	
4.	Betz criteria	1	10-09-2025		TLM2	
5.	Types of winds	1	11-09-2025		TLM2	
6.	Wind data measurement	1	13-09-2025		TLM2	
7.	Bio-mass: Principles of bio-conversion	1	17-09-2025		TLM2	
8.	Anaerobic/aerobic digestion	1	18-09-2025		TLM2	
9.	Types of biogas digesters	1	20-09-2025		TLM2	
10.	Gas yield, Gasifiers	1	24-09-2025		TLM2	
11.	Applications	1	25-09-2025		TLM2	
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	27-10-2025		TLM2	
2.	Types of Geothermal Resources	1	01-10-2025		TLM2	
3.	Geothermal power generation	1	04-10-2025		TLM2	
4.	Relative merits and demerits	1	08-10-2025		TLM2	
5.	Ocean Energy: Ocean Thermal energy	1	09-10-2025		TLM2	
6.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	11-10-2025		TLM2	
7.	Challenges and applications, Fuel Cells: Introduction, Applications	1	15-10-2025		TLM2	
8.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell	1	16-10-2025		TLM2	
9.	Alkaline fuel cell	1	18-10-2025		TLM2	
10.	PEM fuel cell	1	29-10-2025		TLM2	
11.	MC fuel cell	1	30-10-2025		TLM2	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

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

Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	30-06-2025	23-08-2025	8
I MID Examinations	25-08-2025	30-08-2025	1
II Phase of Instructions	01-09-2025	01-11-2025	9
II MID Examinations	03-11-2025	08-11-2025	1
Preparation and Practicals	10-11-2025	15-11-2025	1
Semester End Examinations	17-11-2025	25-11-2025	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.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO	**Communication**: Communicate effectively on complex engineering activities with the

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the 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**
Mallikarjuna Rao Dandu	Dr. P.Vijay Kumar	Dr. P.Vijay Kumar	Dr. M B S Sreekar Reddy

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Dr.G.V.Suresh
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 – C Section **A.Y.:** 2025-26

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							1	2		3
CO2	3	3	2	2	3							2	2		2
CO3	3	3	2	3	3							2	2		2
CO4	3	2	2	2	3							2	2		2
CO5	3	3	2	2	3							2	2		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: DW&DM 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.	Data Warehousing and Online Analytical Processing: Basic concepts	1	30-06-25		1 & 2	
2.	Data Warehouse Modeling	1	02-07-25		1 & 2	
3.	Data Cube and OLAP	1	04-07-25		1 & 2	
4.	Data Warehouse Design and Usage	1	05-07-25		1 & 2	
5.	Data Warehouse Implementation	1	07-07-25		1 & 2	
6.	Cloud Data Warehouse	1	09-07-25		1 & 2	
7.	Data Mining and Patten Mining	1	11-07-25		1 & 2	
8.	Technologies	1	14-07-25		1 & 2	
9.	Applications	1	16-07-25		1 & 2	
10.	Major issues	1	18-07-25		1 & 2	
11.	Data Objects &Attribute Types	1	19-07-25		1 & 2	
12.	Basic Statistical Descriptions of Data	1	21-07-25		1 & 2	
13.	Data Visualization,	1	23-07-25		1 & 2	
14.	Measuring Data Similarity and Dissimilarity	1	25-07-25		1 & 2	
15.	Unit-1 Revision	1	26-07-25		1 & 2	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Entity Relationship Model and Relational Model

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.	Data Preprocessing: An Overview	1	28-07-25		1 & 2	
17.	Data Cleaning	1	30-07-25		1 & 2	
18.	Data Cleaning	1	01-08-25		1 & 2	
19.	Data Integration	1	02-08-25		1 & 2	
20.	Data Integration	1	04-08-25		1 & 2	
21.	Data Reduction	1	06-08-25		1 & 2	
22.	Data Reduction	1	08-08-25		1 & 2	

23.	Data Reduction	1	11-08-25		1 & 2	
24.	Data Transformation	1	13-08-25		1 & 2	
25.	Data Transformation	1	18-08-25		1 & 2	
26.	Data Discretization.	1	20-08-25		1 & 2	
27.	Data Discretization.	1	22-08-25		1 & 2	
28.	Unit-II revision	1	23-08-25		1 & 2	
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: BASIC SQL

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.	Classification: Basic Concepts	1	01-09-25		1 & 2	
30.	General Approach to solving a classification problem	1	03-09-25		1 & 2	
31.	Decision Tree Induction	1	06-09-25		1 & 2	
32.	Attribute Selection Measures	1	08-09-25		1 & 2	
33.	Tree Pruning	1	10-09-25		1 & 2	
34.	Scalability and Decision Tree Induction	1	12-09-25		1 & 2	
35.	Visual Mining for Decision Tree Induction	1	15-09-25		1 & 2	
36.	Bayesian Classification Methods: Bayes Theorem	1	17-09-25		1 & 2	
37.	Naïve Bayes Classification	1	19-09-25		1 & 2	
38.	Rule-Based Classification	1	20-09-25		1 & 2	
39.	Model Evaluation and Selection	1	22-09-25		1 & 2	
40.	Unit-III Revision	1	24-09-25		1 & 2	
No. of classes required to complete UNIT-III: 12				**No. of classes taken:**		

UNIT-IV: Schema Refinement (Normalization)

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Association Analysis : Problem Definition	1	26-09-25		1 & 2	
42.	Frequent Item set Generation	1	26-09-25		1 & 2	
43.	Rule Generation	1	27-09-25		1 & 2	
44.	Confident Based Pruning	1	29-09-25		1 & 2	
45.	Rule Generation in Apriori Algorithm	1	06-10-25		1 & 2	
46.	Compact Representation of frequent item sets	1	08-10-25		1 & 2	
47.	FP-Growth Algorithm	1	10-10-25		1 & 2	
48.	Unit-IV revision	1	13-10-25		1 & 2	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Transaction Processing and Concurrency Control, Introduction to Recovery Protocols and Introduction to Indexing

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	Cluster Analysis: Overview	1	15-10-25		1 & 2	
	Basics and Importance of Cluster Analysis	1	17-10-25		1 & 2	
	Clustering techniques, Different Types of Clusters	1	18-10-25		1 & 2	
	K-means: The Basic K-means Algorithm	1	22-10-25		1 & 2	
	K-means Additional Issues, Bi-secting K Means	1	24-10-25		1 & 2	
	Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm	1	25-10-25		1 & 2	
	DBSCAN: Traditional Density Center-Based Approach	1	27-10-25		1 & 2	
	DBSCAN Algorithm	1	29-10-25		1 & 2	
	Strengths and Weaknesses	1	31-10-25		1 & 2	
	Unit-5 revision	1	01-11-25		1 & 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.	Model-Based Clustering Methods	1	01-11-2025					
No. of Classes		1			No. of classes taken:			
II MID EXAMINATIONS 03-11-2025 TO 08-11-2025								

PART-C

EVALUATION PROCESS (R20 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	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	**Dr. G.V.Suresh**	**Dr. D. Venkata Subbaiah**	**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: 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 /D **A.Y.:** 2025-26

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 Networksm, 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	30-07-2025		TLM2	
2.	Network Types: LAN, MAN, WAN	1	01-07-2025		TLM2	
3.	Network Topologies: Bus, Star, Ring, Mesh, Hybrid	1	03-07-2025		TLM1	
4.	OSI Reference Model – 7 Layers, Role of each layer	1	05-07-2025		TLM2	
5.	TCP/IP Reference Model – Layers, Function, Protocols	1	07-07-2025		TLM2	
6.	Comparison: OSI vs TCP/IP	1	8-07-2025		TLM2	
7.	Introduction to Physical Layer	2	10-07-2025 12-07-2025		TLM2	
8.	Guided Media: Twisted Pair, Coaxial, Fiber Optic	2	14-07-2025 15-07-2025		TLM2	
9.	Unguided Media: Radio, Microwave, Infrared	2	17-07-2025 19-07-2025		TLM1	
10.	Recap + Quiz + Discussion	1	21-07-2025		TLM1	
11.	tutorial	1	22-07-2025		TLM1	
No. of classes required to complete UNIT-I: 14				**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	24-07-2025		TLM1	
13.	Flow Control: Stop-and-wait, Sliding Window	1	26-07-2025		TLM1	
14.	Error Control: Types of Errors, Detection & Correction	2	28-07-2025 29-07-2025		TLM1	
15.	CRC and Checksum (One's complement, Internet checksum)	2	31-07-2025 02-08-2025		TLM1	
16.	Services to Network Layer	2	04-08-2025 05-08-2025		TLM1	
17.	Elementary Protocols: Simplex, Stop-and-Wait	1	7-08-2025		TLM1	
18.	Protocols for Noisy Channels	1	11-08-2025		TLM1	
19.	Sliding Window Protocols: Go-back-N, Selective Repeat	1	12-08-2025		TLM1	
20.	Summary and Protocol Comparison	2	14-08-2025 18-08-2025		TLM1	

21.	Recap + Hands-on Simulation + Quiz	1	19-08-2025		TLM1	
22.	tutorial	1	21-08-2025		TLM1	
No. of classes required to complete UNIT-II: 15				**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	01-09-2025		TLM1	
24.	CSMA/CD & CSMA/CA	1	02-09-2025		TLM1	
25.	Channelization Techniques: FDMA, TDMA, CDMA	1	04-09-2025		TLM1	
26.	Wired LANs: Introduction to Ethernet	1	06-09-2025		TLM1	
27.	Standard Ethernet – Frame Structure	1	08-09-2025		TLM1	
28.	Fast Ethernet – Features, Standards	1	09-09-2025		TLM1	
29.	Gigabit Ethernet and 10 Gigabit Ethernet	1	11-09-2025		TLM1	
30.	Ethernet Summary + Comparison Table	1	15-09-2025		TLM1	
31.	Practice: Frame design and decoding	1	16-09-2025		TLM1	
32.	Recap + tutorial	1	18-09-2025		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	20-09-2025		TLM1	
34.	Connectionless vs Connection-Oriented Services	1	22-09-2025		TLM1	
35.	Datagram vs Virtual Circuit Networks	1	23-09-2025		TLM1	
36.	Routing Algorithms: Optimality, Shortest Path, Flooding	2	25-09-2025 27-09-2025		TLM1	
37.	Distance Vector and Link State Routing	2	29-09-2025 30-09-2025		TLM1	
38.	Congestion Control: Principles, Algorithms	1	02-10-2025		TLM1	
39.	Traffic Control: Leaky Bucket, Token Bucket	1	04-10-2025		TLM1	
40.	Internetworking: IPv4, IPv6	2	06-10-2025 07-10-2025		TLM1	
41.	Recap + tutorial	1	9-10-2025		TLM1	
No. of classes required to complete UNIT-IV: 12				**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	11-10-2025		TLM1	
43.	UDP – Format, Features, Applications	2	13-10-2025 14-10-2025		TLM1	
44.	TCP – Services, Connection Establishment, Segments	1	16-10-2025		TLM1	
45.	TCP Features – Flow, Error, Congestion Control	1	18-10-2025		TLM1	
46.	Application Layer: Introduction to WWW & HTTP	1	20-10-2025		TLM1	
47.	Email Architecture: SMTP, POP3, IMAP	1	21-10-2025		TLM1	
48.	Email Security, Web-based Mail	1	23-10-2025		TLM1	
49.	TELNET – Remote Access	1	25-10-2025		TLM1	
50.	DNS – Hierarchy, Resolution Process	1	27-10-2025		TLM2	
51.	Recap + Assessment	2	28-10-2025		TLM2	
52.	tutorial		30-10-2025		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	31-10-2025					
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	**B.Swanth**	**Dr. B Sivarama krishna**	**Dr. D. Venkata Subbaiah**	**Dr .Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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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.
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 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 /D **A.Y.:** 2025-26

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. 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	02-07-2025		TLM2	
2.	Need of Automata theory, Central Concepts of Automata Theory	1	0-07-2025		TLM2	
3.	Finite Automata, Transition Systems	1	04-07-2025		TLM1	
4.	Acceptance of a String, DFA, Design of DFAs,	1	05-07-2025		TLM1	
5.	NFA, Design of NFA	1	09-07-2025		TLM1	
6.	Equivalence of DFA and NFA	2	10-07-2025 11-07-2025		TLM1	
7.	Conversion of NFA into DFA	2	12-07-2025 16-07-2025		TLM1	
8.	Finite Automata with Є Transitions	2	17-07-2025 18-07-2025		TLM1	
9.	Minimization of Finite Automata	2	19-07-2025 23-07-2025		TLM1	
10.	Finite Automata with output-Mealy and Moore Machines	1	24-07-2025		TLM1	
11.	Applications and Limitation of Finite Automata	1	25-07-2025		TLM1	
No. of classes required to complete UNIT-I: 15				**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	30-07-2025		TLM1	
13.	Regular Sets, Identity Rules	1	31-07-2025		TLM1	
14.	Equivalence of two RE	2	01-08-2025 02-08-2025		TLM1	
15.	Manipulations of REs, Finite Automata and Regular Expressions	2	06-08-2025 07-08-2025		TLM1	
16.	Inter Conversion, Equivalence between FA and RE	2	08-08-2025 09-08-2025		TLM1	
17.	Pumping Lemma of Regular Sets	1	13-08-2025		TLM1	
18.	Closure Properties of Regular Sets, Grammars	1	14-08-2025		TLM1	
19.	Classification of Grammars	1	20-08-2025		TLM1	
20.	Chomsky Hierarchy	1	21-08-2025		TLM1	
21.	Right and Left Linear Regular Grammars,	1	22-08-2025		TLM1	

22.	Equivalence between RG and FA, Inter Conversion.	1	23-08-2025		TLM1	
No. of classes required to complete UNIT-II: 14				**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
23.	Context Free Grammar, Leftmost and Rightmost Derivations	1	03-09-2025		TLM1	
24.	Parse Trees,	1	04-09-2025		TLM1	
25.	Ambiguous Grammars	1	05-09-2025		TLM1	
26.	Simplification of Context Free Grammars-Elimination of Useless Symbols	1	06-09-2025		TLM1	
27.	Є- Productions	1	10-09-2025		TLM1	
28.	Unit Productions	1	11-09-2025		TLM1	
29.	Normal Forms-Chomsky Normal Form	1	12-09-2025		TLM1	
30.	Greibach Normal Form	1	13-09-2025		TLM1	
31.	Pumping Lemma,	1	17-09-2025		TLM1	
32.	Closure Properties, Applications of Context Free Grammars.	1	18-09-2025		TLM1	
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
33.	Pushdown Automata, Definition, Model, Graphical Notation	1	19-09-2025		TLM1	
34.	Instantaneous Description	1	20-09-2025		TLM1	
35.	Language Acceptance of Pushdown Automata	1	22-09-2025		TLM1	
36.	Design of Pushdown Automata	2	24-09-2025 25-09-2025		TLM1	
37.	Deterministic and Non – Deterministic Pushdown Automata	2	26-09-2025 27-09-2025		TLM1	
38.	Equivalence of Pushdown Automata and Context Free Grammar	1	03-10-2025		TLM1	
39.	Conversion	1	04-10-2025		TLM1	
40.	Two Stack Pushdown Automata	2	08-10-2025 09-10-2025		TLM1	
41.	Application of Pushdown Automata	1	10-10-2025		TLM1	
No. of classes required to complete UNIT-IV: 12				**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
42.	Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions	1	11-10-2025		TLM1	
43.	Transition Tables and Transition Diagrams	2	15-10-2025 16-10-2025		TLM1	
44.	Language of a TM, Design of TMs	1	17-10-2025		TLM1	
45.	Types of TMs, Church's Thesis,	1	18-10-2025		TLM1	
46.	Universal and Restricted TM	1	22-10-2025		TLM1	
47.	Decidable and Un-decidable Problems,	1	23-10-2025		TLM1	
48.	Halting Problem of TMs	1	24-10-2025		TLM1	
49.	Post's Correspondence Problem	1	25-10-2025		TLM1	
50.	Modified PCP	1	29-10-2025		TLM2	
51.	Classes of P and NP	2	30-10-2025 31-10-2025		TLM2	
52.	NP-Hard and NP-Complete Problems				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.	Designing and implementing the control logic of Vending machines using Finite Automata	1	31-10-2025					
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. D.Veeraiah**	**Dr. D.Veeraiah**	**Dr. D. Venkata Subbaiah**	**Dr .Nagarjuna Reddy**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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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.
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 **:** Artificial Intelligence & 23AD02
L-T-P Structure **:3-0-0** **Credits:** 3
Program/Sem/Sec :BTECH/V/D **A.Y.:** 2025-26

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,"Artifical 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	1-07-2025		TLM1	
2.	Basics of AI	1	2-07-2025		TLM1	
3.	foundation of AI and history of AI	1	3-07-2025		TLM1	
4.	intelligent agents: Agents and Environments,	1	05-07-2025		TLM1	
5.	the concept of rationality,	1	8-07-2025		TLM2	
6.	the nature of environments	1	9-07-2025		TLM2	
7.	structure of agents,	1	10-07-2025		TLM2	
8.	problem solving agents	1	12-07-2025		TLM2	
9.	problem formulation.	1	15-07-2025		TLM2	
10.	Revision	1	16-07-2025		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	17-07-2025		TLM2	
12.	Breadth first search	1	19-07-2025		TLM2	
13.	Breadth first search	1	22-07-2025		TLM2	
14.	depth first Search.	1	23-07-2025		TLM2	
15.	Search with partial information (Heuristic search) Hill climbing	1	24-07-2025		TLM2	
16.	Search with partial information (Heuristic search) Hill climbing	1	29-07-2025		TLM2	
17.	A* Algorithm	1	30-07-2025		TLM2	
18.	A* Algorithm	1	31-07-2025		TLM2	
19.	AO* Algorithm	1	02-08-2025		TLM2	
20.	AO* Algorithm	1	05-08-2025		TLM2	
21.	Problem reduction, Game Playing- Adversial search	1	06-08-2025		TLM2	
22.	Problem reduction, Game Playing- Adversial search, Games,	1	07-08-2025		TLM2	
23.	mini-max algorithm,	1	09-08-2025		TLM2	
24.	optimal decisions in multiplayer games	2	12-08-2025 13-08-2025		TLM2	
25.	Problem in Game playing	2	14-08-2025 19-08-2025		TLM2	
26.	Alpha-Beta pruning	1	20-08-2025		TLM2	
27.	Evaluation functions.	1	21-08-2025		TLM2	
28.	Revision	1	23-08-2025			
No. of classes required to complete UNIT-II: 21				**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	02-09-2025		TLM2	
30.	predicate logic- logic programming	1	03-09-2025		TLM2	
31.	semantic nets- frames and inheritance	1	04-09-2025		TLM2	
32.	constraint propagation	1	06-09-2025		TLM2	
33.	representing knowledge using rules,	1	09-09-2025		TLM2	
34.	rules based deduction systems. Reasoning under uncertainty,	1	10-09-2025		TLM2	
35.	review of probability, Bayes' probabilistic interference	1	11-09-2025		TLM2	
36.	dempstershafer theory	1	13-09-2025		TLM2	
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	16-09-2025		TLM2	
38.	First order logic	1	17-09-2025		TLM2	
39.	Inference in first order logic,	1	18-09-2025		TLM2	
40.	propositional vs. first order inference,	1	20-09-2025		TLM2	
41.	unification & lifts forward chaining	1	23-09-2025		TLM2	
42.	Backward chaining	1	24-09-2025		TLM2	
43.	Resolution	1	25-09-2025		TLM2	
44.	Learning from observation	1	27-09-2025		TLM2	
45.	Inductive learning,	1	01-10-2025		TLM2	
46.	Decision trees,	1	04-10-2025		TLM2	
47.	Decision trees,	1	07-10-2025		TLM2	
48.	Explanation based learning	1	08-10-2025		TLM2	
49.	Statistical Learning methods	1	09-10-2025		TLM2	
50.	Reinforcement Learning	1	11-10-2025		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	14-10-2025		TLM2	
52.	Roles of expert systems	1	15-10-2025		TLM2	
53.	Knowledge Acquisition Meta knowledge Heuristics.	1	16-10-2025		TLM2	
54.	Knowledge Acquisition Meta knowledge Heuristics.	2	18-10-2025 22-10-2025		TLM2	
55.	Typical expert systems – MYCIN	2	23-10-2025 25-10-2025		TLM2	
56.	DART	1	28-10-2025		TLM2	
57.	XCON	1	29-10-2025		TLM2	
58.	Expert systems shells.	1	30-10-2025		TLM2	
59.	Revision	1	01-11-2025			

No. of classes required to complete UNIT-V: 11	No. of classes taken:

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

PART-C

EVALUATION PROCESS (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	**Mr.N.Srikanth**	**Dr.N.V.Maha Lakshmi**	**Dr.K.Devi Priya**	**Dr. S. Nagarjuna Reddy**
Signature				

LAKIREDDY BALIREDDYCOLLEGE OF ENGINEERING

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Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE HANDOUT

PART-A

Name of Course Instructor: Mallikarjuna Rao 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.:** 2025-26

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	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO2	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO3	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO4	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-
CO5	3	2	-	-	-	3	3	-	-	-	-	2	3	-	-

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

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

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	30-06-2025		TLM2	
2.	Role and potential of new and renewable sources	1	01-07-2025		TLM2	
3.	The solar energy option, Environmental impact of solar power	1	04-07-2025		TLM2	
4.	Structure of the Sun, The solar constant	1	07-07-2025		TLM2	
5.	Sun-earth relationships	1	08-07-2025		TLM2	
6.	Coordinate systems and coordinates of the sun	1	11-07-2025		TLM2	
7.	Extraterrestrial and terrestrial solar radiation	1	14-07-2025		TLM2	
8.	Solar radiation on tilted surface	1	15-07-2025		TLM2	
9.	Instruments for measuring solar radiation and sun shine, Solar radiation data	1	18-07-2025		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, Packing Density	1	21-07-2025		TLM2	
2.	Interconnenctions, Mismatch and temperature effects	1	22-07-2025		TLM2	
3.	Electrical and Mechanical Insulation, Lifetime of PV modules, Degradation and failure	1	25-07-2025		TLM2	
4.	PV module parameters, Efficiency of PV Systems	1	28-07-2025		TLM2	
5.	Solar PV Systems	1	29-07-2025		TLM2	
6.	Battery Operation, Types of Batteries, Battery parameters, Applications, Selection of batteries for Solar PV System	1	01-08-2025		TLM2	
No. of classes required to complete UNIT-II: 06				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	04-08-2025		TLM2	
2.	Classification of concentrating collectors	1	05-08-2025		TLM2	
3.	Solar Energy Storage and Applications: Different methods	1	08-08-2025		TLM2	
4.	Sensible latent heat and stratified storage, Solar ponds	1	11-08-2025		TLM2	
5.	Solar Applications-solar heating cooling technique	1	12-08-2025		TLM2	
6.	Solar distillation and drying	1	18-08-2025		TLM2	
7.	Solar cookers	1	19-08-2025		TLM2	
8.	Central power tower concept	1	22-08-2025		TLM2	
9.	Solar chimney	1	01-09-2025		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	1	02-09-2025		TLM2	
2.	Horizontal and Vertical axis wind mill	1	05-09-2025		TLM2	
3.	Performance characteristics	1	08-09-2025		TLM2	
4.	Betz criteria	1	09-09-2025		TLM2	
5.	Types of winds	1	12-09-2025		TLM2	
6.	Wind data measurement	1	15-09-2025		TLM2	
7.	Bio-mass: Principles of bio-conversion	1	16-09-2025		TLM2	
8.	Anaerobic/aerobic digestion	1	19-09-2025		TLM2	
9.	Types of biogas digesters	1	22-09-2025		TLM2	
10.	Gas yield, Gasifiers	1	23-09-2025		TLM2	
11.	Applications	1	26-09-2025		TLM2	
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	06-10-2025		TLM2	
2.	Types of Geothermal Resources	1	07-10-2025		TLM2	
3.	Geothermal power generation	1	10-10-2025		TLM2	
4.	Relative merits and demerits	1	13-10-2025		TLM2	
5.	Ocean Energy: Ocean Thermal energy	1	14-10-2025		TLM2	
6.	Open cycle and closed cycle OTEC plants, Environmental impacts	1	17-10-2025		TLM2	
7.	Challenges and applications, Fuel Cells: Introduction, Applications	1	20-10-2025		TLM2	
8.	Classification, Different types of Fuel Cells, Phosphoric Acid fuel cell	1	24-10-2025		TLM2	
9.	Alkaline fuel cell	1	27-10-2025		TLM2	
10.	PEM fuel cell	1	28-10-2025		TLM2	
11.	MC fuel cell	1	31-10-2025		TLM2	
No. of classes required to complete UNIT-V: 11				No. of classes taken:		

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

Academic Calendar

Description	From	To	Weeks
I Phase of Instructions	30-06-2025	23-08-2025	8
I MID Examinations	25-08-2025	30-08-2025	1
II Phase of Instructions	01-09-2025	01-11-2025	9
II MID Examinations	03-11-2025	08-11-2025	1
Preparation and Practicals	10-11-2025	15-11-2025	1
Semester End Examinations	17-11-2025	25-11-2025	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.
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	**Communication**: Communicate effectively on complex engineering activities with the

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	To apply the 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
Mallikarjuna Rao Dandu	Dr. P.Vijay Kumar	Dr. P.Vijay Kumar	Dr. M B S Sreekar Reddy

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE HANDOUT
PART-A

Name of Course Instructor : Dr.G.V.Suresh
Course Name & Code : Data Mining Lab (23AD55)
L-T-P Structure : 0-0-3 **Credits:**1.5
Program/Sem/Sec : B. Tech V Sem CSE – B Section **A.Y.:** 2025-26

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	3	2	2	3					2		2	2	2	3
CO2	3	3	3	3	3					2		2	2	2	3
CO3	3	3	2	3	3					2		2	2	2	3
CO4			2		2	2		2	3	3	3	2	1	1	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	02-07-25		TLM4	
2	Data preprocessing tasks using python libraries: c) Dealing with missing data	3	09-07-25		TLM4	
3	Data preprocessing tasks using python libraries: a) Dealing with categorical data	3	16-07-25		TLM4	
4	Data preprocessing tasks using python libraries: b) Scaling the features. c) Splitting dataset into Training and Testing Sets	3	23-07-25		TLM4	
5	Similarity and Dissimilarity Measures using python: a) Pearson's Correlation b) Cosine Similarity	3	30-07-25		TLM4	
6	Similarity and Dissimilarity Measures using python: c) Jaccard Similarity d) Euclidean Distance	3	06-08-25		TLM4	
7	Similarity and Dissimilarity Measures using python: d) Euclidean Distance e) Manhattan Distance	3	13-08-25		TLM4	
8	Build a model using linear regression algorithm on any dataset.	3	20-08-25		TLM4	
9	Build a classification model using Decision Tree algorithm on iris dataset.	3	03-09-25		TLM4	
10	Apply Naïve Bayes Classification algorithm on any dataset.	3	10-09-25		TLM4	
11	Generate frequent item set using Apriori Algorithm in python.	3	17-09-25		TLM4	
12	Generate association rules for any market basket data.	3	24-09-25		TLM4	
13	Apply K- Means clustering algorithm on any dataset.	3	08-10-25		TLM4	
14	Apply Hierarchical Clustering algorithm on any	3	15-10-25		TLM4	

	dataset.				
15	Apply DBSCAN clustering algorithm on any dataset.	3	22-10-25		
16	Internal Exam	3	29-10-25		

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

PART-C

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

Title	**Course Instructor**	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	**Dr.G.V.Suresh**	**Dr. D. Venkata Subbaiah**	**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: 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/D **A.Y.:** 2025-26

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	01-07-2025		
2.	Write a Program to implement the data link layer farming methods such as i) Character stuffing ii) bit stuffing.	03	08-07-2025		
3.	Write a Program to implement data link layer farming method checksum.	03	15-07-2025		
4.	Write a program for Hamming Code generation for error detection and correction.	03	22-07-2025		
5.	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16	03	29-07-2025		
6.	Write a Program to implement Sliding window protocol for Goback N.	03	05-08-2025		
7.	Write a Program to implement Sliding window protocol for Selective repeat.	03	12-08-2025		
8.	Write a Program to implement Stop and Wait Protocol.	03	19-08-2025		
9.	Write a program for congestion control using leaky bucket algorithm	03	02-09-2025		
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	09-09-2025		
11.	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.	03	23-09-2025		
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	14-10-2025		
13.	Internal Exam	03	03-11-2025		

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 oforganization.
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. 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: Mr. Md. Amanatulla
Course Name & Code : FULL STACK DEVELOPMENT-II (23CSS3)
L-T-P Structure : 0-1-2 **Credits:** 2
Program/Sem/Sec : B.Tech. – CSE/V/D **A.Y.:** 2025-26

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	30-06-2025		**DM5**	
2.	JDBC Programs	3	07-07-2025		**DM5**	
3.	Servlet Programs	3	14-07-2025		**DM5**	
4.	JSP Introduction	3	21-07-2025		**DM5**	
5.	JSP MVC programs	6	28-07-2025 04-08-2025		**DM5**	
6.	Node JS Introduction	3	11-08-2025		**DM5**	
7.	Express JS Framework	3	18-08-2025		**DM5**	
8.	Node JS & Express JS Programs	6	01-09-2025 08-09-2025		**DM5**	
9.	MangoDB	3	15-09-2025		**DM5**	
10.	MangoDB with Express JS	3	22-09-2025		**DM5**	
11.	React JS	3	29-09-2025		**DM5**	
12.	React JS and Full stack Integration	3	06-10-2025		**DM5**	
13.	Web Application Development	6	13-10-2025 20-10-2025		**DM5**	
14.	Internal Test	3	27-10-2025		**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.
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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.
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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. Md. Amanatulla	Mr. N. SrinivasaRao	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 B SIVARAMAKRISHNA
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/III/D **A.Y.:** 2025-26

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	PO 10	PO 11	PO 12	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	01-07-2025		
2.	a) Install Flutter and Dart SDK. b) Write a simple Dart program to understand the language basics.	03	08-07-2025		
3.	a) Explore various Flutter widgets (Text, Image, Container, etc.). b) Implement different layout structures using Row, Column, and Stack widgets.	03	15-07-2025		
4.	a) Design a responsive UI that adapts to different screen sizes. b) Implement media queries and breakpoints for responsiveness.	03	22-07-2025		
5.	a) Set up navigation between different screens using Navigator. b) Implement navigation with named routes.	03	29-07-2025		
6.	Practice Lab	03	05-08-2025		
7.	a) Learn about stateful and stateless widgets. b) Implement state management using set State and Provider.	03	12-08-2025		
8.	a) Create custom widgets for specific UI elements. b) Apply styling using themes and custom styles.	03	19-08-2025		
9.	a) Design a form with various input fields. b) Implement form validation and error handling.	03	02-09-2025		
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	09-09-2025		
11.	a) Add animations to UI elements using Flutter 's animation framework. b) Experiment with different types of animations (fade, slide, etc.).	03	23-09-2025		
12.	a) Fetch data from a REST APL b) Display the fetched data in a meaningful way in the UI.	03	14-10-2025		
13.	Internal Exam	03	03-11-2025		

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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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. Y. Vijaya Bhaskar Reddy**	**Dr. S. Nagarjuna Reddy**
Signature				