LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
Accredited by NAAC & NBA (CSE, IT, ECE, EEE & ME)
Approved by AICTE, New Delhi and Affiliated to JNTUK, Kakinada
L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India
DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT
PART-A

Name of Course Instructor : Mr. G. Rajendra
Course Name & Code : Operating Systems & 20CS11 **Section:** B
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech., IT., IV-Sem., **A.Y:** 2022-23

Pre-requisite: Knowledge of Computer fundamentals & Data structures& Algorithms.

Course Educational Objectives (CEOs): The objective of the course is to provide basic knowledge of computer operating system structure and functioning, understand how Operating Systems evolved with advent of computer architecture, and comprehend the different CPU scheduling algorithms, page replacement algorithms, disk scheduling and identify best one.

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

CO1	Demonstrate the underlying principles and techniques of operating system **(Understand-L2)**
CO2	Interpret scheduling and communication methods of processes handled by operating systems **(Understand-L2)**.
CO3	Distinguish the process synchronization methods and deadlock handling approaches employed in operating systems **(Understand-L2)**.
CO4	Classify memory management techniques and virtual memory mechanisms **(Understand-L2)**.
CO5	Interpret the strategies of disk scheduling algorithms and file system architecture **(Understand-L2)**.

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

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

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

TEXTBOOKS:

1. Silberschatz & Galvin, "Operating System Concepts", Wiley, 7th edition, 2007.

REFERENCE BOOKS:

1. William Stallings, "Operating Systems", PHI, 5th Edition, 2004.
2. B.A. Forouzan& R.F. Giberg, —Unix and shell Programming||, Thomson, First Edition, New Delhi, 2003.
3. http://codex.cs.yale.edu/avi/os-book/OS9/slide-dir/index.html
4. https://swayam.gov.in/nd1_noc19_cs50/preview

PART-B

COURSE DELIVERY PLAN (LESSON PLAN)

UNIT-I: Introduction to Operating System

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course Outcomes and Program Outcomes	1	30-01-2023		**TLM2**	
2.	Operating-System Services	1	31-01-2023		**TLM2**	
3.	User Operating-System Interface.	1	01-02-2023		**TLM2**	
4.	System Calls, Types of System Calls,	1	02-02-2023		**TLM2**	
5.	System Programs, Operating-System Design and Implementation	1	06-02-2023		**TLM2**	
6.	**Tutorial-1**	1	07-02-2023		**TLM3**	
7.	Operating-System Structure	1	08-02-2023		**TLM2**	
8.	Virtual Machines.	1	09-02-2023		**TLM2**	
9.	Operating-System Generation, System Boot	1	13-02-2023		**TLM2**	
10.	**Tutorial-2**	1	14-02-2023		**TLM3**	
11.	**Assignment-1/ Quiz-1**	1	15-02-2023		**TLM6**	
No. of classes required to complete UNIT-I		11	No. of classes taken:			

UNIT-II: Process Management & Process Scheduling

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.	Process Concept, IPC.	1	16-02-2023		**TLM2**	
13.	Communication in Client-Server Systems.	1	20-02-2023		**TLM2**	
14.	Threads: Overview,	1	21-02-2023		**TLM2**	
15.	Multithreading Models	1	22-02-2023		**TLM2**	
16.	Process Scheduling: Scheduling Criteria.	1	23-02-2023		**TLM2**	
17.	Scheduling Algorithms (FCFS, SJF)	1	27-02-2023		**TLM2**	
18.	Scheduling Algorithms (Priority)	1	01-03-2023		**TLM2**	
19.	**Tutorial-3**	1	02-03-2023		**TLM3**	
20.	Scheduling Algorithms (Round Robin)	1	06-03-2023		**TLM2**	
21.	Discuss various problems related to scheduling algorithms	1	07-03-2023		**TLM2**	
22.	Discuss various problems related to scheduling algorithms		09-03-2023		**TLM2**	
23.	Discuss various problems related to scheduling algorithms	1	13-03-2023		**TLM2**	
24.	**Tutorial-4**	1	14-03-2023		**TLM3**	
25.	**Assignment-2 / Quiz-2**	1	15-03-2023		**TLM6**	
No. of classes required to complete UNIT-II		14	No. of classes taken:			

(27-03-2023 TO 01-04-2023) I-MID EXAMS

UNIT-III: Synchronization and Deadlocks

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	The Critical-Section Problem		16-03-2023		**TLM2**	
27.	Peterson's Solution, Synchronization Hardware.	1	20-03-2023		**TLM2**	
28.	Semaphores, Classic Problems of Synchronization.	1	21-03-2023		**TLM2**	
29.	Monitors	1	23-03-2023		**TLM2**	
30.	Deadlocks: System Model, Deadlock Characterization.	1	03-04-2023		**TLM2**	
31.	Methods for Handling Deadlocks.	1	04-04-2023		**TLM2**	
32.	Deadlock Prevention		06-04-2023		**TLM2**	
33.	Deadlock Avoidance, Deadlock Detection.	1	10-04-2023		**TLM2**	
34.	Recovery from Deadlock. **Tutorial-5**	1	11-04-2023		**TLM2, TLM3**	
35.	**Tutorial-6**	1	12-04-2023		**TLM3**	
36.	**Assignment-3 / Quiz-3**	1	13-04-2023		**TLM6**	
No. of classes required to complete UNIT-III		11	No. of classes taken:			

UNIT-IV: Memory Management

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
37.	Memory Management Strategies: Swapping, Contiguous Memory Allocation.	1	17-04-2023		**TLM2**	
38.	Paging, Structure of the Page Table.	1	18-04-2023		**TLM2**	
39.	Segmentation	1	19-04-2023		**TLM2**	
40.	**Tutorial-7**	1	20-04-2023		**TLM3**	
41.	Virtual Memory Management:	1	24-04-2023		**TLM2**	
42.	Demand Paging	1	25-04-2023		**TLM2**	
43.	Page Replacement,	1	26-04-2023		**TLM2**	
44.	Allocation of Frames, Thrashing.	1	27-04-2023		**TLM2**	
45.	**Tutorial-8**	1	01-05-2023		**TLM3**	
46.	**Assignment-4 / Quiz-4**	1	02-05-2023		**TLM6**	
No. of classes required to complete UNIT-IV		10	No. of classes taken:			

UNIT-V: File System Management

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
47.	Overview of Mass-Storage Structure, Disk Structure.	1	03-05-2023		**TLM2**	
48.	Disk Attachment, Disk Scheduling.	1	04-05-2023		**TLM2**	
49.	Disk Management	1	08-05-2023		**TLM2**	
50.	**Tutorial-9**	1	09-05-2023		**TLM3**	
51.	File-System Structure, File-System Implementation	1	10-05-2023		**TLM2**	
52.	Directory Implementation, Allocation Methods	1	11-05-2023		**TLM2**	
53.	Free-space Management	1	15-05-2023		**TLM2**	
54.	Efficiency and Performance		16-05-2023		**TLM2**	
55.	Recovery.		17-05-2023		**TLM2**	
56.	**Tutorial-10**	1	18-05-2023		**TLM3**	
57.	**Assignment-4 / Quiz-4**	1	23-05-2023		**TLM6**	
No. of classes required to complete UNIT-V		11	No. of classes taken:			

(05-06-203 TO 10-06-2023) II-MID EXAMS

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
58.		1	24-05-2023			
59.		1	25-05-2023			

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
Commencement of Class Work	**30-01-2023**		
I Phase of Instructions	30-01-2023	25-03-2023	8 W
I Mid Examinations	**27-03-2023**	**01-04-2023**	1W
II Phase of Instructions	03-04-2023	27-05-2023	7 W
II Mid Examinations	**05-06-2023**	**10-06-2023**	1W
Preparation and Practical	12-06-2023	17-06-2023	1W
Semester End Examinations	**19-06-2023**	**01-07-2023**	2W

EVALUATION PROCESS:(R20 Regulations)

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):

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Organize, Analyze, and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	Develop IT application services with the help of different current engineering tools.

Course Instructor	Module Coordinator	Course Coordinator	HOD
Mr. G. Rajendra	Dr. O. Rama Devi	Mr. G. Rajendra	Dr. B. Srinivasa Rao

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr.G. Rajendra
Course Name & Code : Operating Systems and Linux Internals Lab & 20IT53
L-T-P Structure : 0-0-3 Credits : 1.5
Program/Sem/Sec : B.Tech., IT., IV-Sem.,-B A.Y : 2022-23

PRE-REQUISITE: Programming language, DBMS, OOP concepts.

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

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

CO1	Experiment with Unix commands and shell programming **(Understand- L2)**
CO2	Implement CPU scheduling algorithms and memory management techniques **(Apply- L3)**.
CO3	Simulate process synchronization and file system management using system calls **(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				3								3		
CO2	3				3								1		
CO3		3			3										3
CO4										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).

PART-B

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.	Cycle-1	3	06-02-2023 13-02-2023		**TLM4**	
2.	Cycle-2	3	20-02-2023 27-02-2023		**TLM4**	
3.	Cycle-3	3	06-03-2023		**TLM4**	
4.	Cycle-4	3	13-03-2023		**TLM4**	
5.	Cycle-5	3	20-03-2023		**TLM4**	
6.	Cycle-6	3	03-04-2023		**TLM4**	
7.	Cycle-7	3	10-04-2023		**TLM4**	
8.	Cycle-8	3	17-04-2023		**TLM4**	
9.	Cycle-9	3	24-04-2023 01-05-2023		**TLM4**	
10.	Cycle-10	3	08-05-2023 15-05-2023		**TLM4**	
11.	Additional Lab Experiments	3	22-05-2023		**TLM4**	
12.	Additional Lab Experiments	3	29-05-2023		**TLM4**	

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

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	**Marks**
Day-to-day work	D1=05
Record	R1=05
Internal Test	IT1=5
Continuous Internal Evaluation (CIE)=D1+R1+IT1	**15**
Procedure/Algorithm	P1=5
Experimentation/Program execution	E1=10
Observations/Calculations/Validation	O1=10
Result/Inference	R1=5
Viva voce	V1=5
Semester End Examination (SEE)= P1+ E1+ O1+ V1	**30**
Total Marks = CIE+SEE	**50**

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and 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	Organize, Analyze and Interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs.
PSO 3	Develop IT application services with the help of different current engineering tools.

Course Instructor	Module Coordinator	Course Coordinator	HOD
Mr. G. Rajendra	Dr. O. Rama Devi	Mr. G. Rajendra	Dr. B. Srinivasa Rao

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

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: CH. POORNA VENKATA SRINIVASA RAO
Course Name & Code : DESIGN AND ANALYSIS OF ALGORITHMS & 20CS06
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/IV/B **A.Y. :**2022-23

PREREQUISITE: Discrete Mathematical Structures and Data Structures.

COURSE EDUCATIONAL OBJECTIVES (CEOs):

The objective of the course is to learn various algorithm design techniques and analyze the computing resources of the algorithms and motivate the students to design new algorithms for various problems.

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

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

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

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

TEXTBOOKS:

T1. Ellis Horowitz, SartajSahni,S Rajasekaran , “Fundamentals of Computer Algorithms”, University press, 2nd edition, 2012.

REFERENCE BOOKS:

R1 Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson, 3rd Edition, 2007.

R2 Aho, Hopcroft & Ullman, “The Design and Analysis of Computer Algorithms”, Addison Wesley publications, 2008.

R3 Thomas H.Corman et al, “Introduction to Algorithms”, PHI, 3rd edition, 2008.

R4 Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, PEA.

R5 P. H. Dave, H. B. Dave, “Design and Analysis of Algorithms‖, Pearson Education”, 2008.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Introduction

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction	1	01-02-2023		TLM1	
2.	Algorithm definition	1	02-02-2023		TLM1	
3.	Specifications	1	03-02-2023		TLM1	
4.	Performance Analysis	1	07-02-2023		TLM1	
5.	Time Complexity	1	08-02-2023		TLM1	
6.	Space Complexity	1	09-02-2023		TLM1	
7.	Asymptotic Notations	1	10-02-2023		TLM1	
8.	Big-Oh	1	14-02-2023		TLM1	
9.	Omega	1	15-02-2023		TLM1	
10.	Theta	1	16-02-2023		TLM1	
11.	Divide and Conquer	1	17-02-2023		TLM1	
12.	General Method	1	21-02-2023		TLM1	
13.	Binary Search	1	22-02-2023		TLM1	
14.	Finding Maximum and Minimum	1	23-02-2023		TLM1	
15.	Merge Sort	1	24-02-2023		TLM1	
16.	Quick sort	1	28-02-2023		TLM1	
17.	closest pair of points	1	01-03-2023		TLM1	
No. of classes required to complete UNIT-I: 17				**No. of classes taken:**		

UNIT-II: The Greedy Method

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
18.	The Greedy Method	1	01-03-2023		TLM1	
19.	General Method	1	02-03-2023		TLM1	
20.	Knapsack Problem	2	07-03-2023		TLM1	
21.	Job sequencing with deadlines	1	09-03-2023		TLM1	
22.	Minimum-cost spanning trees	2	14-03-2023		TLM1	
23.	Optimal storage on tapes	1	15-03-2023		TLM1	

24.	Single source shortest paths	2	17-03-2023		TLM1	
25.	Huffman coding	2	23-03-2023		TLM1	
No. of classes required to complete UNIT-II: 12				**No. of classes taken:**		

UNIT-III: Dynamic Programming

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Dynamic Programming	1	24-03-2023		TLM1	
27.	General method	1	04-04-2023		TLM1	
28.	Multistage graph	1	11-04-2023		TLM1	
29.	All pairs shortest path	2	13-04-2023		TLM1	
30.	Single Source Shortest path	2	19-04-2023		TLM1	
31.	Optimal Binary search trees	2	20-04-2023		TLM1	
32.	0/1 Knapsack	2	21-04-2023		TLM1	
33.	Reliability design	1	25-04-2023		TLM1	
34.	The travelling salesman problem	1	26-04-2023		TLM1	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Back tracking

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
35.	Back tracking	1	27-04-2023		TLM1	
36.	The General Method	1	28-04-2023		TLM1	
37.	The 8-Queens Problem	1	02-05-2023		TLM1	
38.	Sum of subsets	2	04-05-2023		TLM1	
39.	Graph Coloring	2	09-05-2023		TLM1	
40.	Hamiltonian cycles	1	10-05-2023		TLM1	
No. of classes required to complete UNIT-IV: 08				**No. of classes taken:**		

UNIT-V: Branch and Bound

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
41.	Branch and Bound	1	11-05-2023		TLM1	
42.	General method	1	12-05-2023		TLM1	
43.	Job sequencing with deadlines LC Branch and Bound	2	17-05-2023		TLM2	

44.	FIFO Branch and Bound and LIFO Branch and Bound	2	19-05-2023		TLM2	
45.	0/1 Knapsack problem LC Branch and Bound solution	2	24-05-2023		TLM2	
46.	0/1 Knapsack problem FIFO Branch and Bound solution	2	26-05-2023		TLM2	
47.	Travelling salesperson Problem LC Branch and Bound solution	2	30-05-2023		TLM2	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Recursive and Non-Recursive Algorithms	1	20-03-2022		TLM1	
2.	Recurrence Relations	1	26-03-2023		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

PEVALUATION PROCESS (R20 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**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. Ch. Poorna Venkata Srinivasa Rao**	**Dr. M. Sitha Ram**	**Mrs. M.Hemalatha**	**Dr.B.Srinivasa Rao**
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
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L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India
DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : Mr. M. Rajesh Reddy
Course Name & Code : Data Mining using Python Lab & 20CS58
L-T-P Structure : 0-0-3 Credits : 3
Program/Sem/Sec : B.Tech., IT., IV-Sem., B section A.Y : 2022-23

PRE-REQUISITE : Python Programming

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

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

CO 1	Apply preprocessing techniques on real world datasets.(**Apply-L3**)
CO 2	Apply apriori algorithm to generate frequent itemsets.(**Apply L3**)
CO 3	Apply Classification and clustering algorithms on different datasets.(**Apply L3**)
CO 4	Improve individual / teamwork skills, communication & report writing skills with ethical values.

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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	2	-	1	-	-	-	-	-	-	-	3	1	
CO2	-	-	-	2	1	-	-	-	-	-	-	-	-	3	1
CO3	-	-	-	2	1	-	-	-	-	-	-	-	-	3	2
CO4	-	-	-	-	-	-	-	2	2	2	-	-	-	-	-

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

Web Resources:

1. https://analyticsindiamag.com/data-pre-processing-in-python/
2. https://towardsdatascience.com/decision-tree-in-python-b433ae57fb93
3. https://towardsdatascience.com/calculate-similarity-the-most-relevant-metrics-in-a-nutshell-9a43564f533e
4. https://www.springboard.com/blog/data-mining-python-tutorial/
5. https://medium.com/analytics-vidhya/association-analysis-in-python-2b955d0180c
6. https://www.datacamp.com/community/tutorials/naive-bayes-scikit-learn
7. https://www.analyticsvidhya.com/blog/2019/05/beginners-guide-hierarchical-clustering/
8. https://towardsdatascience.com/dbscan-algorithm-complete-guide-and-application-with-python-scikit-learnd690cbae4c5d

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

S NO	Date (Tentative)	Actual Date	Topics to be covered	Teaching Learning Methods	HOD Signature
1	31.01.2023, 07.02.2023, 14.02.2023		Demonstrate the following data preprocessing tasks using python libraries. a) Loading the dataset b) Identifying the dependent and independent variables. c) Dealing with missing data	**TLM4**	
2	21.02.2023, 28.02.2023		Demonstrate the following data preprocessing tasks using python libraries. a) Dealing with categorical data. b) Scaling the features. c) Splitting dataset into Training and Testing Sets	**TLM4**	
3	07.03.2023		Demonstrate the following Similarity and Dissimilarity Measures using python a) Pearson's Correlation b) Cosine Similarity c) Jaccard Similarity d) Euclidean Distance e) Manhattan Distance	**TLM4**	
4	14.03.2023		Build a model using a linear regression algorithm on any dataset.	**TLM4**	
5	21.03.2023		Build a classification model using Decision Tree algorithm on iris dataset	**TLM4**	
Mid - I Examinations 27.03.2023 to 01.04.2023					
6	03.04.2023		Apply Naïve Bayes Classification algorithm on any dataset	**TLM4**	
7	10.04.2023		Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	**TLM4**	
8	17.04.2023, 24.04.2023		Apply the K- Means clustering algorithm on any dataset.	**TLM4**	
9	01.05.2023		Apply Hierarchical Clustering algorithms on any dataset.	**TLM4**	
10	08.05.2023		Apply the DBSCAN clustering algorithm on any dataset.	**TLM4**	
11	15.05.2023		Revision of all Experiments	**TLM4**	
12	22.05.2023		Internal Exam	**TLM4**	

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

PART-C

EVALUATION PROCESS (R17 Regulations):

Evaluation Task	Marks
Day-to-day work	D1=05
Record	R1=05
Internal Test	IT1=5
Continuous Internal Evaluation (CIE)=D1+R1+IT1	15
Procedure/Algorithm	P1=5
Experimentation/Program execution	E1=10
Observations/Calculations/Validation	O1=10
Result/Inference	R1=5
Viva voce	V1=5
Semester End Examination (SEE)= P1+ E1+ O1+ V1	30
Total Marks = CIE+SEE	50

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and 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.
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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	Organize, Analyze and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	Develop IT application services with the help of different current engineering tools.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. M. Rajesh Reddy**	**Dr. S. Jayaprada**	**Dr.K. Lavanya**	**Dr.B.Srinivasa Rao**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: M. Rajesh Reddy
Course Name & Code : Data Warehousing and Data mining & 20CS01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech/IV/B **A.Y.:** 2022-23

PREREQUISITE : **DBMS and Probability and Statistics**

COURSE EDUCATIONAL OBJECTIVES (CEOs): The Objective of the course is to introduce the concepts of data warehouse and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data warehousing concepts.

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

CO1	Summarize the architecture of data warehouse.(**Understand- L2**)
CO2	Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.(**Apply – L3**)
CO3	Construct a decision tree and resolve the problem of model over fitting. (**Analyze– L4**)
CO4	Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation.(**Apply - L3**)
CO5	Apply suitable clustering algorithm for the given data set.(**Apply - L3**)

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

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

TEXTBOOKS:

T1 Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.

T2 Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011.

REFERENCE BOOKS:

R1 Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010.

R2 Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020

R3 Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Data Warehouse and OLAP Technology

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction to Course and COs	1	31.01.2023		TLM1,2	
2.	Introduction to Unit-I	1	02.02.2023			
3.	**Data Warehouse and OLAP Technology**: An Overview: Data Warehouse	1	03.02.2023		TLM1,2	
4.	**Data Warehouse and OLAP Technology**: A Multidimensional Data Model	1	06.02.2023		TLM1,2	
5.	**Data Warehouse and OLAP Technology**: Data Warehouse Architecture	1	07.02.2023		TLM1,2	
6.	**Data Warehouse and OLAP Technology**: Data Warehouse Implementation	2	10.02.2023		TLM1,2	
7.	**Data Warehouse and OLAP Technology**: From Data Warehousing to Data Mining.	2	14.02.2023		TLM1,2	
8.	**Revision**	1	16.02.2023		TLM1,2	
9.	**Assignment on Unit-1**	1	17.02.2023			
No. of classes required to complete UNIT-I: 11				**No. of classes taken:**		

UNIT-II: Data Mining & Data Preprocessing

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**Data Mining**: Introduction to Data Mining	1	20.02.2023		TLM1,2	
2.	Motivating challenges, The origins of Data Mining,	1	21.02.2023		TLM1,2	
3.	Data MiningTasks, Types of Data, Data Quality.	2	24.02.2023		TLM1,2	
4.	**Data Preprocessing:** Aggregation	1	27.02.2023		TLM1,2	
5.	**Data Preprocessing:** Sampling, Dimensionality Reduction, Feature Subset Selection	2	02.03.2023		TLM1,2	
6.	**Data Preprocessing:** Feature creation	1	03.03.2023		TLM1,2	
7.	**Data Preprocessing:** Discretization and Binarization	1	06.03-2023		TLM1,2	
8.	**Data Preprocessing:** Variable Transformation	1	07.03.2023		TLM1,2	
9.	**Data Preprocessing:** Measures of Similarity and Dissimilarity	1	09.03.2023		TLM1,2	
10.	**Revision**	1	10.03.2023		TLM1,2	

11.	**Assignment on Unit-2**	1	13.03.2023			
No. of classes required to complete UNIT-II: 13				**No. of classes taken:**		

UNIT-III: Classification & Model Over fitting

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**Classification:** Basic Concepts, General Approach to solving a classification problem	2	16.03.2023		TLM1,2	
2.	**Decision Tree Induction**: Working of Decision Tree, building a decision tree	2	20.03.2023		TLM1,2	
3.	methods for expressing an attribute test conditions, measures for selecting the best split	2	23.03.2023		TLM1,2	
4.	Algorithm for decision tree Induction.	1	24.03.2023		TLM1,2	
Mid - I Examinations from 27.03.2023 to 01.04.2023						
5.	**Model Overfitting**: Due to presence of noise, due to lack of representation samples	1	03.04.2023		TLM1,2	
6.	**Evaluating the performance of classifier**: holdout method, random sub sampling, cross-validation, bootstrap.	2	06.04.2023		TLM1,2	
7.	BayesTheorem	1	11.04.2023		TLM1,2	
8.	Naïve Bayes Classifier	2	17.04.2023		TLM1,2	
No. of classes required to complete UNIT-III: 13				**No. of classes taken:**		

UNIT-IV: Association Analysis

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	**Association Analysis:** Basic Concepts	1	18.04.2023		TLM1,2	
2.	Algorithms: Problem Definition, Frequent Item Set Generation	2	21.04.2023		TLM1,2	
3.	Apriori Principle, Apriori Algorithm	2	25.04.2023		TLM1,2	
4.	Rule Generation, Compact Representation of Frequent Itemsets	2	28.04.2023		TLM1,2	
5.	FPGrowth Algorithm	1	01.05.2023		TLM1,2	
6.	**Revision**	1	02.05.2023		TLM1,2	
7.	**Assignment on Unit-4**	1	04.05.2023			
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
1.	**Cluster Analysis**: Basic Concepts and Algorithms: Preliminaries	1	05.05.2023		TLM1,2	
2.	Different Types ofClustering, Different Types of Clusters;	1	08.05.2023		TLM1,2	
3.	**K-means:** The Basic K-means Algorithm	1	09.05.2023		TLM1,2	
4.	K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses;	1	11.05.2023		TLM1,2	
5.	Exercise problems on K-means	1	12.05.2023		TLM1,2	
6.	**Agglomerative Hierarchical Clustering:** Basic Agglomerative Hierarchical Clustering Algorithm	1	15.05.2023		TLM1,2	
7.	Exercise problems on Agglomerative Hierarchical Clustering Algorithm	1	16.05.2023		TLM1,2	
8.	DBSCAN: Traditional Density Center-Based Approach,DBSCAN Algorithm, Strengths and Weaknesses.	1	18.05.2023		TLM1,2	
9.	Exercise problems on DBSCAN Algorithm	1	19.05.2023		TLM1,2	
10.	**Revision**	1	22.05.2023		TLM1,2	
11.	**Assignment on Unit-5**	1	23.05.2023			
No. of classes required to complete UNIT-V: 11				**No. of classes taken:**		

CONTENT BEYOND THE SYLLABUS:

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Regression Analysis - I (Linear Regression)	1	25.05.2023		TLM1,2	
2.	Regression Analysis - II (Logistic Regression)	1	26.05.2023		TLM1,2	

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

B.Tech (IV Semester)			
Commencement of Class Work	**30-01-2023**		
I Phase of Instructions	30-01-2023	25-03-2023	8 W
I MID Examinations	**27-03-2023**	**01-04-2023**	**1 W**
II Phase of Instructions	03-04-2023	27-05-2023	8 W
Summer Vacation	29-05-2023	03-06-2023	1 W
II MID Examinations	**05-06-2023**	**10-06-2023**	**1 W**
Preparation and Practicals	12-06-2023	17-06-2023	1 W
Semester End Examinations	**19-06-2023**	**01-07-2023**	**2 W**
Internship	03-07-2023	15-07-2023	2 W
Commence of Next Semester Class Work		17-07-2023	

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.

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PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Organize, Analyze and interpret the data to extract meaningful conclusions.
PSO 2	Design, Implement and Evaluate a computer-based system to meet desired needs
PSO 3	Develop IT application services with the help of different current engineering tools.

Title	Course Instructor	Course Coordinator	Module Coordinator	Head of the Department
Name of the Faculty	**Mr. M. Rajesh Reddy**	**Dr. S. Jayaprada**	**Dr.K. Lavanya**	**Dr.B.Srinivasa Rao**
Signature				

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Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: Mrs.S.JYOTHI
Course Name & Code : Software Engineering Lab, 20IT55
L-T-P Structure : 0-0-3 **Credits:** 1.5
Program/Sem/Sec : B.Tech-IT / IV SEM / B
A.Y. : 2022-23

PREREQUISITE : Object Oriented Programming

Course Educational Objectives:

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

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

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

COURSE ARTICULATION MATRIX (Correlation of Cos & POs, PSOs):

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

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

PART-B

COURSE DELIVERY PLAN (LESSON PLAN): Section-C

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	Case Studies	3	02-02-2023		TLM4	CO1	
2	**Cycle-1**: Analyze the Requirements for the following Case Studies. 1) Automated Teller Machine (ATM) 2) Library Management System 3) Railway Ticket Reservation System	3	09-02-2023		TLM4	CO1	
3	**Cycle-2**: Analyze the Requirements for the following Case Studies. 1) Point-of-Sale Terminal 2) Customer Support Service Operations 3) Cab Booking Service	3	16-02-2023		TLM4	CO1	
4	**Cycle-3:** Basics of UML, 1) Introduction to UML. 2) Familiarization with any one of the Software such as Rational Rose or Umbrello or Gliffy Diagram etc.	3	23-02-2023		TLM4	CO1	
5	**Cycle-4:** For each case study given earlier, Construct Use Case Diagram for following: 1) Identify and Analyze the Actors. 2) Identify the Actions. 3) Analyze the Relationships between Actors and Actions. 4) Sketch the Use Case Diagram.	3	02-03-2023		TLM4	CO2	
6	**Cycle-5:** For each case study given earlier, Construct Class Diagram in the following manner: 1) Identify and Analyze the Classes related to your problem. 2) Analyze the Attributes and Operations 3) Analyze the Relationships between Classes 4) Sketch the Class Diagram	3	09-03-2023		TLM4	CO1	
7	**Cycle-6:** For each case study given earlier, Construct Class Diagram in the following manner: 1) Identify and Analyze the Classes related to		16-03-2023				

	your problem. 2) Analyze the Attributes and Operations 3) Analyze the Relationships between Classes 4) Sketch the Class Diagram						
8	**Cycle-7:** For each case study given earlier, Construct Interaction Diagrams in the following manner: 1) Identify the Objects participating in Communication. 2) Identify the Messages between the objects. 3) Give numbering to messages. 4) Use Flat Sequencing or Procedural Sequencing for numbering	3	23-03-2023		TLM4	CO2	
9	**Cycle-8:**For each case study given earlier, Construct Activity Diagram in the following manner: 1) Identify activities in your case study. 2) Identify relationships among activities. 3) Use Fork or Join, if necessary. 4) Sketch the diagram.	6	06-04-2023 & 13-04-2023		TLM4	CO3	
10	**Cycle-9**: For each case study given earlier, Construct State Chart Diagram in the following manner: 1) Identify the different states in your case study. 2) List out the different sub-states present in the state. 3) Identify relationships among the state to state. 4) Sketch the diagram.	6	20-04-2023 & 27-04-2023		TLM4	CO3	
11	**Cycle-10**:For each case study given earlier, Construct Component Diagram in the following manner: 1) Identify the different components in your case study 2) Create a visual for each of the component. 3) Describe the organization and relationships between components using interfaces, ports etc. 4) Sketch the diagram.	6	04-05-2023 & 11-05-2023		TLM4	CO3	

12	**Cycle-11:** For each case study given earlier, Construct Deployment Diagram in the following manner: 1) Identify the nodes. 2) Identify the relationships among the nodes. 3) Sketch the Diagram.	3	18-05-2023		TLM4	CO3	
13	**Internal Lab Exam**		27-05-2023				

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**
Day-to-Day Work	A1 = 5
Record & Observation	B1 = 5
Internal Exam	C1 = 5
Cumulative Internal Examination (CIE): (A1+B1+C1)	15
Semester End Examination (SEE)	35
Total Marks = CIE + SEE	50

PART-D

PROGRAMME OUTCOMES (POs):

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

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mrs.S.Jyothi	Dr.J.Nageswara Rao	Mr.G.Rajendra	Dr. B.Srinivasa Rao
Signature				

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor : Mrs.S.JYOTHI
Course Name & Code : Software Engineering, 20IT01
L-T-P Structure : **3-0-0** **Credits:** 3
Program/Sem/Sec : B.Tech, IV,Sec-B **A.Y.:** 2022-23

PREREQUISITE : Object Oriented Programming

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

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

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

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

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

TEXTBOOKS:

T1 Roger S. Pressman, "Software engineering- A Practitioner 's Approach", TMH International Edition, 6th edition, 2005.

T2 Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modelling Language User Guide", PEARSON, 4th Impression, 2012.

REFERENCE BOOKS:

R1 Software Engineering - Concepts and practices: Ugrasen Suman, Cengage learning

R2 Object-oriented analysis and design using UML", Mahesh P. Matha, PHI

R3 Fundamentals of Software Engineering, Rajib Mall, Third Edition ,PHI

R4 https://nptel.ac.in/courses/106/105/106105182/[1,2,3]

R5 https://onlinecourses.nptel.ac.in/noc20_cs68 [1,2,3,4,5]

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: Software and software Engineering & Software Process and Process Models

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction, CO's and PO's	1	01/02/23		TLM-1	
2.	The Evolving role of Software	1	02/02/23		TLM-1	
3.	Characteristics of Software	1	03/02/23		TLM-2	
4.	Importance of software Engineering	1	06/02/23		TLM-2	
5.	Changing nature of software, Legacy Software	1	08/02/23		TLM-2	
6.	Software Myths.	1	09/02/23		TLM-1	
7.	Layered technology, Process frame work	2	10/02/23& 13/02/23		TLM-1	
8.	The process and Product	1	15/02/23		TLM-1	
9.	Software process models, The water fall model	2	16/02/23& 17/02/23		TLM-2	
10.	Incremental model,	1	20/02/23		TLM-2	
11.	The spiral and V Model	1	22/02/23		TLM-2	
12.	Component based s/w development	1	23/02/23		TLM-2	
13.	Unified process model	1	24/02/23		TLM-1	
No. of classes required to complete UNIT-I: 15				**No. of classes taken:**		

UNIT-II: Requirements Analysis and Software design & Data Engineering

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
14.	Requirements gathering	1	27/02/23		TLM-1	
15.	Requirements analysis	1	01/03/23		TLM-1	
16.	software requirements specifications (SRS)	2	02/03/23& 03/03/23		TLM-1	
17.	overview of design process	2	06/03/23& 09/03/23		TLM-1	
18.	Design Concepts	2	10/03/23& 13/03/23		TLM-2	
19.	Architectural Concepts	2	15/03/23& 16/03/23		TLM-2	
No. of classes required to complete UNIT-II: 10				**No. of classes taken:**		

UNIT-III: Design Using UML

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
20.	Building Blocks of UML	1	17/03/23		TLM-1	
21.	Defining things	1	20/03/23		TLM-1	
22.	Relationships and diagrams	1	23/03/23		TLM-1	
23.	Common Mechanism in UML	1	24/03/23		TLM-1	
24.	Class Diagrams	1	03/04/23		TLM-2	
25.	Object Diagrams	1	06/04/23		TLM-2	
No. of classes required to complete UNIT-III: 6				**No. of classes taken:**		

UNIT-IV: Behavioral Modeling

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
26.	Interactions, Interaction diagrams	1	10/04/23		TLM-2	
27.	use cases, Use case Diagrams	2	12/04/23& 13/04/23		TLM-2	
28.	Activity Diagrams	2	17/04/23& 19/04/23		TLM-2	
29.	Events and signals	2	20/04/23& 21/04/23		TLM-1	
30.	state machines	2	24/04/23& 26/04/23		TLM-1	
31.	Processes and Threads	2	27/04/23& 28/04/23		TLM-1	
32.	Time and space	2	01/05/23& 03/05/23		TLM-1	
33.	State chart diagrams	2	04/05/23& 05/05/23		TLM-2	
No. of classes required to complete UNIT-IV: 15				**No. of classes taken:**		

UNIT-V: Testing Techniques

S. No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
34.	Software testing fundamentals	1	08/05/23		TLM-2	
35.	Unit testing	2	10/05/23& 11/05/23		TLM-1	
36.	Integration testing	2	12/05/23& 15/05/23		TLM-1	
37.	Black box testing	2	17/05/23& 18/05/23		TLM-1	
38.	white box testing	2	19/05/23& 22/05/23		TLM-1	
39.	Debugging	2	24/05/23& 25/05/23		TLM-1	
40.	System testing	1	26/05/23		TLM-1	
No. of classes required to complete UNIT-V: 12				**No. of classes taken:**		

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

PART-C

EVALUATION PROCESS (R20 Regulation):

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

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

PART-D

PROGRAMME OUTCOMES (POs):

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PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1	Organize, Analyze and Interpret the data to extract meaningful conclusions
PSO 2	Design, Implement and evaluate a computer-based system to meet desired needs
PSO 3	Develop IT application services with the help of different current engineering tools

	Course Instructor	**Course Coordinator**	**Module Coordinator**	**Head of the Department**
Name of the Faculty	Mrs.S.Jyothi	Dr.J.Nageswara Rao	Mr.G.Rajendra	Dr. B.Srinivasa Rao
Signature				