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:** 2021-22

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	07-03-2022		**TLM2**	
2.	Operating-System Services	1	08-03-2022		**TLM2**	
3.	User Operating-System Interface.	1	10-03-2022		**TLM2**	
4.	System Calls, Types of System Calls,	1	11-03-2022		**TLM2**	
5.	System Programs, Operating-System Design and Implementation	1	14-03-2022		**TLM2**	
6.	**Tutorial-1**	1	15-03-2022		**TLM3**	
7.	Operating-System Structure	1	17-03-2022		**TLM2**	
8.	Virtual Machines.	1	21-03-2022		**TLM2**	
9.	Operating-System Generation, System Boot	1	22-03-2022		**TLM2**	
10.	**Tutorial-2**	1	24-03-2022		**TLM3**	
11.	**Assignment-1/ Quiz-1**	1	25-03-2022		**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	28-03-2022		**TLM2**	
13.	Communication in Client-Server Systems.	1	29-03-2022		**TLM2**	
14.	Threads: Overview,	1	31-03-2022		**TLM2**	
15.	Multithreading Models	1	01-04-2022		**TLM2**	
16.	Process Scheduling: Scheduling Criteria.	1	04-04-2022		**TLM2**	
17.	Scheduling Algorithms (FCFS, SJF)	1	07-04-2022		**TLM2**	
18.	Scheduling Algorithms (Priority)	1	08-04-2022		**TLM2**	
19.	**Tutorial-3**	1	11-04-2022		**TLM3**	
20.	Scheduling Algorithms (Round Robin)	1	12-04-2022		**TLM2**	
21.	Discuss various problems related to scheduling algorithms	1	18-04-2022		**TLM2**	
22.	Discuss various problems related to scheduling algorithms	1	19-04-2022		**TLM2**	
23.	**Tutorial-4**	1	21-04-2022		**TLM3**	
24.	**Assignment-2 / Quiz-2**	1	22-04-2022		**TLM6**	
No. of classes required to complete UNIT-II		13	No. of classes taken:			

(25-04-2022 TO 30-04-2022) 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
25.	The Critical-Section Problem, Peterson's Solution, Synchronization Hardware.	1	02-05-2022		**TLM2**	
26.	Semaphores, Classic Problems of Synchronization.	1	05-05-2022		**TLM2**	
27.	Monitors	1	06-05-2022		**TLM2**	
28.	Deadlocks: System Model, Deadlock Characterization.	1	09-05-2022		**TLM2**	
29.	Methods for Handling Deadlocks, Deadlock Prevention.	1	10-05-2022		**TLM2**	
30.	Deadlock Avoidance, Deadlock Detection.	1	12-05-2022		**TLM2**	
31.	Recovery from Deadlock. **Tutorial-5**	1	13-05-2022		**TLM2, TLM3**	
32.	**Tutorial-6**	1	16-05-2022		**TLM3**	
33.	**Assignment-3 / Quiz-3**	1	17-05-2022		**TLM6**	
No. of classes required to complete UNIT-III		9	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
34.	Memory Management Strategies: Swapping, Contiguous Memory Allocation.	1	19-05-2022		**TLM2**	
35.	Paging, Structure of the Page Table.	1	20-05-2022		**TLM2**	
36.	Segmentation	1	23-05-2022		**TLM2**	
37.	**Tutorial-7**	1	24-05-2022		**TLM3**	
38.	Virtual Memory Management: Demand Paging	1	26-05-2022		**TLM2**	
39.	Page Replacement,	1	27-05-2022		**TLM2**	
40.	Allocation of Frames, Thrashing.	1	30-05-2022		**TLM2**	
41.	**Tutorial-8**	1	31-05-2022		**TLM3**	
42.	**Assignment-4 / Quiz-4**	1	02-06-2022		**TLM6**	
No. of classes required to complete UNIT-IV		9	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
43.	Overview of Mass-Storage Structure, Disk Structure.	1	03-06-2022		TLM2	
44.	Disk Attachment, Disk Scheduling.	1	06-06-2022		TLM2	
45.	Disk Management	1	07-06-2022		TLM2	
46.	**Tutorial-9**	1	09-06-2022		TLM3	
47.	File-System Structure, File-System Implementation	1	10-06-2022		TLM2	
48.	Directory Implementation, Allocation Methods	1	13-06-2022		TLM2	
49.	Free-space Management, Efficiency and Performance, Recovery.	1	14-06-2022		TLM2	
50.	**Tutorial-10**	1	16-06-2022		TLM3	
51.	**Assignment-4 / Quiz-4**	1	17-06-2022		TLM6	
No. of classes required to complete UNIT-V		9	No. of classes taken:			

(20-06-2022 TO 26-06-2022) 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
52.		1				
53.		1				

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	**07-03-2022**		
I Phase of Instructions	07-03-2022	23-04-2022	7 W
I Mid Examinations	**25-04-2022**	**30-04-2022**	1W
II Phase of Instructions	02-05-2022	18-06-2022	7 W
II Mid Examinations	**20-06-2022**	**25-06-2022**	1W
Preparation and Practical	27-06-2022	02-07-2022	1W
Semester End Examinations	**04-07-2022**	**16-07-2022**	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

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 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.
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	HOD
(Mr. G. Rajendra)		Dr. B. Srinivasa Rao

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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:** 2021-22

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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:

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REFERENCE BOOKS:

1. William Stallings, "Operating Systems", PHI, 5th Edition, 2004.

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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	07-03-2022		**TLM2**	
2.	Operating-System Services	1	08-03-2022		**TLM2**	
3.	User Operating-System Interface.	1	10-03-2022		**TLM2**	
4.	System Calls, Types of System Calls,	1	11-03-2022		**TLM2**	
5.	System Programs, Operating-System Design and Implementation	1	14-03-2022		**TLM2**	
6.	**Tutorial-1**	1	15-03-2022		**TLM3**	
7.	Operating-System Structure	1	17-03-2022		**TLM2**	
8.	Virtual Machines.	1	21-03-2022		**TLM2**	
9.	Operating-System Generation, System Boot	1	22-03-2022		**TLM2**	
10.	**Tutorial-2**	1	24-03-2022		**TLM3**	
11.	**Assignment-1/ Quiz-1**	1	25-03-2022		**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	28-03-2022		**TLM2**	
13.	Communication in Client-Server Systems.	1	29-03-2022		**TLM2**	
14.	Threads: Overview,	1	31-03-2022		**TLM2**	
15.	Multithreading Models	1	01-04-2022		**TLM2**	
16.	Process Scheduling: Scheduling Criteria.	1	04-04-2022		**TLM2**	
17.	Scheduling Algorithms (FCFS, SJF)	1	07-04-2022		**TLM2**	
18.	Scheduling Algorithms (Priority)	1	08-04-2022		**TLM2**	
19.	**Tutorial-3**	1	11-04-2022		**TLM3**	
20.	Scheduling Algorithms (Round Robin)	1	12-04-2022		**TLM2**	
21.	Discuss various problems related to scheduling algorithms	1	18-04-2022		**TLM2**	
22.	Discuss various problems related to scheduling algorithms	1	19-04-2022		**TLM2**	
23.	**Tutorial-4**	1	21-04-2022		**TLM3**	
24.	**Assignment-2 / Quiz-2**	1	22-04-2022		**TLM6**	
No. of classes required to complete UNIT-II		13	No. of classes taken:			

(25-04-2022 TO 30-04-2022) 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
25.	The Critical-Section Problem, Peterson's Solution, Synchronization Hardware.	1	02-05-2022		**TLM2**	
26.	Semaphores, Classic Problems of Synchronization.	1	05-05-2022		**TLM2**	
27.	Monitors	1	06-05-2022		**TLM2**	
28.	Deadlocks: System Model, Deadlock Characterization.	1	09-05-2022		**TLM2**	
29.	Methods for Handling Deadlocks, Deadlock Prevention.	1	10-05-2022		**TLM2**	
30.	Deadlock Avoidance, Deadlock Detection.	1	12-05-2022		**TLM2**	
31.	Recovery from Deadlock. **Tutorial-5**	1	13-05-2022		**TLM2, TLM3**	
32.	**Tutorial-6**	1	16-05-2022		**TLM3**	
33.	**Assignment-3 / Quiz-3**	1	17-05-2022		**TLM6**	
No. of classes required to complete UNIT-III		9	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
34.	Memory Management Strategies: Swapping, Contiguous Memory Allocation.	1	19-05-2022		**TLM2**	
35.	Paging, Structure of the Page Table.	1	20-05-2022		**TLM2**	
36.	Segmentation	1	23-05-2022		**TLM2**	
37.	**Tutorial-7**	1	24-05-2022		**TLM3**	
38.	Virtual Memory Management: Demand Paging	1	26-05-2022		**TLM2**	
39.	Page Replacement,	1	27-05-2022		**TLM2**	
40.	Allocation of Frames, Thrashing.	1	30-05-2022		**TLM2**	
41.	**Tutorial-8**	1	31-05-2022		**TLM3**	
42.	**Assignment-4 / Quiz-4**	1	02-06-2022		**TLM6**	
No. of classes required to complete UNIT-IV		9	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
43.	Overview of Mass-Storage Structure, Disk Structure.	1	03-06-2022		TLM2	
44.	Disk Attachment, Disk Scheduling.	1	06-06-2022		TLM2	
45.	Disk Management	1	07-06-2022		TLM2	
46.	**Tutorial-9**	1	09-06-2022		TLM3	
47.	File-System Structure, File-System Implementation	1	10-06-2022		TLM2	
48.	Directory Implementation, Allocation Methods	1	13-06-2022		TLM2	
49.	Free-space Management, Efficiency and Performance, Recovery.	1	14-06-2022		TLM2	
50.	**Tutorial-10**	1	16-06-2022		TLM3	
51.	**Assignment-4 / Quiz-4**	1	17-06-2022		TLM6	
No. of classes required to complete UNIT-V		9	No. of classes taken:			

(20-06-2022 TO 26-06-2022) 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
52.		1				
53.		1				

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	**07-03-2022**		
I Phase of Instructions	07-03-2022	23-04-2022	7 W
I Mid Examinations	**25-04-2022**	**30-04-2022**	1W
II Phase of Instructions	02-05-2022	18-06-2022	7 W
II Mid Examinations	**20-06-2022**	**25-06-2022**	1W
Preparation and Practical	27-06-2022	02-07-2022	1W
Semester End Examinations	**04-07-2022**	**16-07-2022**	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):

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 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.
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	HOD
(Mr. G. Rajendra)		Dr. B. Srinivasa Rao

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   : 2021-22

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

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.	Cycle-1	3	10-03-2022		**TLM4**	
2.	Cycle-2	3	17-03-2022		**TLM4**	
3.	Cycle-3	3	24-03-2022		**TLM4**	
4.	Cycle-4	3	31-03-2022		**TLM4**	
5.	Cycle-5	3	07-04-2022		**TLM4**	
6.	Cycle-6	3	21-04-2022		**TLM4**	
7.	Cycle-7	3	05-05-2022		**TLM4**	
8.	Cycle-8	3	12-05-2022		**TLM4**	
9.	Cycle-9	3	19-05-2022		**TLM4**	
10.	Cycle-10	3	26-05-2022		**TLM4**	
11.		3	02-06-2022		**TLM4**	
12.		3	09-06-2022		**TLM4**	
13.		3	16-06-2022			

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	**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	Module Coordinator	HOD

(Mr.G.Rajendra)	(Dr .S. Naganjaneyulu)	(Dr. B, Srinivasa Rao)

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor   : Mr.S.Praveen Kumar
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., A section   A.Y   : 2021-22

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PS O3
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	10.03.2022, 17.03.2022,		1. 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	24.03.2022 31.03.2022		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	07.04.2022		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	21.04.2022		Build a model using a linear regression algorithm on any dataset.	TLM4	
		Mid - I Examinations 25.04.2022 to 30.04.2022			
5	05.05.2022		Build a classification model using Decision Tree algorithm on iris dataset	TLM4	
6	12.05.2022		Apply Naïve Bayes Classification algorithm on any dataset	TLM4	
7	19.05.2022		Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	TLM4	
8	26.05.2022		Apply the K- Means clustering algorithm on any dataset.	TLM4	
9	02.06.2022		Apply Hierarchical Clustering algorithms on any dataset.	TLM4	
10	09.06.2022		Apply the DBSCAN clustering algorithm on any dataset.	TLM4	
11	16.06.2022		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.
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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
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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.

Course Instructor	Course Coordinator	Module Coordinator	HOD
Mr.S.Praveen Kumar			Dr B.Srinivasa Rao

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor   : Mr.Michael Sadgun Rao Kona
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   : 2021-22

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	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PS O3
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	08.03.2022, 15.03.2022, 22.03.2022		1. 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	29.03.2022, 05.04.2022		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	12.04.2022		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	19.04.2022		Build a model using a linear regression algorithm on any dataset.	TLM4	
Mid - I Examinations 25.04.2022 to 30.04.2022					
5	03.05.2022		Build a classification model using Decision Tree algorithm on iris dataset	TLM4	
6	10.05.2022		Apply Naïve Bayes Classification algorithm on any dataset	TLM4	
7	17.05.2022		Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any market basket data.	TLM4	
8	24.05.2022		Apply the K- Means clustering algorithm on any dataset.	TLM4	
9	31.05.2022		Apply Hierarchical Clustering algorithms on any dataset.	TLM4	
10	07.06.2022		Apply the DBSCAN clustering algorithm on any dataset.	TLM4	
11	14.06.2022		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.
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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	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	HOD
Mr.Michael Sadgun Rao Kona			Dr B.Srinivasa Rao

COURSE HANDOUT

PART-A

Name of Course Instructor: Michael Sadgun Rao Kona
Course Name & Code : Data Warehousing and Data mining & 20CS01
L-T-P Structure : 3-0-0 **Credits:** 3
Program/Sem/Sec : B.Tech/IV/A **A.Y.:** 2021-22

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	07.03.2022		TLM1,2	
2.	Introduction to Unit-I	1	09.03.2022			
3.	**Data Warehouse and OLAP Technology**: An Overview: Data Warehouse	1	10.03.2022		TLM1,2	
4.	**Data Warehouse and OLAP Technology**: A Multidimensional Data Model	1	11.03.2022		TLM1,2	
5.	**Data Warehouse and OLAP Technology**: Data Warehouse Architecture	1	14.03.2022		TLM1,2	
6.	**Data Warehouse and OLAP Technology**: Data Warehouse Implementation	2	16.03.2022, 21.03.2022		TLM1,2	
7.	**Data Warehouse and OLAP Technology**: From Data Warehousing to Data Mining.	2	23.03.2022, 25.03.2022		TLM1,2	
8.	Revision	1	28.03.2022		TLM1,2	
No. of classes required to complete UNIT-I: 10				**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	30.03.2022		TLM1,2	
2.	Motivating challenges, The origins of Data Mining,	1	01.04.2022		TLM1,2	
3.	Data MiningTasks, Types of Data, Data Quality.	2	04.04.202,2 06.04.2022		TLM1,2	
4.	**Data Preprocessing:** Aggregation	1	07.04.2022		TLM1,2	
5.	**Data Preprocessing:** Sampling, Dimensionality Reduction, Feature Subset Selection	1	08.04.2022		TLM1,2	
6.	**Data Preprocessing:** Feature creation	1	11.04.2022		TLM1,2	
7.	**Data Preprocessing:** Discretization and Binarization	1	13.04.2022		TLM1,2	
8.	**Data Preprocessing:** Variable Transformation	1	14.04.2022		TLM1,2	
9.	**Data Preprocessing:** Measures of Similarity and Dissimilarity	1	18.04.2022		TLM1,2	
10.	**Revision**	1	20.04.2022		TLM1,2	
No. of classes required to complete UNIT-II: 11				**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	1	21.04.2022	22.04.2022	TLM1,2	
2.	**Decision Tree Induction**: Working of Decision Tree, building a decision tree	1	22.04.2022	22.04.2022	TLM1,2	
Mid - I Examinations from 25.04.2022 to 30.04.2022					
3.	methods for expressing an attribute test conditions, measures for selecting the best split	1	02.05.2022		TLM1,2	
4.	Algorithm for decision tree induction.	1	04.05.2022		TLM1,2	
5.	**Model Overfitting**: Due to presence of noise, due to lack of representation samples	1	05.05.2022		TLM1,2	
6.	**Evaluating the performance of classifier**: holdout method, random sub sampling, cross-validation, bootstrap.	2	06.05.2022, 09.05.2022		TLM1,2	
7.	BayesTheorem	2	11.05.2022, 12.05.2022		TLM1,2	
8.	Naïve Bayes Classifier	2	13.05.2022, 16.05.2022		TLM1,2	
No. of classes required to complete UNIT-III: 11				**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	18.05.2022		TLM1,2	
2.	Algorithms: Problem Definition, Frequent Item Set Generation	2	19.05.2022, 20.05.2022		TLM1,2	
3.	Apriori Principle, Apriori Algorithm	2	23.05.2022, 25.05.2022		TLM1,2	
4.	Rule Generation, Compact Representation of Frequent Itemsets	2	26.05.2022, 27.05.2022		TLM1,2	
5.	FPGrowth Algorithm	2	30.05.2022, 31.05.2022		TLM1,2	
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V: Memory System Design, Peripheral Devices and their characteristics

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	01.06.2022		TLM1,2	
2.	Different Types ofClustering, Different Types of Clusters;	1	02.06.2022		TLM1,2	
3.	**K-means:** The Basic K-means Algorithm	1	03.06.2022		TLM1,2	
4.	K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses;	1	06.06.2022		TLM1,2	
5.	Exercise problems on K-means	1	08.06.2022		TLM1,2	
6.	**Agglomerative Hierarchical Clustering:** Basic Agglomerative Hierarchical Clustering Algorithm	1	09.06.2022		TLM1,2	
7.	Exercise problems on Agglomerative Hierarchical Clustering Algorithm	1	10.06.2022		TLM1,2	
8.	DBSCAN: Traditional Density Center-Based Approach,DBSCAN Algorithm, Strengths and Weaknesses.	1	13.06.2022		TLM1,2	
9.	Exercise problems on DBSCAN Algorithm	1	15.06.2022		TLM1,2	
No. of classes required to complete UNIT-V: 09				**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	16.06.2022		TLM1,2	
2.	Regression Analysis - II (Logistic Regression)	1	17.06.2022		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	

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.
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 engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**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.Michael Sadgun Rao.K	Dr.K.Anu Priya	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-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT

PART-A

Name of Course Instructor: Michael Sadgun Rao Kona
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.:** 2021-22

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	07.03.2022		TLM1,2	
2.	Introduction to Unit-I	1	09.03.2022			
3.	**Data Warehouse and OLAP Technology**: An Overview: Data Warehouse	1	10.03.2022		TLM1,2	
4.	**Data Warehouse and OLAP Technology**: A Multidimensional Data Model	1	11.03.2022		TLM1,2	
5.	**Data Warehouse and OLAP Technology**: Data Warehouse Architecture	1	14.03.2022		TLM1,2	
6.	**Data Warehouse and OLAP Technology**: Data Warehouse Implementation	2	16.03.2022, 21.03.2022		TLM1,2	
7.	**Data Warehouse and OLAP Technology**: From Data Warehousing to Data Mining.	2	23.03.2022, 25.03.2022		TLM1,2	
8.	Revision	1	28.03.2022		TLM1,2	
No. of classes required to complete UNIT-I: 10				**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	30.03.2022		TLM1,2	
2.	Motivating challenges, The origins of Data Mining,	1	01.04.2022		TLM1,2	
3.	Data MiningTasks, Types of Data, Data Quality.	2	04.04.202,2 06.04.2022		TLM1,2	
4.	**Data Preprocessing:** Aggregation	1	07.04.2022		TLM1,2	
5.	**Data Preprocessing:** Sampling, Dimensionality Reduction, Feature Subset Selection	1	08.04.2022		TLM1,2	
6.	**Data Preprocessing:** Feature creation	1	11.04.2022		TLM1,2	
7.	**Data Preprocessing:** Discretization and Binarization	1	13.04.2022		TLM1,2	
8.	**Data Preprocessing:** Variable Transformation	1	14.04.2022		TLM1,2	
9.	**Data Preprocessing:** Measures of Similarity and Dissimilarity	1	18.04.2022		TLM1,2	
10.	**Revision**	1	20.04.2022		TLM1,2	
No. of classes required to complete UNIT-II: 11				**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	1	21.04.2022	22.04.2022	TLM1,2	
2.	**Decision Tree Induction**: Working of Decision Tree, building a decision tree	1	22.04.2022	22.04.2022	TLM1,2	
Mid - I Examinations from 25.04.2022 to 30.04.2022						
3.	methods for expressing an attribute test conditions, measures for selecting the best split	1	02.05.2022		TLM1,2	
4.	Algorithm for decision tree induction.	1	04.05.2022		TLM1,2	
5.	**Model Overfitting**: Due to presence of noise, due to lack of representation samples	1	05.05.2022		TLM1,2	
6.	**Evaluating the performance of classifier**: holdout method, random sub sampling, cross-validation, bootstrap.	2	06.05.2022, 09.05.2022		TLM1,2	
7.	BayesTheorem	2	11.05.2022, 12.05.2022		TLM1,2	
8.	Naïve Bayes Classifier	2	13.05.2022, 16.05.2022		TLM1,2	
No. of classes required to complete UNIT-III: 11				**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	18.05.2022		TLM1,2	
2.	Algorithms: Problem Definition, Frequent Item Set Generation	2	19.05.2022, 20.05.2022		TLM1,2	
3.	Apriori Principle, Apriori Algorithm	2	23.05.2022, 25.05.2022		TLM1,2	
4.	Rule Generation, Compact Representation of Frequent Itemsets	2	26.05.2022, 27.05.2022		TLM1,2	
5.	FPGrowth Algorithm	2	30.05.2022, 31.05.2022		TLM1,2	
No. of classes required to complete UNIT-IV: 09				**No. of classes taken:**		

UNIT-V: Memory System Design, Peripheral Devices and their characteristics

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	01.06.2022		TLM1,2	
2.	Different Types ofClustering, Different Types of Clusters;	1	02.06.2022		TLM1,2	
3.	**K-means:** The Basic K-means Algorithm	1	03.06.2022		TLM1,2	
4.	K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses;	1	06.06.2022		TLM1,2	
5.	Exercise problems on K-means	1	08.06.2022		TLM1,2	
6.	**Agglomerative Hierarchical Clustering:** Basic Agglomerative Hierarchical Clustering Algorithm	1	09.06.2022		TLM1,2	
7.	Exercise problems on Agglomerative Hierarchical Clustering Algorithm	1	10.06.2022		TLM1,2	
8.	DBSCAN: Traditional Density Center-Based Approach,DBSCAN Algorithm, Strengths and Weaknesses.	1	13.06.2022		TLM1,2	
9.	Exercise problems on DBSCAN Algorithm	1	15.06.2022		TLM1,2	
No. of classes required to complete UNIT-V: 09				**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	16.06.2022		TLM1,2	
2.	Regression Analysis - II (Logistic Regression)	1	17.06.2022		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

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.
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 engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**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.Michael Sadgun Rao.K**	**Dr.K.Anu Priya**	**Dr.K. Lavanya**	**Dr.B.Srinivasa Rao**
Signature				

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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT
PART-A

Name of Course Instructor   : Dr. Shaheda Niloufer
Course Name & Code   : Environmental Science & 20MC03
L-T-P Structure   : 2-0-0   Credits : 0
Program/Sem/Sec   : B.Tech., IT-A., IV-Sem., SEC-A   A.Y   : 2021-22

PRE-REQUISITE:

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

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

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

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

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

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

TEXT BOOKS:

T1   Anubha Kaushik, C.P.Kaushik, "Perspectives in Environmental Studies", New age international publishers, 5th Edition, Delhi, 2016.

T2   Mahua Basu, S. Xavier, "Fundamentals of Environmental Studies", Cambridge University Press, 1st Edition, Delhi, 2016.

REFERENCE BOOKS:

R1   S. Deswal, A. Deswal, "A Basic course in Environmental Studies", Educational & Technical Publishers, 2nd Edition, Delhi, 2014.

R2   R. Rajagopalan, "*Environmental Studies (From Crisis to Cure)*", Oxford University Press,

2nd Edition, New Delhi, 2012.

R3 De, A.K, "Environmental Chemistry", New Age International (P) Limited, 5th Edition, New Delhi, 2003.

R4 Dr.K.V.S.G. Murali Krishna, "Environmental Studies", VGS Techno Series, 1st Edition, Vijayawada, 2010.

R5 G. Tyler Miller, Scott Spoolman, "Introduction to Environmental Studies", Cengage Learning, 13th Edition, New Delhi, 2009.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: NATURE AND SCOPE OF ENVIRONMENTAL PROBLEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction of course and course objectives. Introduction of components of Environment	1	07-03-2022		2	
2.	Population explosion and variations among Nations.	1	11-03-2022		2	
3.	Resettlement and Rehabilitation - Issues and possible solutions	1	14-03-2022		2	
4.	Environmental Hazards	1	21-03-2022		2	
5.	Role of Information Technology in environmental management and human health.	1	25-03-2022		2	
No. of classes required to complete UNIT-I: 5				No. of classes taken:		

UNIT-II: NATURAL RESOURCES AND CONSERVATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and classification of Natural resources, Forest Resources,	1	28-03-2022		2	
2.	Water Resources	1	01-04-2022		2	
3.	Mineral Resources	1	04-04-2022		2	
4.	Food Resources	1	08-04-2022		2	
5.	Food Resources	1	11-04-2022		2	
6.	Mineral Resources	1	18-04-2022		2	
No. of classes required to complete UNIT-II: 6				No. of classes taken:		

UNIT-III: ECOLOGY AND BIODIVERSITY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Definition, structure and functions of an ecosystem	1	22-04-2022		2	
2.	Food chains and Food webs, Ecological succession, Ecological pyramids, Bio-geo-chemical cycles	1	22-04-2022		2	
3.	Major Types of Ecosystems – Forest, Grassland, Desert Land & aquatic Ecosystem, Ecological Niche and Keystone Species, Bio-geographical classification of	1	22-04-2022		2	

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	India. India as a mega diversity nation					
4.	I MID EXAMINATION		25-04-2022			
5.	I MID EXAMINATION		29-04-2022			
6.	Values of biodiversity- Direct and Indirect values. Threats to biodiversity; Assignment in Unit II	1	02-05-2022		2	
7.	Man and wild life conflicts. Endangered and endemic species of India	1	06-05-2022		2,3	
8.	Conservation of biodiversity: In-situ and Ex-situ conservation methods	1	09-05-2022		2	
No. of classes required to complete UNIT-III: 6				No. of classes taken:		

UNIT-IV : ENVIRONMENTAL POLLUTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Air Pollution	1	13-05-2022		2	
2.	Causes, effects and control measures of: Water Pollution	1	16-05-2022		2	
3.	Causes, effects and control measures of: Soil Pollution,		20-05-2022			
4.	Noise Pollution		23-05-2022			
5.	Solid Waste Management	1	27-05-2022		2,3	
6.	Solid Waste Management	1	30-05-2022		2	
7.	CASE STUDIES	1	03-06-2022			
8.	Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.	1	06-06-2022			
No. of classes required to complete UNIT-IV: 8				No. of classes taken:		

UNIT-V : ENVIRONMENTAL MANAGEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Sustainable Development	1	10-06-2022		2	
2.	Climate disruption- Greenhouse effect, ozone layer depletion and acid rain. Stockholm conference	1	13-06-2022		2,3	
3.	Environmental Impact Assessment (EIA), Green building, Environmental Law	1	17-06-2022		2	
4.	II MID EXAMINATIONS	1	20-06-2022			
5.	II MID EXAMINATIONS	1	24-06-2022			
6.	II MID EXAMINATIONS	1	27-06-2022			
No. of classes required to complete UNIT-V: 03				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 (R17 Regulation):

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

PART-D

PROGRAMME OUTCOMES (POs):

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by 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.

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

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)
Accredited by NAAC & NBA (Under Tier - I), ISO 9001:2015 Certified Institution
Approved by AICTE, New Delhi. and Affiliated to JNTUK, Kakinada
L.B. REDDY NAGAR, MYLAVARAM, KRISHNA DIST., A.P.-521 230.
Phone: 08659-222933, Fax: 08659-222931

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HANDOUT
PART-A

Name of Course Instructor	: Dr. V. Bhagya Lakshmi
Course Name & Code	: Environmental Science & 20MC03
L-T-P Structure	: 2-0-0 Credits : 0
Program/Sem/Sec	: B.Tech., IT-B., IV-Sem., SEC-B A.Y : 2021-22

PRE-REQUISITE:

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

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

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

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

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

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

TEXT BOOKS:

T1 Anubha Kaushik, C.P.Kaushik, "Perspectives in Environmental Studies", New age international publishers, 5th Edition, Delhi, 2016.

T2 Mahua Basu, S. Xavier, "Fundamentals of Environmental Studies", Cambridge University Press, 1st Edition, Delhi, 2016.

REFERENCE BOOKS:

R1 S. Deswal, A. Deswal, "A Basic course in Environmental Studies", Educational & Technical Publishers, 2nd Edition, Delhi, 2014.

R2 R. Rajagopalan, "*Environmental Studies (From Crisis to Cure)*", Oxford University Press,

2nd Edition, New Delhi, 2012.

R3 De, A.K, "Environmental Chemistry", New Age International (P) Limited, 5th Edition, New Delhi, 2003.

R4 Dr.K.V.S.G. Murali Krishna, "Environmental Studies", VGS Techno Series, 1st Edition, Vijayawada, 2010.

R5 G. Tyler Miller, Scott Spoolman, "Introduction to Environmental Studies", Cengage Learning, 13th Edition, New Delhi, 2009.

PART-B

COURSE DELIVERY PLAN (LESSON PLAN):

UNIT-I: NATURE AND SCOPE OF ENVIRONMENTAL PROBLEMS

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction of course and course objectives. Introduction of components of Environment	1	07-03-2022		2	
2.	Population explosion and variations among Nations.	1	09-03-2022		2	
3.	Resettlement and Rehabilitation - Issues and possible solutions	1	14-03-2022		2	
4.	Environmental Hazards	1	16-03-2022		2	
5.	Role of Information Technology in environmental management and human health.	1	21-03-2022		2	
No. of classes required to complete UNIT-I: 5				No. of classes taken:		

UNIT-II: NATURAL RESOURCES AND CONSERVATION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Introduction and classification of Natural resources, Forest Resources,	1	23-03-2022		2	
2.	Water Resources	1	28-03-2022		2	
3.	Mineral Resources	1	30-03-2022		2	
4.	Food Resources	1	04-04-2022		2	
5.	Food Resources	1	06-04-2022		2	
6.	Mineral Resources	1	11-04-2022		2	
No. of classes required to complete UNIT-II: 6				No. of classes taken:		

UNIT-III: ECOLOGY AND BIODIVERSITY

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Definition, structure and functions of an ecosystem	1	13-04-2022		2	
2.	Food chains and Food webs, Ecological succession, Ecological pyramids, Bio-geo-chemical cycles	1	18-04-2022		2	
3.	Major Types of Ecosystems – Forest, Grassland, Desert Land & aquatic Ecosystem, Ecological Niche and Keystone Species, Bio-geographical classification of	1	20-04-2022		2	

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
	India. India as a mega diversity nation					
4.	I MID EXAMINATION		25-04-2022			
5.	I MID EXAMINATION		27-04-2022			
6.	Values of biodiversity- Direct and Indirect values. Threats to biodiversity; Assignment in Unit II	1	02-05-2022		2	
7.	Man and wild life conflicts. Endangered and endemic species of India	1	04-05-2022		2,3	
8.	Conservation of biodiversity: In-situ and Ex-situ conservation methods	1	09-05-2022		2	
No. of classes required to complete UNIT-III: 6				No. of classes taken:		

UNIT-IV : ENVIRONMENTAL POLLUTION

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Air Pollution	1	11-05-2022		2	
2.	Causes, effects and control measures of: Water Pollution	1	16-05-2022		2	
3.	Causes, effects and control measures of: Soil Pollution,		18-05-2022			
4.	Noise Pollution		23-05-2022			
5.	Solid Waste Management	1	25-05-2022		2,3	
6.	Solid Waste Management	1	30-05-2022		2	
7.	CASE STUDIES	1	01-06-2022			
8.	Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.	1	06-06-2022			
No. of classes required to complete UNIT-IV: 8				No. of classes taken:		

UNIT-V : ENVIRONMENTAL MANAGEMENT

S.No.	Topics to be covered	No. of Classes Required	Tentative Date of Completion	Actual Date of Completion	Teaching Learning Methods	HOD Sign Weekly
1.	Sustainable Development	1	08-06-2022		2	
2.	Climate disruption-Greenhouse effect, ozone layer depletion and acid rain. Stockholm conference	1	13-06-2022		2,3	
3.	Environmental Impact Assessment (EIA), Green building, Environmental Law	1	15-06-2022		2	
4.	II MID EXAMINATIONS	1	20-06-2022			
5.	II MID EXAMINATIONS	1	22-06-2022			
6.	II MID EXAMINATIONS	1	27-06-2022			
7.	II MID EXAMINATIONS	1	29-06-2022			
No. of classes required to complete UNIT-V: 03				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

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EVALUATION PROCESS (R17 Regulation):

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Name of the Faculty	Dr. V. Bhagya Lakshmi	Dr. Shaheda Niloufer	Dr. Shaheda Niloufer	Dr. A. Rami Reddy
Signature				