

BCA

Syllabus

Program Code: UCA

2023 - Onwards



MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with “A⁺” Grade by NAAC

PASUMALAI, MADURAI – 625 004

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS),
MADURAI – 625 004
BACHELOR OF COMPUTER APPLICATIONS CURRICULUM
(For the students admitted from the academic year 2023-2024 onwards)

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
FIRST SEMESTER						
Part – I	Tamil / Hindi Course					
23UTAGT11 / 23UHIGH11	தமிழ் இலக்கிய வரலாறு - I / Hindi Ka Samanya Gyan Aur Nibandh	6	3	25	75	100
Part – II	English					
23UENGE11	General English - I	6	3	25	75	100
Part - III	Core Courses					
23UCACC11	Python Programming	5	5	25	75	100
23UCACP11	Python Programming Lab	5	5	25	75	100
Part - III	Elective Course					
23UMTEA12	Numerical Methods	4	3	25	75	100
Part IV	Non Major Elective					
23UCANM11	Office Automation	2	2	25	75	100
Part IV	Foundation Course					
23UCAFC11	Structured Programming in C	2	2	25	75	100
Total		30	23	175	525	700
SECOND SEMESTER						
Part – I	Tamil / Hindi Course					
23UTAGT21 / 23UHIGH21	தமிழ் இலக்கிய வரலாறு – II / Katha Sahitya Aur Vyakaran	6	3	25	75	100
Part – II	English					
23UENGE21	General English - II	6	3	25	75	100
Part - III	Core Courses					
23UCACC21	Object Oriented Programming Concepts Using C++	5	5	25	75	100
23UCACP21	C++ Programming Lab	5	5	25	75	100
Part - III	Elective Course					
23UCAEC21	Introduction to Data Science	4	3	25	75	100
Part IV	Non Major Elective					
23UCANM21	Understanding Internet	2	2	25	75	100
Part IV	Skill Enhancement course					
23UCASP21	Advanced Excel Lab	2	2	25	75	100
Total		30	23	175	525	700

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
THIRD SEMESTER						
Part – I	Tamil / Alternative course					
23UTAGT31 / 23UHIGH31	தமிழக வரலாறும் பண்பாடும் / Patra Lekhan Aur Paribhashik Shabdavali	6	3	25	75	100
Part – II	English					
23UENGE31	General English - III	6	3	25	75	100
Part - III	Core courses					
23UCACC31	Data Structures and Algorithms	5	5	25	75	100
23UCACP31	Data Structures and Algorithms Lab	5	5	25	75	100
Part - III	Elective course					
23UMTEA31	Statistical Methods and Its Application	4	3	25	75	100
Part - IV	Skill Based courses					
23UCASC31	Multimedia Systems	1	1	25	75	100
23UCASP31	Introduction to HTML Lab	2	2	25	75	100
Part - IV	Mandatory course					
23UEVSG41	Environmental Studies	1	-	-	-	-
Total		30	22	175	525	700
FOURTH SEMESTER						
Part – I	Tamil / Alternative course					
23UTAGT41 / 23UHIGH41	தமிழும் அறிவியலும் / Hindi Bhasha Aur Computer	6	3	25	75	100
Part – II	English					
23UENGE41	General English - IV	6	3	25	75	100
Part - III	Core courses					
23UCACC41	Programming in Java	5	5	25	75	100
23UCACP41	Programming in Java Lab	5	5	25	75	100
Part - III	Elective course					
23UCAEC41	Database Management System	3	3	25	75	100
Part - IV	Skill Based courses					
23UCASC41	Biometrics	2	2	25	75	100
23UCASP41	PHP Programming Lab	2	2	25	75	100
Part - IV	Mandatory course					
23UEVSG41	Environmental Studies	1	2	25	75	100
Total		30	25	200	600	800

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
FIFTH SEMESTER						
Part - III	Core courses					
23UCACC51	Operating System	5	4	25	75	100
23UCACC52	ASP.Net Programming	5	4	25	75	100
23UCACP51	ASP.Net Programming Lab	5	4	25	75	100
Part - III	Core project					
23UCAPR51	Project with Viva - Voce	5	4	25	75	100
Part - III	Elective courses - I					
23UCAEC51	Big Data Analytics	4	3	25	75	100
23UCAEC52	Software Project Management					
23UCAEC53	Computational Intelligence					
Part - III	Elective courses - II					
23UCAEC54	Artificial Intelligence	4	3	25	75	100
23UCAEC55	Cloud Computing					
23UCAEC56	Information Security					
Part - IV	Mandatory course					
23UVLEG51	Value Education	2	2	25	75	100
23UCAIN51	Internship Report	-	2	25	75	100
Total		30	26	200	600	800
SIXTH SEMESTER						
Part - III	Core courses					
23UCACC61	Computer Networks	6	4	25	75	100
23UCACC62	Data Analytics Using R Programming	6	4	25	75	100
23UCACP61	R Programming Lab	6	4	25	75	100
Part - III	Elective courses - I					
23UCAEC61	IoT and Its Applications	5	3	25	75	100
23UCAEC62	Image Processing					
23UCAEC63	Human Computer Interaction					
Part – III	Elective courses - II					
23UCAEC64	Cryptography	5	3	25	75	100
23UCAEC65	Analytics for Service Industry					
23UCAEC66	Natural Language Processing					
Part - IV	Skill course					
23UCASP61	Cyber Forensics Lab	2	2	25	75	100
Part - V	Extension activities					
23UNCET61, 23UNSET61, 23UPEET61, 23URRET61, 23UYRET61, 23UHFET61, 23UEOET61 & 23UHRET61	N.C.C, N.S.S, Physical Education, R.R.C, Y.R.C, Health and Fitness Club, ECO Club & Human Rights Club	-	1	25	75	100
Total		30	21	175	525	700
Grand total		180	140	1100	3300	4400

FIFTH SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Operating System			
Course Code	23UCACC51	L	P	C
Category	Core	5	-	4
COURSE OBJECTIVES: ➤ Understanding the design of the Operating System. ➤ Imparting knowledge on CPU scheduling, process, and memory management. ➤ To code specialized programs for managing overall resources and operations of the computer. ➤ To study about the concept of job and processor scheduling. ➤ To learn about the concept of memory organization and multiprogramming.				
UNIT - I Introduction, Process Concepts				15
Introduction: Operating System, History (1990s to 2000 and Beyond), Distributed Computing, Parallel Computation. Process Concepts: Definition of Process, Process States - Lifecycle of a Process, Process Management - Process State Transitions, Process Control Block (PCB), Process Operations, Suspend and Resume, Context Switching, Interrupts - Interrupt Processing, Interrupt Classes, Interprocess Communication - Signals, Message Passing.				
UNIT - II Asynchronous Concurrent Processes, Semaphores				15
Asynchronous Concurrent Processes: Mutual Exclusion - Critical Section, Mutual Exclusion Primitives, Implementing Mutual Exclusion Primitives, Peterson's Algorithm, Software Solutions to the Mutual Exclusion Problem, n-thread Mutual Exclusion - Lamport's Bakery Algorithm. Semaphores: Mutual Exclusion with Semaphores, Thread Synchronization with Semaphores.				
UNIT - III Deadlock and Indefinite Postponement				15
Deadlock and Indefinite Postponement: Resource Concepts, Four Necessary Conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance and Dijkstra's Banker's Algorithm, Deadlock Detection, Deadlock Recovery.				
UNIT - IV Job and Processor Scheduling, Algorithms				15
Job and Processor Scheduling: Scheduling Levels, Scheduling Objectives, Scheduling Criteria, Preemptive vs Non-Preemptive Scheduling, Interval Timer or Interrupting Clock, Priorities, Scheduling Algorithms - FIFO Scheduling, RR Scheduling, Quantum Size, SJF Scheduling, SRT Scheduling, HRN Scheduling, Multilevel Feedback Queues, Fair Share Scheduling.				
UNIT - V Real Memory Management, Virtual Memory Management				15
Real Memory Management: Memory Organization, Memory Management, Memory Hierarchy, Memory Management Strategies, Contiguous vs Non-Contiguous Memory Allocation, Single User Contiguous Memory Allocation, Fixed Partition Multiprogramming, Variable Partition Multiprogramming, Memory Swapping. Virtual Memory Management: Virtual Memory Basic Concepts, Multilevel Storage Organization, Block Mapping, Paging Basic Concepts, Segmentation, Paging/Segmentation Systems, Demand Paging, Page Replacement Strategies.				
Total Lecture Hours				75

BOOKS FOR STUDY:

- H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011.

BOOKS FOR REFERENCES:

- William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.
- A. Silberschatz, and P.B. Galvin, Operating Systems Concepts, Ninth Edition, John Wiley & Sons (ASIA) Pte Ltd., 2012.

WEB RESOURCES:

- ❖ <https://www.w3schools.com/java>
- ❖ <http://java.sun.com>
- ❖ <http://www.afu.com/javafaq.html>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		30%	No Changes Made		New Course		
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Define the fundamentals of OS and identify the concepts relevant to process, process lifecycle, scheduling algorithms, deadlock, and memory management.	K1 to K4
CO2	Know the critical analysis of processes involving various algorithms, an exposure to threads and semaphores.	K1 to K4
CO3	Have a complete study about deadlock and its impact over OS. Knowledge of handling deadlock with respective algorithms and measures to retrieve from deadlock.	K1 to K4
CO4	Have complete knowledge of scheduling algorithms and its types.	K1 to K4
CO5	Understand memory organization and management.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	L	M	M	M	M	M
CO2	S	S	M	M	M	L	M	M	M	M
CO3	M	L	M	S	M	S	M	M	M	M
CO4	M	M	M	S	S	S	M	M	L	M
CO5	M	M	S	L	M	M	M	S	M	M
S- STRONG			M - MEDIUM				L - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	2	2	1
CO 2	2	3	2	2	2
CO 3	3	2	1	3	1
CO 4	1	3	2	1	3
CO 5	3	1	2	3	2
WEIGHTAGE	12	10	9	11	9
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	80	67	60	73	60

LESSON PLAN:

UNIT	Operating System	HRS	PEDAGOGY
I	Introduction: Operating System, History (1990s to 2000 and Beyond), Distributed Computing, Parallel Computation. Process Concepts: Definition of Process, Process States - Lifecycle of a Process, Process Management - Process State Transitions, Process Control Block (PCB), Process Operations, Suspend and Resume, Context Switching, Interrupts - Interrupt Processing, Interrupt Classes, Interprocess Communication - Signals, Message Passing.	15	Black Board/PPT
II	Asynchronous Concurrent Processes: Mutual Exclusion - Critical Section, Mutual Exclusion Primitives, Implementing Mutual Exclusion Primitives, Peterson's Algorithm, Software Solutions to the Mutual Exclusion Problem, n-thread Mutual Exclusion - Lamport's Bakery Algorithm. Semaphores: Mutual Exclusion with Semaphores, Thread Synchronization with Semaphores	15	Black Board/PPT
III	Deadlock and Indefinite Postponement: Resource Concepts, Four Necessary Conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance and Dijkstra's Banker's Algorithm, Deadlock Detection, Deadlock Recovery.	15	Black Board/PPT
IV	Job and Processor Scheduling: Scheduling Levels, Scheduling Objectives, Scheduling Criteria, Preemptive vs Non-Preemptive Scheduling, Interval Timer or Interrupting Clock, Priorities, Scheduling Algorithms - FIFO Scheduling, RR Scheduling, Quantum Size, SJF Scheduling, SRT Scheduling, HRN Scheduling, Multilevel Feedback Queues, Fair Share Scheduling.	15	Black Board/PPT
V	Real Memory Management: Memory Organization, Memory Management, Memory Hierarchy, Memory Management Strategies, Contiguous vs Non-Contiguous Memory Allocation, Single User Contiguous Memory Allocation, Fixed Partition Multiprogramming,	15	Black Board/PPT

	Variable Partition Multiprogramming, Memory Swapping. Virtual Memory Management: Virtual Memory Basic Concepts, Multilevel Storage Organization, Block Mapping, Paging Basic Concepts, Segmentation, Paging/Segmentation Systems, Demand Paging, Page Replacement Strategies.		
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Learning Outcome Based Education & Assessment (LOBE)						
Formative Examination - Blue Print						
Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	ASP.Net Programming			
Course Code	23UCACC52	L	P	C
Category	Core	5	-	4
COURSE OBJECTIVES:				
➤ To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language. ➤ To develop ASP.NET Web application using standard controls. ➤ To implement file handling operations. ➤ To handle SQL Server Database using ADO.NET. ➤ Understand the Grid View control and XML classes.				
UNIT - I Overview of .NET Framework				15
Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library - C# Fundamentals: Primitive types and Variables – Operators – Conditional statements – Looping statements – Creating and using Objects – Arrays – String operations.				
UNIT - II Introduction to ASP.NET				15
Introduction to ASP.NET - IDE - Languages supported Components - Working with Web Forms – Web form standard controls: Properties and its events – HTML controls - List Controls: Properties and its events.				
UNIT - III Rich Controls				15
Rich Controls: Properties and its events – validation controls: Properties and its events – File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading.				
UNIT - IV ADO.NET Overview				15
ADO.NET Overview – Database Connections – Commands – Data Reader – Data Adapter – Data Sets – Data Controls and its Properties – Data Binding.				
UNIT - V Grid View Control				15
Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files – Website Security – Authentication – Authorization – Creating a Web application.				
Total Lecture Hours				75

BOOKS FOR STUDY:

- Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.
- Mathew, MacDonald, The Complete Reference ASP.NET, Tata McGraw-Hill, 2015.

BOOKS FOR REFERENCES:

- Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, 2017.
- Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech press, 2013.
- Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc., 2016.
- Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGraw Hill, 2008.
- Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS, 2010.

WEB RESOURCES:

- ❖ <https://www.geeksforgeeks.org/introduction-to-net-framework/>
- ❖ <https://www.javatpoint.com/net-framework>
- ❖ <https://www.w3schools.com/asp/default.ASP>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED			ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			GLOBAL	✓
Changes Made in the Course	Percentage of Change				No Changes Made			New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.										

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Develop working knowledge of C# programming constructs and the .NET Framework.	K1 to K4
CO2	To develop a software to solve real-world problems using ASP.NET.	K1 to K4
CO3	To work on various controls files.	K1 to K4
CO4	To create a web application using Microsoft ADO.NET.	K1 to K4
CO5	To develop web applications using XML.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	M	S	M	L	M	M
CO2	L	S	S	M	M	M	M	S	M	M
CO3	S	M	S	M	M	L	S	M	M	M
CO4	M	S	M	L	M	S	M	M	M	M
CO5	S	M	S	M	M	M	M	S	M	L
S- STRONG			M – MEDIUM				L - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	1	2	2	1
CO 2	3	2	2	2	2
CO 3	3	3	2	2	3
CO 4	3	1	2	2	1
CO 5	3	1	2	2	1
WEIGHTAGE	15	8	10	10	8
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100	53	67	67	53

LESSON PLAN:

UNIT	ASP.NET Programming	HRS	PEDAGOGY
I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library - C# Fundamentals: Primitive types and Variables – Operators – Conditional statements – Looping statements – Creating and using Objects – Arrays – String operations.	15	Black Board/PPT
II	Introduction to ASP.NET - IDE - Languages supported Components - Working with Web Forms – Web form standard controls: Properties and its events – HTML controls - List Controls: Properties and its events.	15	Black Board/PPT
III	Rich Controls: Properties and its events – validation controls: Properties and its events – File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading.	15	Black Board/PPT
IV	ADO.NET Overview – Database Connections – Commands – Data Reader – Data Adapter – Data Sets – Data Controls and its Properties – Data Binding.	15	Black Board/PPT
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files – Website Security – Authentication – Authorization – Creating a Web application.	15	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Articulation Mapping						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions		PART – A		(10 x 1 = 10 Marks)	
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	ASP.NET Programming Lab			
Course Code	23UCACP51	L	P	C
Category	Core Lab	-	5	4

COURSE OBJECTIVES:

- To develop ASP.NET Web application using standard controls.
- To create rich database applications using ADO.NET.
- To implement file handling operations.
- To implement XML classes.
- To utilize ASP.NET security features for authenticating the website.

S. No.	Lab Exercise	75
1.	Create an exposure of Web applications and tools.	
2.	Implement the HTML Controls.	
3.	Implement the Server Controls.	
4.	Web application using Web controls.	
5.	Web application using List controls.	
6.	Web page design using Rich control. Validate user input using Validation controls. Working with File concepts.	
7.	Web application using Data Controls.	
8.	Data binding with Web controls.	
9.	Data binding with Data Controls.	
10.	Database application to perform insert, update, and delete operations.	
11.	Database application using Data Controls to perform insert, delete, edit, paging, and sorting operations.	
12.	Implement the XML classes.	
13.	Implement Authentication – Authorization.	
14.	Ticket reservation using ASP.NET controls.	
15.	Online examination using ASP.NET controls.	
Total Lecture Hours		75

BOOKS FOR STUDY:

- Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.
- Mathew, MacDonald, The Complete Reference ASP.NET, Tata McGraw-Hill, 2015.

BOOKS FOR REFERENCES:

- Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, 2017.
- Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 BlackBook, Dreamtech press, 2013.
- Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc., 2016.
- Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGraw Hill, 2008.
- Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS, 2010.

WEB RESOURCES:

- ❖ <https://www.geeksforgeeks.org/introduction-to-net-framework/>
- ❖ <https://www.javatpoint.com/net-framework>
- ❖ <https://www.w3schools.com/asp/default.ASP>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED			ENTREPRENEURSHIP				
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			GLOBAL	✓	
Changes Made in the Course	Percentage of Change				No Changes Made				New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.											

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	To create web applications and implement various controls.	K1 to K4
CO2	Create a web page in Rich control.	K1 to K4
CO3	Develop knowledge about file handling operations.	K1 to K4
CO4	An ability to design XML classes.	K1 to K4
CO5	To develop a software to solve real-world problems using ASP.NET.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	L	S	M	M	M	M
CO2	M	M	S	M	M	M	M	S	L	M
CO3	S	M	M	S	M	M	L	S	M	M
CO4	M	S	L	M	M	S	S	M	M	M
CO5	S	M	S	M	S	L	M	S	M	M

S- STRONG**M – MEDIUM****L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	2	2	2
CO 2	3	2	3	2	2
CO 3	3	3	2	2	2
CO 4	3	2	3	2	1
CO 5	3	2	2	2	2
WEIGHTAGE	15	11	12	10	9
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100	73	80	67	60

LESSON PLAN:

UNIT	ASP.NET Programming Lab	HRS	PEDAGOGY
1	Create an exposure of Web applications and tools.	75	Demonstration Hands-on Training
2	Implement the HTML Controls.		
3	Implement the Server Controls.		
4	Web application using Web controls.		
5	Web application using List controls.		
6	Web page design using Rich control. Validate user input using Validation controls. Working with File concepts.		
7	Web application using Data Controls.		
8	Data binding with Web controls.		
9	Data binding with Data Controls.		
10	Database application to perform insert, update, and delete operations.		
11	Database application using Data Controls to perform insert, delete, edit, paging, and sorting operations.		
12	Implement the XML classes.		
13	Implement Authentication – Authorization.		
14	Ticket reservation using ASP.NET controls.		
15	Online examination using ASP.NET controls.		

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding & Implementation	Debugging & Output
CI AI	CO1	K1	5				
	CO2	K2		5			
	CO3	K3			5		
	CO4	K3				5	
	CO5	K4					5
Question Pattern CIA		No. of Questions to be asked	2	2	2	2	2
		No. of Questions to be answered	2	2	2	2	2
		Marks for each question	2.5	2.5	2.5	2.5	2.5
		Total Marks for each section	5	5	5	5	5

Distribution of Marks with K Level CIA									
	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding	Debugging & Output	Total Marks	% of (Marks without choice)	Consolidated %
CIA	K1	5					5	20	20
	K2		5				5	20	20
	K3			5	5		10	40	40
	K4					5	5	20	20
	Marks						25	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S.No.	Cos	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding & Implementation	Debugging & Output
1	CO1	K1	15				
2	CO2	K2		15			
3	CO3	K3			15		
4	CO4	K3				15	
5	CO5	K4					15
Question Pattern		No. of Questions to be asked	2	2	2	2	2
		No. of Questions to be answered	2	2	2	2	2
		Marks for each question	7.5	7.5	7.5	7.5	7.5
		Total Marks for each section	15	15	15	15	15

Distribution of Marks with K Level

K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding	Debugging & Output	Total Marks	% of (Marks without choice)	Consolidated %
K1	15					15	20	20
K2		15				15	20	20
K3			15	15		30	40	40
K4					15	15	20	20
Marks	15	15	15	15	15	75	100	100



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Project with Viva - Voce			
Course Code	23UCAPR51	L	P	C
Category	Core	-	5	4

COURSE OBJECTIVES:

- Gain exposure to the various phases of the Software Development Life Cycle.
- Learn to apply skills and knowledge in design, coding, and testing using appropriate technological tools and procedures.
- Develop applications while adhering to personal, societal, and professional ethical standards.

REGULATIONS

1. The Candidates have to undergo Project Work during the Course of Study in the Institution itself.
2. Candidates must identify and analyze real-world problems within their selected project domain.
3. During the course of study, candidates are required to develop, design, and test applications as per the guidance of their assigned mentor.
4. Candidates must prepare and submit a project manuscript as a report, following the requirements set by the institution/department for evaluation.
5. The project report must be submitted at the end of the semester for presentation and Viva-Voce as part of the practical examinations.
6. The minimum passing requirement for the project work is 40%.
7. If a candidate fails to secure 40% in the project work, they must improve and resubmit it in the next attempt.
8. A faculty member from the department will act as a guide to supervise and monitor the candidates' progress throughout the project work.
9. The assigned faculty member will also serve as the internal examiner during the project work and the Viva-Voce examination.
10. Internal marks for the project work will be awarded by the assigned guide/internal examiner.
11. Both internal and external examiners will evaluate the project report, assess the presentation, and conduct the Viva-Voce examination.

Total Lecture Hours

75

INTERNAL MARKS AWARDED FOR THE PROJECT WORK – 25 Marks	
1. Plan of the Project – 5 Marks 2. Execution of the Plan – 5 Marks 3. Individual Initiative – 5 Marks 4. Review 1 – 5 Marks 5. Review 2 – 5 Marks	
EXTERNAL MARKS AWARDED FOR THE PROJECT WORK – 75 Marks	
1. Evaluation of the Project Report - 25 Marks 2. Presentation – 25 Marks 3. Viva-Voce Examination – 25 Marks	
Total – 100 Marks	

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL	✓	GLOBAL
Changes Made in the Course	Percentage of Change		80%	No Changes Made		New Course		
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:										K LEVEL	
After studying this course, the students will be able to:											
CO1	Show Leadership Skills and Learn Time Management									K1 to K4	
CO2	Identify various Tools to be applied to a specific Problem									K1 to K4	
CO3	Evaluate the Reports									K1 to K4	
CO4	Involve in the Team and Manage it to deliver the excellent Outcomes									K1 to K4	
CO5	Assess and Develop the Individual Skills to Present and Organize the Projects									K1 to K4	
MAPPING WITH PROGRAM OUTCOMES:											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	M	S	S	S	M	M	S	M	
CO2	S	S	S	S	S	S	S	M	S	S	
CO3	S	S	S	S	S	S	S	M	S	S	
CO4	S	S	S	S	S	S	S	S	S	S	
CO5	S	S	S	S	S	S	S	S	S	S	
S- STRONG			M – MEDIUM					L - LOW			
CO / PO MAPPING:											
COS		PSO1		PSO2		PSO3		PSO4		PSO5	PSO6
CO1		3		2		3		3		3	

C02	3	3	3	3	3	2
C03	3	3	3	3	3	3
C04	3	2	3	3	3	3
C05	3	3	3	3	2	3
WEIGHTAGE	15	13	15	15	14	14
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTIO N TO POS	100%	87%	93%	100%	93%	93%



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Big Data Analytics			
Course Code	23UCAEC51	L	P	C
Category	Elective	4	-	3
COURSE OBJECTIVES:				
➤ Understand the Big Data Platform and its Use cases ➤ To identify and understand the basics of cluster and decision tree ➤ To study about the Association Rules, Recommendation System ➤ To learn about the concept of streaming ➤ Understand the concepts of NoSQL Databases				
UNIT - I	INTRODUCTION	12 HRS		
Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications —Perception and Quantification of Value –Understanding Big Data Storage —A General Overview of High-Performance Architecture—HDFS—Map Reduce And YARN—Map Reduce Programming Model				
UNIT - II	ADVANCED ANALYTICAL THEORY AND METHODS, CLASSIFICATION-	12 HRS		
Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method—Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .Classification: Decision Trees—Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms—Evaluating a Decision Tree—Decision Trees in R — Naïve Bayes — Bayes Theorem—Naïve Bayes Classifier.				
UNIT - III	ADVANCED ANALYTICAL THEORY AND METHODS, RECOMMENDATION SYSTEM	12 HRS		
Advanced Analytical Theory and Methods: Association Rules—Overview— Apriori Algorithm— Evaluation of Candidate Rules—Applications of Association Rule Finding Association & finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation-Hybrid Recommendation Approaches.				
UNIT - IV	STREAM CONCEPTS	12HRS		
Introduction to Streams Concepts—Stream Data Model and Architecture—Stream Computing, Sampling Data in a Stream — Filtering Streams —Counting Distinct Elements in a Stream — Estimating moments—Counting ones in a Window—Decaying Window—Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics- give spaces between words				
UNIT - V	NOSQL DATABASES	12 HRS		
NoSQL Databases: Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores—Graph Databases Hive—Sharding—HBase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.				
Total Lecture Hours				60 HRS

BOOKS FOR STUDY:

- Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

BOOKS FOR REFERENCES:

- David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013.
- EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2015.

WEB RESOURCES:

- ❖ https://www.tutorialspoint.com/big_data_analytics/index.htm
- ❖ https://www.sas.com/en_us/insights/analytics/big-data-analytics.html
- ❖ https://www.tutorialspoint.com/big_data_analytics/index.htm

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL		GLOBAL ✓
Changes Made in the Course	Percentage of Change		60%	No Changes Made			New Course	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Work with big data tools and its analysis techniques.	K1 to K4
CO2	Analyze data by utilizing clustering and classification algorithms.	K1 to K4
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	K1 to K4
CO4	Perform analytics on data streams.	K1 to K4
CO5	Learn NoSQL databases and management.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	L	M	M	M	M
CO2	S	S	M	L	M	M	M	M	M	M
CO3	M	M	M	S	M	S	L	M	M	M
CO4	M	M	L	S	S	S	M	M	M	M
CO5	M	M	S	M	M	M	L	S	M	M
S- STRONG			M - MEDIUM				L - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	1	3	2	2	3
CO 2	3	2	3	2	3
CO 3	1	3	2	2	2
CO 4	3	3	3	1	3
CO 5	3	2	3	3	3
WEIGHTAGE	11	13	13	10	14
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	73	87	87	67	93

LESSON PLAN:

UNIT	Big Data Analytics	HRS	PEDAGOGY
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications —Perception and Quantification of Value – Understanding Big Data Storage —A General Overview of High-Performance Architecture—HDFS—Map Reduce And YARN—Map Reduce Programming Model	12 HRS	Black Board/PPT
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method— Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions . Classification: Decision Trees—Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms—Evaluating a Decision Tree—Decision Trees in R — Naïve Bayes — Bayes Theorem—Naïve Bayes Classifier.	12 HRS	Black Board/PPT
III	Advanced Analytical Theory and Methods: Association Rules— Overview— Apriori Algorithm—Evaluation of Candidate Rules— Applications of Association Rule Finding Association & finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation —Knowledge Based Recommendation-Hybrid Recommendation Approaches.	12 HRS	Black Board/PPT
IV	Introduction to Streams Concepts —Stream Data Model and Architecture—Stream Computing, Sampling Data in a Stream — Filtering Streams —Counting Distinct Elements in a Stream — Estimating moments—Counting on a Sliding Window—Decaying Window—Real time Analytics Platform(RTAP) applications — Case	12 HRS	Black Board/PPT

	Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics- give spaces between words		
V	NoSQL Databases: Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores-Document Stores — Tabular Stores — Object Data Stores—Graph Databases Hive—Sharding—HBase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	12 HRS	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)						
Formative Examination - Blue Print						
Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions		PART – A		(10 x 1 = 10 Marks)	
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Software Project Management			
Course Code	23UCAEC52	L	P	C
Category	Elective	4	-	3
COURSE OBJECTIVES:				
➤ To define and highlight the importance of software project management. ➤ To formulate and define the software management metrics & strategy in managing projects. ➤ Understand and apply software testing techniques in a commercial environment.				
UNIT - I	INTRODUCTION TO COMPETENCIES			12 HRS
Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and Models - The SEI CMM - International Organization for Standardization.				
UNIT - II	MANAGING DOMAIN PROCESSES			12 HRS
Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project - Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.				
UNIT - III	TASKS AND ACTIVITIES			12 HRS
Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.				
UNIT - IV	PROJECT MANAGEMENT RESOURCE			12 HRS
Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.				
UNIT - V	QUALITY			12 HRS
Quality: Requirements – The SEI CMM – Guidelines – Challenges – Quality Function Deployment – Building the Software Quality Assurance Plan – Software Configuration Management: Principles – Requirements – Planning and Organizing – Tools – Benefits – Legal Issues in Software – Case Study.				
Total Lecture Hours				60 HRS

BOOKS FOR STUDY:

- Robert T. Futrell, Donald F. Shafer, Linda I. Safer, "Quality Software Project Management", Pearson Education Asia, 2002.

BOOKS FOR REFERENCES:

- Pankaj Jalote, "Software Project Management in Practice", Addison Wesley, 2002.
- Hughes, "Software Project Management", Tata McGraw Hill, 2004, 3rd Edition.

WEB RESOURCES:

- ❖ https://onlinecourses.nptel.ac.in/noc19_cs70/preview
- ❖ <https://www.smartworld.com/notes/software-project-management>
- ❖ https://www.tutorialspoint.com/software_engineering/software_project_management.htm

Nature of Course	EMPLOYABILITY			SKILL ORIENTED			ENTREPRENEURSHIP		✓
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓	
Changes Made in the Course	Percentage of Change		20%	No Changes Made			New Course		
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.									

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Understand the principles and concepts of project management	K1 to K4
CO2	Knowledge gained to train software project managers	K1 to K4
CO3	Apply software project management methodologies.	K1 to K4
CO4	Able to create comprehensive project plans	K1 to K4
CO5	Evaluate and mitigate risks associated with software development process	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	L	M	M	M	M
CO2	S	S	M	M	L	M	M	M	M	M
CO3	M	M	M	S	M	S	M	L	M	M
CO4	M	M	L	S	S	S	M	M	M	M
CO5	M	M	S	M	M	M	L	S	M	M
S- STRONG			M - MEDIUM				L - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	2	2	1	3	3	1
CO 2	2	1	2	3	3	1
CO 3	3	2	1	2	3	3
CO 4	2	3	2	3	2	1
CO 5	2	2	2	3	3	3
WEIGHTAGE	11	9	8	14	14	9
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	73	60	53	93	93	60

LESSON PLAN:

UNIT	Software Project Management	HRS	PEDAGOGY
I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and Models - The SEI CMM - International Organization for Standardization.	12	BLACK BOARD / LCD
II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project - Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	12	BLACK BOARD / LCD
III	Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	12	BLACK BOARD / LCD
IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.	12	BLACK BOARD / LCD
V	Quality: Requirements – The SEI CMM – Guidelines – Challenges – Quality Function Deployment – Building the Software Quality Assurance Plan – Software Configuration Management: Principles – Requirements – Planning and Organizing – Tools – Benefits – Legal Issues in Software – Case Study.	12	BLACK BOARD / LCD

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Computational Intelligence			
Course Code	23UCAEC53	L	P	C
Category	Elective	4	-	3
COURSE OBJECTIVES: ➤ To identify and understand the basics of AI and its search. ➤ To study about the Fuzzy logic systems. ➤ Understand and apply the concepts of Neural Network and its functions. ➤ Understand the concepts of Artificial Neural Network. ➤ To study about the Genetic Algorithm.				
UNIT - I Introduction to AI: Problem formulation				12
Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.				
UNIT - II Fuzzy Logic Systems				12
Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule-Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – Fuzzy Rule-Based Classifier.				
UNIT - III Neural Networks				12
Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Back propagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory. Adaptive Resonance theory and Self Organizing Map, Recent Applications.				
UNIT - IV Artificial Neural Networks				12
Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.				
UNIT - V Genetic Algorithm				12
Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm.				
Total Lecture Hours				60

BOOKS FOR STUDY:

- S.N. Sivanandam and S.N. Deepa, —Principles of Soft Computing, 2nd Edition, Wiley India Pvt. Ltd.
- Stuart Russell and Peter Norvig, —Artificial Intelligence - A Modern Approach, 2nd Edition, Pearson Education in Asia.
- S. Rajasekaran, G.A. Vijayalakshmi, —Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis & Applications, PHI.

BOOKS FOR REFERENCES:

- F. Martin McNeill and Ellen Thro, —Fuzzy Logic: A Practical Approach, AP Professional, 2000.
- Chin-Teng Lin, C.S. George Lee, —Neuro-Fuzzy Systems, PHI.

WEB RESOURCES:

- ❖ <https://www.javatpoint.com/artificial-intelligence-tutorial>
- ❖ <https://www.w3schools.com/ai/>
- ❖ <https://github.com/Computational-Intelligence-Fall18/Computational-Intelligence-Tutorials>

Nature of Course	EMPLOYABILITY			SKILL ORIENTED			ENTREPRENEURSHIP		✓
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓	
Changes Made in the Course	Percentage of Change			No Changes Made			New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.									

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	K1 to K4
CO2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	K1 to K4
CO3	Understand the concepts of Neural Network and analyze and apply the learning techniques.	K1 to K4
CO4	Understand the artificial neural networks and its applications.	K1 to K4
CO5	Understand the concept of Genetic Algorithm and analyze the optimization problems using GAs.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	L	M	M	M	M
CO2	S	S	L	M	M	M	M	M	M	M
CO3	M	M	M	S	L	S	M	M	M	M
CO4	L	M	M	S	S	S	M	M	M	M
CO5	M	M	S	L	M	M	M	S	M	M

S- STRONG		M – MEDIUM			L - LOW	
CO / PO MAPPING:						
COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	2	3	2	2	-	1
CO 2	3	2	3	2	3	3
CO 3	3	1	2	2	2	3
CO 4	2	3	-	1	3	-
CO 5	3	2	3	3	3	3
WEIGHTAGE	13	11	10	10	11	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	87	73	67	67	73	67
LESSON PLAN:						
UNIT	Computational Intelligence			HRS	PEDAGOGY	
I	Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.			12	Black Board/PPT	
II	Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule-Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – Fuzzy Rule-Based Classifier			12	Black Board/PPT	
III	Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Backpropagation Learning, Variation of Standard Backpropagation Neural Network, Introduction to Associative Memory. Adaptive Resonance theory and Self Organizing Map, Recent Applications			12	Black Board/PPT	
IV	Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.			12	Black Board/PPT	
V	Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm.			12	Black Board/PPT	

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Articulation Mapping						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Artificial Intelligence			
Course Code	23UCAEC54	L	P	C
Category	Elective	4	-	3
COURSE OBJECTIVES:				
➤ To learn various concepts of AI techniques. ➤ To learn various search algorithms in AI. ➤ To learn probabilistic reasoning and models in AI. ➤ To learn about Markov Decision Process. ➤ To learn various types of reinforcement learning				
UNIT - I Introduction				12
Introduction: Concept of AI, History, Current Status, Scope, Agents, Environments, Problem Formulations, Review of Tree and Graph Structures, State Space Representation, Search Graph and Search Tree				
UNIT - II Search Algorithms				12
Search Algorithms: Random Search, Search with Closed and Open List, Depth-First and Breadth-First Search, Heuristic Search, Best-First Search, A* Algorithm, Game Search				
UNIT - III Probabilistic Reasoning				12
Probabilistic Reasoning: probability, conditional probability, Bayes' rule, Bayesian networks - representation, construction, and inference, temporal models, hidden Markov model				
UNIT - IV Markov Decision Process (MDP)				12
Markov Decision Process (MDP): MDP Formulation, Utility Theory, Utility Functions, Value Iteration, Policy Iteration, and Partially Observable MDPs				
UNIT - V Reinforcement Learning				12
Reinforcement Learning: Passive Reinforcement Learning, Direct Utility Estimation, Adaptive Dynamic Programming, Temporal Difference Learning, Active Reinforcement Learning				
Total Lecture Hours				60

BOOKS FOR STUDY:

- Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall.
- Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill.

BOOKS FOR REFERENCES:

- Trivedi, M. C., "A Classical Approach to Artificial Intelligence", Khanna Publishing House, Delhi.
- Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011.
- David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press, 2010.

WEB RESOURCES:

- ❖ <https://nptel.ac.in/courses/106106140/>
- ❖ <https://nptel.ac.in/courses/106106126/>
- ❖ <https://www.geeksforgeeks.org/artificial-intelligence/>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		80%	No Changes Made		New Course		
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Understand the various concepts of AI techniques	K1 to K4
CO2	Understand various Search Algorithms in AI.	K1 to K4
CO3	Understand probabilistic reasoning and models in AI.	K1 to K4
CO4	Understand Markov Decision Process.	K1 to K4
CO5	Understand various types of Reinforcement learning techniques.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	M	L	M	M
CO2	S	S	M	M	M	M	L	M	M	M
CO3	L	M	M	S	M	S	M	M	M	M
CO4	M	L	M	S	S	S	M	M	M	M
CO5	M	M	S	M	L	M	M	S	M	M
S- STRONG			M – MEDIUM			L - LOW				

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	3	2	3	2
CO 2	2	2	2	3	3
CO 3	1	2	1	1	2
CO 4	3	1	2	2	2
CO 5	2	1	3	1	2
WEIGHTAGE	10	9	10	10	11
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	67	60	67	67	73

LESSON PLAN:

UNIT	Artificial Intelligence	HRS	PEDAGOGY
I	Introduction: Concept of AI, History, Current Status, Scope, Agents, Environments, Problem Formulations, Review of Tree and Graph Structures, State Space Representation, Search Graph and Search Tree	12	Black Board/PPT
II	Search Algorithms: Random Search, Search with Closed and Open List, Depth-First and Breadth-First Search, Heuristic Search, Best-First Search, A*Algorithm, Game Search	12	Black Board/PPT
III	probabilistic reasoning: probability, conditional probability, bayes' rule, Bayesian networks - representation, construction, and inference, temporal models, hidden Markov model	12	Black Board/PPT
IV	Markov Decision Process (MDP): MDP Formulation, Utility Theory, Utility Functions, Value Iteration, Policy Iteration, and Partially Observable MDPs	12	Black Board/PPT
V	Reinforcement Learning: Passive Reinforcement Learning, Direct Utility Estimation, Adaptive Dynamic Programming, Temporal Difference Learning, Active Reinforcement Learning	12	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI AII	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions		PART – A		(10 x 1 = 10 Marks)	
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Cloud Computing			
Course Code	23UCAEC55	L	P	C
Category	Elective	4	-	3

COURSE OBJECTIVES:

- Learning fundamental concepts and technologies of Cloud Computing.
- Learning various cloud service types and their uses and pitfalls.
- To learn about Cloud Architecture and application design.
- To know the various aspects of application design, benchmarking, and security on the Cloud.
- To learn the various case studies in Cloud Computing.

UNIT – I Introduction to Cloud Computing & Cloud Concepts and Technologies 12

Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications.

Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.

UNIT - II Cloud Services 12

Cloud Services

Compute Services: Amazon Elastic Compute Cloud - Google Compute Engine - Windows Azure Virtual Machines. **Storage Services:** Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. **Database Services:** Amazon Relational Data Store - Amazon DynamoDB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service. **Application Services:** Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services. **Content Delivery Services:** Amazon CloudFront - Windows Azure Content Delivery Network. **Analytics Services:** Amazon Elastic MapReduce - Google MapReduce Service - Google Big Query - Windows Azure HDInsight. **Deployment and Management Services:** Amazon Elastic Beanstalk – Amazon CloudFormation. **Identity and Access Management Services:** Amazon Identity and Access Management - Windows Azure Active Directory. **Open-Source Private Cloud Software:** Cloud Stack - Eucalyptus - OpenStack.

UNIT - III Cloud Application Design 12

Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).

COURSE OUTCOMES:										K LEVEL	
After studying this course, the students will be able to:											
CO1	Understand the fundamental concepts and technologies in Cloud Computing.									K1 to K4	
CO2	Able to understand various cloud service types and their uses and pitfalls.									K1 to K4	
CO3	Able to understand Cloud Architecture and Application design.									K1 to K4	
CO4	Understand the various aspects of application design, benchmarking, and security in the Cloud.									K1 to K4	
CO5	Understand various case studies in Cloud Computing.									K1 to K4	
MAPPING WITH PROGRAM OUTCOMES:											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	M	M	M	M	M	M	L	M	M	
CO2	S	S	L	M	M	M	M	M	M	M	
CO3	L	M	M	S	M	S	M	M	M	M	
CO4	M	M	M	S	S	S	L	M	M	M	
CO5	M	M	S	L	M	M	M	S	M	M	
S- STRONG			M – MEDIUM					L - LOW			
CO / PO MAPPING:											
COS		PSO1		PSO2		PSO3		PSO4		PSO5	
CO 1		2		2		2		3		3	
CO 2		3		1		2		3		3	
CO 3		3		2		1		2		1	
CO 4		3		3		2		3		2	
CO 5		2		2		1		3		3	
WEIGHTAGE		13		10		8		14		12	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		87		67		53		93		80	
LESSON PLAN:											
UNIT	Cloud Computing							HRS	PEDAGOGY		
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.							12	Black Board/PPT		

II	Cloud Services Compute Services: Amazon Elastic Compute Cloud - Google Compute Engine - Windows Azure Virtual Machines. Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. Database Services: Amazon Relational Data Store - Amazon DynamoDB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service. Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services. Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network. Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google Big Query - Windows Azure HDInsight. Deployment and Management Services: Amazon Elastic Beanstalk - Amazon CloudFormation. Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory. Open-Source Private Cloud Software: Cloud Stack - Eucalyptus - OpenStack	12	Black Board/PPT
III	Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	12	Black Board/PPT
IV	Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security: Securing data at rest, securing data in motion – Key Management – Auditing.	12	Black Board/PPT
V	Case Studies: Cloud Computing for Healthcare – Cloud Computing for Energy Systems – Cloud Computing for Transportation Systems – Cloud Computing for Manufacturing Industry – Cloud Computing for Education.	12	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI AII	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions		PART – A		(10 x 1 = 10 Marks)	
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Information Security			
Course Code	23UCAEC56	L	P	C
Category	Elective	4	-	3
COURSE OBJECTIVES:				
➤ To know the objectives of information security ➤ Understand the importance and application of each of confidentiality, integrity, authentication, and availability ➤ Understand various cryptographical algorithms ➤ Understand the basic categories of threats to computers and networks ➤ To study about the concepts of security in networks, web security				
UNIT - I Introduction to Information Security				12
Introduction to Information Security: Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.				
UNIT - II The Security Problem in Computing& Cryptography				12
The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plaintext and ciphertext, substitution techniques, transposition techniques, encryption and decryption.				
UNIT - III Symmetric and Asymmetric Cryptographic Techniques & Authentication and Digital Signatures				12
Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms. Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.				
UNIT - IV Program Security& Designing Trusted O.S				12
Program Security: Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of-use Errors, Viruses, Trapdoors, Salami attack, Man-in-the-middle attacks, Covert channels. File protection Mechanisms, User Authentication. Designing Trusted O.S: Security policies, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples.				
UNIT – V Security in Networks& Web Security:				12
Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.				
Total Lecture Hours				60

BOOKS FOR STUDY:

- Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education.
- Cryptography and Network Security Principles and Practice, Fourth or Fifth Edition, William Stallings, Pearson.

BOOKS FOR REFERENCES:

- Cryptography and Network Security: C.K. Shyamala, N. Harini, Dr. T.R. Padmanabhan, Wiley India, 1st Edition.
- Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 2nd Edition.
- Information Security, Principles and Practice: Mark Stamp, Wiley India.
- Principles of Computer Security: W.M. Arthur Conklin, Greg White, TMH.

WEB RESOURCES:

- ❖ <https://www.geeksforgeeks.org/what-is-information-security/>
- ❖ <https://www.tutorialspoint.com/what-is-informationsecurity#:~:text=Information%20security%20is%20designed%20and,destruction%2C%20alteration%2C%20and%20disruption>
- ❖ <https://www.tutorialspoint.com/what-is-information-security>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED			ENTREPRENEURSHIP				
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			GLOBAL	✓	
Changes Made in the Course	Percentage of Change				No Changes Made				New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.											

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Understand network security threats, security services, and countermeasures	K1 to K4
CO2	Understand vulnerability analysis of network security	K1 to K4
CO3	Acquire background on hash functions; authentication; firewalls; intrusion detection techniques	K1 to K4
CO4	Gain hands-on experience with programming and simulation techniques for security protocols	K1 to K4
CO5	Apply methods for authentication, access control, intrusion detection and prevention	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	M	M	M	M	M	M	M
CO2	S	S	M	M	M	L	M	M	M	M
CO3	M	M	M	S	M	S	M	M	M	L
CO4	M	M	M	S	S	S	L	M	M	M
CO5	L	M	S	M	M	M	M	S	M	M
S- STRONG			M – MEDIUM			L - LOW				

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	3	3	2	3
CO 2	2	1	1	2	3
CO 3	1	3	2	3	1
CO 4	3	3	1	3	3
CO 5	2	3	2	3	3
WEIGHTAGE	10	13	9	13	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	67	87	60	87	87

LESSON PLAN:

UNIT	Information Security	HRS	PEDAGOGY
I	Introduction to Information Security: Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.	12	Black Board/PPT
II	The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plaintext and ciphertext, substitution techniques, transposition techniques, encryption and decryption.	12	Black Board/PPT
III	Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RS Algorithms. Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.	12	Black Board/PPT
IV	Program Security: Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of-use Errors, Viruses, Trapdoors, Salami attack, Man-in-the-middle attacks, Covert channels. File protection Mechanisms, User Authentication. Designing Trusted O.S: Security policies, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples.	12	Black Board/PPT
V	Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.	12	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Internship			
Course Code	23UCAIN51	L	P	C
Category	Summer Internship	-	-	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce the concepts of working ambiance, attitude, adaptability, problem-solving ability,
- Ability to work with a supervisor, and the capacity to follow directions, etc.
- Provide exposure to the different phases of developing a computer solution with team spirit.
- Develop problem-solving skills and soft skills.
- Learn the essential working skills required in the industry.

REGULATIONS

1. Candidates must complete a minimum of 30 hours of an internship program in the industry during the holidays of the fourth semester of their course of study.
2. Candidates must undertake a project, analyze it, learn the various stages of solution development, test, validate, and fulfill other related requirements.
3. During the third semester, candidates should refine the work carried out during the internship, enhance their solution to meet industry standards, and incorporate constructive feedback received from the industry and/or institution during reviews.
4. Candidates must prepare and submit a report documenting their internship experience, following the institution/department's evaluation requirements.
5. The internship report must be submitted at the end of the third semester for presentation and Viva-Voce as part of the practical examinations.
6. The minimum passing requirement for the internship is 40%.
7. If a candidate fails to secure 40% in the internship, they must improve and resubmit it in the next attempt.
8. A faculty member from the department will act as a guide to supervise and monitor candidates' progress throughout the internship.
9. The assigned faculty member will also serve as the internal examiner during the internship and the Viva-Voce examination.
10. Internal marks for the internship will be awarded by the assigned guide/internal examiner.
11. Both internal and external examiners will evaluate the internship report, assess the presentation, and conduct the Viva-Voce examination.

Total Hours	30 hours
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INTERNAL MARKS AWARDED FOR THE INTERNSHIP – 25 Marks	
• Learning the Work Culture leading towards Performance, Organizations Skills and Relationship with Team Members – 5 Marks • Internship Review 1 (During the beginning of the Semester) – 5 Marks • Internship Review 2 (During the end of the Semester) – 5 Marks • Progress of the Internship by the Candidate's active Participation – 10 Marks	
EXTERNAL MARKS AWARDED FOR THE INTERNSHIP – 75Marks	
1. Evaluation of the Internship Report - 25 Marks	
2. Presentation – 25 Marks	
3. Viva-Voce Examination – 25 Marks	
Total – 100 Marks	

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL	✓	GLOBAL
Changes Made in the Course	Percentage of Change		80%	No Changes Made		New Course		
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:										K LEVEL
After studying this course, the students will be able to:										
CO1	Demonstrate leadership skills and effective time management in a professional work environment.									K1 to K4
CO2	Identify and apply appropriate industry tools and technologies to solve real-world problems.									K1 to K4
CO3	Analyze and evaluate the internship reports.									K1 to K4
CO4	Collaborate effectively within a team and contribute to successful project outcomes.									K1 to K4
CO5	Enhance individual skills in communication, presentation and project organization.									K1 to K4
MAPPING WITH PROGRAM OUTCOMES:										
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	S	M	S	S	M
CO2	M	S	S	S	M	S	S	M	S	S
CO3	S	S	M	M	S	M	S	S	S	S
CO4	S	S	M	S	M	S	M	S	S	S
CO5	S	S	S	M	S	S	S	M	M	S
S- STRONG			M – MEDIUM					L - LOW		

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	3	3
CO2	3	3	3	3	2	2
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	2	3
WEIGHTAGE	15	14	15	15	13	14
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTIO N TO POS	100%	93%	93%	100%	87%	93%

SIXTH SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Computer Networks			
Course Code	23UCACC61	L	P	C
Category	Core	6	-	4
COURSE OBJECTIVES: ➤ To understand the concept of Data Communication and Computer Network. ➤ To gain knowledge on routing algorithms. ➤ To impart knowledge about networking and internetworking devices. ➤ To study about Network Communication. ➤ To learn the concept of Transport Layer.				
UNIT - I Introduction				18
Introduction – Network Hardware, Software, Reference Models, OSI and TCP/IP Models. Example Networks: Internet, ATM, Ethernet, and Wireless LANs. Physical Layer – Theoretical Basis for Data Communication, Guided Transmission Media.				
UNIT - II Wireless Transmission				18
Wireless Transmission – Communication Satellites. Telephone System: Structure, Local Loop, Trunks, Multiplexing, and Switching. Data Link Layer: Design Issues – Error Detection and Correction				
UNIT - III Elementary Data Link Protocols.				18
Elementary Data Link Protocols. Sliding Window Protocols. Data Link Layer in the Internet. Medium Access Layer: Channel Allocation Problem, Multiple Access Protocols, Bluetooth.				
UNIT - IV Network Layer				18
Network Layer: Design Issues, Routing Algorithms, Congestion Control Algorithms. IP Protocol – IP Addresses – Internet Control Protocols.				
UNIT - V Transport Layer				18
Transport Layer: Services, Connection Management, Addressing, Establishing and Releasing a Connection. Simple Transport Protocol – Internet Transport Protocols (ITP). Network Security: Cryptography.				
Total Lecture Hours				90

BOOKS FOR STUDY:

- A. S. Tanenbaum, "Computer Networks," 4th Edition, Prentice Hall of India, 2008.

BOOKS FOR REFERENCES:

- B. A. Forouzan, "Data Communications and Networking," 4th Edition, Tata McGraw Hill, 2017.
- F. Halsall, "Data Communications, Computer Networks, and Open Systems," Pearson Education, 2008.
- D. Bertsekas and R. Gallager, "Data Networks," 2nd Edition, PHI, 2008.
- Lamarca, "Communication Networks," Tata McGraw Hill, 2002.

WEB RESOURCES:

- ❖ https://en.wikipedia.org/wiki/Computer_network
- ❖ <https://citationsy.com/styles/computer-networks>
- ❖ <https://www.tpointtech.com/computer-network-tutorial>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		10%	No Changes Made			New Course		
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.									

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	To understand the basics of Computer Network architecture, OSI, and TCP/IP reference models.	K1 to K4
CO2	To gain knowledge of Telephone Systems using wireless networks.	K1 to K4
CO3	To understand the concept of MAC.	K1 to K4
CO4	To analyze the characteristics of Routing and Congestion Control algorithms.	K1 to K4
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, and DNS.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	M	M	M	M	M	M	M	M
CO2	S	S	L	M	M	M	M	M	M	M
CO3	M	M	M	S	L	S	M	M	M	M
CO4	M	M	M	S	S	S	L	M	M	M
CO5	M	M	S	M	M	M	M	S	M	L
S- STRONG			M - MEDIUM			L - LOW				

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	2	2	1
CO 2	3	2	1	2	2
CO 3	3	3	3	3	2
CO 4	3	1	2	2	1
CO 5	3	3	1	2	3
WEIGHTAGE	15	11	9	10	9
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100	73	60	67	60

LESSON PLAN:

UNIT	Computer Networks	HRS	PEDAGOGY
I	Introduction – Network Hardware, Software, Reference Models, OSI and TCP/IP Models. Example Networks: Internet, ATM, Ethernet, and Wireless LANs. Physical Layer – Theoretical Basis for Data Communication, Guided Transmission Media.	18	Black Board/PPT
II	Wireless Transmission – Communication Satellites. Telephone System: Structure, Local Loop, Trunks, Multiplexing, and Switching. Data Link Layer: Design Issues – Error Detection and Correction	18	Black Board/PPT
III	Elementary Data Link Protocols. Sliding Window Protocols. Data Link Layer in the Internet. Medium Access Layer: Channel Allocation Problem, Multiple Access Protocols, Bluetooth.	18	Black Board/PPT
IV	Network Layer: Design Issues, Routing Algorithms, Congestion Control Algorithms. IP Protocol – IP Addresses – Internet Control Protocols.	18	Black Board/PPT
V	Transport Layer: Services, Connection Management, Addressing, Establishing and Releasing a Connection. Simple Transport Protocol – Internet Transport Protocols (ITP). Network Security: Cryptography.	18	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI AII	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions				PART – B	(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3		
OR					
11. b)	Unit - I	CO1	K3		
12. a)	Unit - II	CO2	K3		
OR					
12. b)	Unit - II	CO2	K3		
13. a)	Unit - III	CO3	K3		
OR					
13. b)	Unit - III	CO3	K3		
14. a)	Unit - IV	CO4	K3		
OR					
14. b)	Unit - IV	CO4	K3		
15. a)	Unit - V	CO5	K3		
OR					
15. b)	Unit - V	CO5	K3		

Answer ALL the questions				PART – C	(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4		
OR					
16. b)	Unit - I	CO1	K4		
17. a)	Unit - II	CO2	K4		
OR					
17. b)	Unit - II	CO2	K4		
18. a)	Unit - III	CO3	K4		
OR					
18. b)	Unit - III	CO3	K4		
19. a)	Unit - IV	CO4	K4		
OR					
19. b)	Unit - IV	CO4	K4		
20. a)	Unit - V	CO5	K4		
OR					
20. b)	Unit - V	CO5	K4		



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Data Analytics Using R Programming			
Course Code	23UCACC62	L	P	C
Category	Core	6	-	4
COURSE OBJECTIVES: ➤ To understand the problem-solving approaches. ➤ To learn the basic programming constructs in R Programming. ➤ To learn the basic programming constructs in R Programming. ➤ To use R Programming data structures – lists, tuples, and dictionaries. ➤ To do input/output with files in R Programming.				
UNIT - I EVOLUTION OF BIG DATA				18
Evolution of Big Data , best practices for Big Data analytics, Big Data characteristics, validating, the promotion of the value of Big Data, Big Data use cases, characteristics of Big Data applications, perception and quantification of value, understanding Big Data storage, a general overview of high-performance architecture, HDFS, MapReduce and YARN, and the MapReduce programming model.				
UNIT - II CONTROL STRUCTURES AND VECTORS				18
Control structures , functions, scoping rules, dates and times, introduction to functions, preview of some important R data structures, vectors, character strings, matrices, lists, data frames, and classes. Vectors: generating sequences, vectors and subscripts, extracting elements of a vector using subscripts, working with logical subscripts, scalars, vectors, arrays, and matrices. Adding and deleting vector elements, obtaining the length of a vector, matrices and arrays as vectors, vector arithmetic and logical operations, vector indexing, and common vector operations.				
UNIT - III LIST AND DATA FRAMES				18
Lists : Creating lists, general list operations, list indexing, adding and deleting list elements, getting the size of a list, extended example: text concordance, accessing list components and values, applying functions to lists. Data Frames : Creating data frames, accessing data frames, and other matrix-like operations.				
UNIT - IV FACTORS AND TABLES				18
Factors and levels , common functions used with factors, working with tables, matrix/array-like operations on tables, extracting a sub-table, finding the largest cells in a table, math functions, calculating a probability, cumulative sums and products, minima and maxima, calculus, functions for statistical distributions.				
UNIT - V OBJECT-ORIENTED PROGRAMMING				18
OBJECT-ORIENTED PROGRAMMING Classes, S-Generic functions, writing S-classes, using inheritance in S-classes, implementing a generic function on an S-class, visualization, simulation, code profiling, statistical analysis with R, and data manipulation.				
Total Lecture Hours				90

BOOKS FOR STUDY:

- Roger D. Peng, "R Programming for Data Science," 2012.
- Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design," 2011.

BOOKS FOR REFERENCES:

- Garrett Grolemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations," 1st Edition, 2014.
- Venables, W. N., and Ripley, "S Programming," Springer, 2000.

WEB RESOURCES:

- ❖ <https://www.geeksforgeeks.org/r-programming-for-data-science/>
- ❖ <https://www.w3schools.com/r/>
- ❖ <https://data-flair.training/blogs/r-tutorials-home/>

Nature of Course	EMPLOYABILITY			SKILL ORIENTED			ENTREPRENEURSHIP		✓		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			GLOBAL	✓	
Changes Made in the Course	Percentage of Change				No Changes Made				New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.											

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Work with big data tools and its analysis techniques.	K1 to K4
CO2	Analyze data by utilizing clustering and classification algorithms.	K1 to K4
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	K1 to K4
CO4	Perform analytics on data streams.	K1 to K4
CO5	Learn NoSQL databases and management.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	M	M	M	M	M	M	M	M
CO2	S	S	M	M	M	M	M	L	M	M
CO3	M	M	M	S	L	S	M	M	M	M
CO4	M	M	L	S	S	S	M	M	M	M
CO5	M	M	S	M	M	M	M	S	M	L
S- STRONG			M - MEDIUM				L - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	1	3	1	3
CO 2	3	3	2	2	2	2
CO 3	1	2	3	1	2	1
CO 4	2	2	2	2	2	2
CO 5	2	2	2	1	3	1
WEIGHTAGE	11	11	10	9	10	9
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	73	73	67	60	67	60

LESSON PLAN:

UNIT	Data Analytics Using R Programming	HRS	PEDAGOGY
I	Evolution of Big Data , best practices for Big Data analytics, Big Data characteristics, validating, the promotion of the value of Big Data, Big Data use cases, characteristics of Big Data applications, perception and quantification of value, understanding Big Data storage, a general overview of high-performance architecture, HDFS, MapReduce and YARN, and the MapReduce programming model.	18	BLACK BOARD / LCD
II	Control structures , functions, scoping rules, dates and times, introduction to functions, preview of some important R data structures, vectors, character strings, matrices, lists, data frames, and classes. Vectors: generating sequences, vectors and subscripts, extracting elements of a vector using subscripts, working with logical subscripts, scalars, vectors, arrays, and matrices. Adding and deleting vector elements, obtaining the length of a vector, matrices and arrays as vectors, vector arithmetic and logical operations, vector indexing, and common vector operations.	18	BLACK BOARD / LCD
III	Lists : Creating lists, general list operations, list indexing, adding and deleting list elements, getting the size of a list, extended example: text concordance, accessing list components and values, applying functions to lists. Data Frames : Creating data frames, accessing data frames, and other matrix-like operations.	18	BLACK BOARD / LCD
IV	Factors and levels , common functions used with factors, working with tables, matrix/array-like operations on tables, extracting a sub-table, finding the largest cells in a table, math functions, calculating a probability, cumulative sums and products, minima and maxima, calculus, functions for statistical distributions.	18	BLACK BOARD / LCD
V	OBJECT-ORIENTED PROGRAMMING Classes, S-Generic functions, writing S-classes, using inheritance in S-classes,	18	BLACK BOARD /

implementing a generic function on an S-class, visualization, simulation, code profiling, statistical analysis with R, and data manipulation.		LCD
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Learning Outcome Based Education & Assessment (LOBE)						
Formative Examination - Blue Print						
Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI AII	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	R Programming Lab			
Course Code	23UCACP61	L	P	C
Category	Core	-	6	4
COURSE OBJECTIVES: ➤ Acquire programming skills in core R Programming. ➤ Acquire object-oriented programming skills in R Programming. ➤ Develop the skill of designing graphical-user interfaces (GUI) in R Programming. ➤ Acquire R Programming skills to move into specific branches.				
S. No.	Lab Exercise	90		
1.	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon the user's choice.			
2.	Program to find the area of a rectangle, square, circle, and triangle by accepting suitable input parameters from the user.			
3.	Write a program to find a list of even numbers from 1 to n using R loops.			
4.	Create a function to print squares of numbers in sequence.			
5.	Write a program to join columns and rows in a data frame using cbind() and rbind() in R.			
6.	Implement different string manipulation functions in R.			
7.	Implement different data structures in R (Vectors, Lists, Data Frames).			
8.	Write a program to read a CSV file and analyse the data in the file in R.			
9.	Create a pie chart and bar chart using R.			
10.	Create a data set and do statistical analysis on the data using R.			
11.	Program to find the factorial of the given number using a recursive function.			
12.	Write an R program to count the number of even and odd numbers from an array of N numbers.			
Total Lecture Hours				90

BOOKS FOR STUDY:

- Roger D. Peng, "R Programming for Data Science," 2012.
- Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design," 2011.

BOOKS FOR REFERENCES:

- Garrett Golemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations," 1st Edition, 2014.
- Venables, W. N., and Ripley, "S Programming," Springer, 2000.

WEB RESOURCES:

- ❖ <https://www.geeksforgeeks.org/data-analysis-using-r/>
- ❖ https://www.w3schools.com/r/r_syntax.asp
- ❖ <https://www.tutorialspoint.com/r/index.htm>

Nature of Course	EMPLOYABILITY				SKILL ORIENTED		✓	ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			GLOBAL	✓
Changes Made in the Course	Percentage of Change			40%	No Changes Made				New Course	
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.										

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Acquire programming skills in core R Programming.	K1 to K4
CO2	Acquire object-oriented programming skills in R Programming.	K1 to K4
CO3	Develop the skill of designing graphical user interfaces (GUI) in R Programming.	K1 to K4
CO4	Acquire R Programming skills to move into specific branches.	K1 to K4
CO5		K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	M	M	M	L	M
CO2	S	M	L	S	M	M	M	S	M	M
CO3	S	M	S	M	M	M	M	S	M	L
CO4	M	L	S	S	M	M	M	M	M	M
CO5	S	M	M	S	S	L	M	M	M	M
S- STRONG			M – MEDIUM				L - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	2	2
CO 2	2	3	3	3	3	3
CO 3	1	3	3	3	1	2
CO 4	2	3	3	3	2	1
CO 5	2	3	3	3	2	2
WEIGHTAGE	10	15	15	15	10	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	67	100	100	100	67	67

LESSON PLAN:

UNIT	R Programming Lab	HRS	PEDAGOGY
1	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon the user's choice.	75	Demonstration Hands-on Training
2	Program to find the area of a rectangle, square, circle, and triangle by accepting suitable input parameters from the user.		
3	Write a program to find a list of even numbers from 1 to n using R loops.		
4	Create a function to print squares of numbers in sequence.		
5	Write a program to join columns and rows in a data frame using cbind() and rbind() in R.		
6	Implement different string manipulation functions in R.		
7	Implement different data structures in R (Vectors, Lists, Data Frames).		
8	Write a program to read a CSV file and analyze the data in the file in R.		
9	Create a pie chart and bar chart using R.		
10	Create a data set and do statistical analysis on the data using R.		
11	Program to find the factorial of the given number using a recursive function.		
12	Write an R program to count the number of even and odd numbers from an array of N numbers.		

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding & Implementation	Debugging & Output
CI AI	CO1	K1	5				
	CO2	K2		5			
	CO3	K3			5		
	CO4	K3				5	
	CO5	K4					5
Question Pattern CIA		No. of Questions to be asked	2	2	2	2	2
		No. of Questions to be answered	2	2	2	2	2
		Marks for each question	2.5	2.5	2.5	2.5	2.5
		Total Marks for each section	5	5	5	5	5

Distribution of Marks with K Level CIA									
	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding	Debugging & Output	Total Marks	% of (Marks without choice)	Consolidated %
CIA	K1	5					5	20	20
	K2		5				5	20	20
	K3			5	5		10	40	40
	K4					5	5	20	20
	Marks						25	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)							
S.No.	Cos	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding & Implementation	Debugging & Output
1	CO1	K1	15				
2	CO2	K2		15			
3	CO3	K3			15		
4	CO4	K3				15	
5	CO5	K4					15
Question Pattern		No. of Questions to be asked	2	2	2	2	2
		No. of Questions to be answered	2	2	2	2	2
		Marks for each question	7.5	7.5	7.5	7.5	7.5
		Total Marks for each section	15	15	15	15	15

Distribution of Marks with K Level								
K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding	Debugging & Output	Total Marks	% of (Marks without choice)	Consolidated %
K1	15					15	20	20
K2		15				15	20	20
K3			15	15		30	40	40
K4					15	15	20	20
Marks	15	15	15	15	15	75	100	100



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	IoT and its Applications			
Course Code	23UCAEC61	L	P	C
Category	Elective	5	-	3
COURSE OBJECTIVES:				
➤ Use of Devices, Gateways, and Data Management in IoT. ➤ Design IoT applications in different domains and be able to analyze their performance. ➤ Implement basic IoT applications on embedded platforms. ➤ Gain knowledge on Industry Internet of Things. ➤ Learn about the privacy and security issues in IoT.				
UNIT – I IOT & WEB TECHNOLOGY				15 HRS
IoT & Web Technology , The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.				
UNIT - II M2M TO IOT				15 HRS
M2M to IoT – A Basic Perspective – Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT – An Architectural Overview – Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.				
UNIT - III IOT ARCHITECTURE				15 HRS
IoT Architecture - State of the Art – Introduction, State of the Art, Architecture. Reference Model - Introduction, Reference Model and Architecture, IoT Reference Model,				
UNIT - IV IOT REFERENCE ARCHITECTURE				15 HRS
IoT Reference Architecture - Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural Views.				
UNIT - V IOT APPLICATIONS				15 HRS
IoT Applications for Value Creation - Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, IoT for Retailing Industry, IoT for Oil and Gas Industry, Home Management.				
Total Lecture Hours				75 HRS

BOOKS FOR STUDY:

- Vijay Madisetti and Arshdeep Bahga, —Internet of Things: (A Hands-on Approach)ll, Universities Press (INDIA) Private Limited, 2014, 1st Edition.

BOOKS FOR REFERENCES:

- Michael Miller, —The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the Worldll, Kindle version.
- Francis da Costa, —Rethinking the Internet of Things: A Scalable Approach to Connecting Everythingll, Apress Publications, 2013, 1st Edition.
- Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"ll, Cuno Pfister, —Getting Started with the Internet of Thingsll, O'Reilly Media, 2011.

WEB RESOURCES:

- ❖ <https://www.tpointtech.com/internet-of-things-applications>
- ❖ https://www.tutorialspoint.com/internet_of_things/index.htm
- ❖ <https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/>

Nature of Course	EMPLOYABILITY		SKILL ORIENTED			ENTREPRENEURSHIP		✓
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change		60%	No Changes Made			New Course	

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Work with big data tools and its analysis techniques.	K1 to K4
CO2	Analyze data by utilizing clustering and classification algorithms.	K1 to K4
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	K1 to K4
CO4	Perform analytics on data streams.	K1 to K4
CO5	Learn NoSQL databases and management.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	L	M	M	M	M
CO2	S	S	M	M	L	M	M	M	M	M
CO3	M	M	M	S	M	S	M	L	M	M
CO4	M	M	L	S	S	S	M	M	M	M
CO5	M	M	S	M	M	M	L	S	M	M

S- STRONG**M – MEDIUM****L - LOW**

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	1	2	2	3	1
CO 2	2	2	2	2	3
CO 3	3	1	1	1	2
CO 4	2	2	2	2	1
CO 5	2	2	3	2	2
WEIGHTAGE	11	9	10	10	9
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	73	60	67	67	60

LESSON PLAN:

UNIT	IoT and its Applications	HRS	PEDAGOGY
I	IoT & Web Technology , The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	15	Black Board/PPT
II	M2M to IoT – A Basic Perspective – Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT – An Architectural Overview – Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	15	Black Board/PPT
III	IoT Architecture - State of the Art – Introduction, State of the Art, Architecture. Reference Model - Introduction, Reference Model and Architecture, IoT Reference Model.	15	Black Board/PPT
IV	IoT Reference Architecture - Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural Views.	15	Black Board/PPT
V	IoT Applications for Value Creation - Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, IoT for Retailing Industry, IoT for Oil and Gas Industry, Home Management.	15	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Image Processing			
Course Code	23UCAEC62	L	P	C
Category	Elective	5	-	3
COURSE OBJECTIVES: ➤ To learn fundamentals of digital image processing. ➤ To learn about various 2D Image transformations. ➤ To learn about various image enhancement processing methods and filters. ➤ To learn about various classification of Image segmentation techniques. ➤ To learn about various image compression techniques.				
UNIT - I Digital Image Fundamentals				12
Digital Image Fundamentals: Image representation - Basic relationship between pixels, Elements of DIP system - Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology - Structuring Elements - Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method - 2D Convolution Through Matrix Analysis.				
UNIT - II 2D Image transforms				12
2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform - Haar transform - Discrete Cosine Transform - Karhunen-Loeve Transform - Singular Value Decomposition. Properties of 2D-DFT - Walsh transform - Hadamard transform - Haar transform - Discrete Cosine Transform - Karhunen-Loeve Transform - Singular Value Decomposition.				
UNIT - III Image Enhancement				12
Image Enhancement: Spatial domain methods - Point processing - Intensity transformations - Histogram processing - Spatial filtering - smoothing filter - Sharpening filters - Frequency domain methods: low-pass filtering, high-pass Filtering - Homomorphic filter.				
UNIT - IV Image segmentation				12
Image segmentation: Classification of Image segmentation techniques - Region approach - Clustering techniques - Segmentation based on thresholding - Edge-based segmentation - Classification of edges - Edge detection - Hough transform - Active contour.				
UNIT - V Image Compression				12
Image Compression: Need for compression - Redundancy - Classification of image - Compression schemes - Huffman coding - Arithmetic coding - Dictionary-based compression - Transform-based compression.				
Total Lecture Hours				60

BOOKS FOR STUDY:

- S Jayaraman, S Esakkirajan, T Veerakumar, *Digital Image Processing*, Tata McGraw Hill, 2015
- Gonzalez Rafael C, *Digital Image Processing*, Pearson Education, 2009

BOOKS FOR REFERENCES:

- Jain Anil K, *Fundamentals of Digital Image Processing*, PHI, 1988
- Kenneth R Castleman, *Digital Image Processing*, Pearson Education, 2/e, 2003
- Pratt William K, *Digital Image Processing*, John Wiley, 4/e, 2007

WEB RESOURCES:

- ❖ <https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20- Vijaya%20Raghavan.pdf>
- ❖ http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
- ❖ <https://dl.acm.org/doi/10.5555/559707> <https://www.ijert.org/image-processing-using-web-2-0-2-give-this-as-reference-link-url>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change			No Changes Made			New Course	✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Understand the fundamental concepts of digital image processing	K1 to K4
CO2	Understand various 2D Image transformations	K1 to K4
CO3	Understand image enhancement processing techniques and filters	K1 to K4
CO4	Understand the classification of Image segmentation techniques	K1 to K4
CO5	Understand various image compression techniques.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	L	M	M	M	M	M
CO2	S	S	L	M	M	M	M	M	M	M
CO3	M	M	M	S	M	S	M	M	M	L
CO4	M	L	M	S	S	S	M	M	M	M
CO5	M	M	S	M	M	M	M	S	L	M
S- STRONG			M – MEDIUM				L - LOW			

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	3	2	2	3	1
CO 2	3	2	3	2	3	3
CO 3	3	3	2	2	2	1
CO 4	3	3	3	1	3	3
CO 5	3	2	3	3	3	3
WEIGHTAGE	13	13	13	10	14	11
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	87	87	87	67	93	73

LESSON PLAN:

UNIT	Image Processing	HRS	PEDAGOGY
I	Digital Image Fundamentals: Image representation - Basic relationship between pixels, Elements of DIP system - Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology - Structuring Elements - Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method - 2D Convolution Through Matrix Analysis.	12	Black Board/PPT
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform - Haar transform - Discrete Cosine Transform - Karhunen-Loeve Transform - Singular Value Decomposition.	12	Black Board/PPT
III	Image Enhancement: Spatial domain methods - Point processing - Intensity transformations - Histogram processing - Spatial filtering - smoothing filter - Sharpening filters - Frequency domain methods: low-pass filtering, high-pass Filtering - Homomorphic filter.	12	Black Board/PPT
IV	Image segmentation: Classification of Image segmentation techniques - Region approach - Clustering techniques - Segmentation based on thresholding - Edge-based segmentation - Classification of edges - Edge detection - Hough transform - Active contour.	12	Black Board/PPT
V	Image Compression: Need for compression - Redundancy - Classification of image - Compression schemes - Huffman coding - Arithmetic coding - Dictionary-based compression - Transform-based compression.	12	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI AII	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Human Computer Interaction			
Course Code	23UCAEC63	L	P	C
Category	Elective	5	-	3

COURSE OBJECTIVES:

- To learn about the foundations of Human-Computer Interaction.
- To learn the design and software process technologies.
- To learn HCI models and theories.
- To learn Mobile Ecosystem.
- To learn the various types of Web Interface Design.

UNIT - I FOUNDATIONS OF HCI 12

FOUNDATIONS OF HCI: The Human: I/O channels – Memory. Reasoning and problem solving. The Computer: Devices – Memory – Processing and networks. Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity – Paradigms. Case Studies.

UNIT – II DESIGN & SOFTWARE PROCESS: 12

DESIGN & SOFTWARE PROCESS: Interactive Design: Basics – Process – Scenarios. Navigation: Screen design, Iteration, and Prototyping. HCI in software process: Software life cycle – Usability engineering – Prototyping in practice – Design rationale. Design rules: Principles, Standards, Guidelines, Rules. Evaluation Techniques – Universal Design.

UNIT - III MODELS AND THEORIES: 12

MODELS AND THEORIES: HCI Models: Cognitive models – Socio-Organizational issues and stakeholder requirements – Communication and collaboration models – Hypertext, Multimedia & WWW.

UNIT - IV Mobile HCI 12

Mobile HCI: Mobile Ecosystem: Platforms, Application frameworks. Types of Mobile Applications: Widgets, Applications, Games. Mobile Information Architecture, Mobile 2.0. Mobile Design: Elements of Mobile Design, Tools. Case Studies.

UNIT - V WEB INTERFACE DESIGN: 12

WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies.

Total Lecture Hours	60
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BOOKS FOR STUDY:

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, *Human-Computer Interaction*, III Edition, Pearson Education, 2004. (UNIT I, II & III)
- Brian Fling, *Mobile Design and Development*, I Edition, O'Reilly Media Inc., 2009. (UNIT IV)
- Bill Scott and Theresa Neil, *Designing Web Interfaces*, First Edition, O'Reilly, 2009. (UNIT V)

BOOKS FOR REFERENCES:

- Ben Shneiderman, *Designing the User Interface: Strategies for Effective Human-Computer Interaction*, V Edition, Pearson Education.

WEB RESOURCES:

- ❖ <https://www.interaction-design.org/literature/topics/human-computer-interaction>
- ❖ https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction
- ❖ https://link.springer.com/10.1007/978-0-387-39940-9_192

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change				No Changes Made			New Course	✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.									

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Understand the fundamentals of HCI.	K1 to K4
CO2	Understand the design and software process technologies.	K1 to K4
CO3	Understand HCI models and theories.	K1 to K4
CO4	Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture, and design.	K1 to K4
CO5	Understand the various types of Web Interface Design.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	M	M	M	M	M	M	M
CO2	S	S	M	M	M	M	M	M	M	L
CO3	L	M	M	S	M	S	M	M	M	M
CO4	M	M	L	S	S	S	M	M	M	M
CO5	M	M	S	M	M	M	M	S	L	M
S- STRONG			M – MEDIUM			L - LOW				

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	2	3	2	2	3
CO 2	3	2	1	1	3
CO 3	2	3	3	3	1
CO 4	2	2	1	3	3
CO 5	1	3	2	3	3
WEIGHTAGE	10	13	9	12	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	67	87	60	80	87

LESSON PLAN:

UNIT	Human Computer Interaction	HRS	PEDAGOGY
I	FOUNDATIONS OF HCI: The Human: I/O channels – Memory. Reasoning and problem solving. The Computer: Devices – Memory – Processing and networks. Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity – Paradigms. Case Studies.	12	Black Board/PPT
II	DESIGN & SOFTWARE PROCESS: Interactive Design: Basics – Process – Scenarios. Navigation: Screen design, Iteration, and Prototyping. HCI in software process: Software life cycle – Usability engineering – Prototyping in practice – Design rationale. Design rules: Principles, Standards, Guidelines, Rules. Evaluation Techniques – Universal Design.	12	Black Board/PPT
III	MODELS AND THEORIES: HCI Models: Cognitive models – Socio-Organizational issues and stakeholder requirements – Communication and collaboration models – Hypertext, Multimedia, and WWW .	12	Black Board/PPT
IV	Mobile HCI: Mobile Ecosystem: Platforms, Application frameworks. Types of Mobile Applications: Widgets, Applications, Games. Mobile Information Architecture, Mobile 2.0. Mobile Design: Elements of Mobile Design, Tools. Case Studies.	12	Black Board/PPT
V	WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies.	12	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI AII	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level

K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions		PART – A		(10 x 1 = 10 Marks)	
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Cryptography			
Course Code	23UCAEC64	L	P	C
Category	Elective	5	-	3
COURSE OBJECTIVES:				
➤ To understand the fundamentals of Cryptography. ➤ To acquire knowledge on standard algorithms used to provide confidentiality, integrity, and authenticity. ➤ To understand the various key distribution and management schemes. ➤ To understand how to deploy encryption techniques to secure data in transit across data networks. ➤ To design security applications in the field of Information Technology.				
UNIT - I Introduction				12
Introduction: The OSI Security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network security.				
UNIT - II Classical Encryption Techniques				12
Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Monoalphabetic cipher – Playfair cipher – Polyalphabetic Cipher – Transposition techniques – Steganography.				
UNIT - III Block Cipher and DES				12
Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES – RSA: The RSA algorithm.				
UNIT - IV Network Security Practices, Web Security				12
Network Security Practices: IP Security overview – IP Security architecture – Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.				
UNIT - V Intruders				12
Intruders – Malicious Software – Firewalls.				
Total Lecture Hours				60

BOOKS FOR STUDY:

- William Stallings, *Cryptography and Network Security Principles and Practices*.

BOOKS FOR REFERENCES:

- Behrouz A. Forouzan, *Cryptography and Network Security*, Tata McGraw-Hill, 2007.
- Atul Kahate, *Cryptography and Network Security*, Second Edition, 2003, TMH.
- M.V. Arun Kumar, *Network Security*, 2011, First Edition, USP.

WEB RESOURCES:

- ❖ <https://www.tutorialspoint.com/cryptography/>
- ❖ <https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography>
- ❖ <https://www.tutorialspoint.com/cryptography/index.htm>

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP			
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change				No Changes Made			New Course	✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.									

COURSE OUTCOMES:										K LEVEL	
After studying this course, the students will be able to:											
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.									K1 to K4	
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms.									K1 to K4	
CO3	Apply the different cryptographic operations of public key cryptography.									K1 to K4	
CO4	Apply the various authentication schemes to simulate different applications.									K1 to K4	
CO5	Understand various security practices and system security standards.									K1 to K4	
MAPPING WITH PROGRAM OUTCOMES:											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	S	S	S	S	S	S	M	M	M	L	
CO2	S	S	S	S	S	S	M	L	M	M	
CO3	S	S	S	S	S	S	L	M	M	M	
CO4	S	S	S	S	S	S	M	M	L	M	
CO5	S	S	S	S	S	S	M	L	M	M	
S- STRONG			M – MEDIUM					L - LOW			
CO / PO MAPPING:											
COS		PSO1		PSO2		PSO3		PSO4		PSO5	PSO6
CO 1		3		3		1		2		3	2
CO 2		3		2		3		2		3	3
CO 3		2		3		2		2		2	1
CO 4		2		3		3		1		2	3
CO 5		3		2		3		3		3	3
WEIGHTAGE		13		13		12		10		13	12
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		87		87		80		67		87	80

LESSON PLAN:

UNIT	Cryptography	HRS	PEDAGOGY
I	Introduction: The OSI Security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network security.	12	Black Board/PPT
II	Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Monoalphabetic cipher – Playfair cipher – Polyalphabetic Cipher – Transposition techniques – Steganography.	12	Black Board/PPT
III	Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES – RSA: The RSA algorithm.	12	Black Board/PPT
IV	Network Security Practices: IP Security overview – IP Security architecture – Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.	12	Black Board/PPT
V	Intruders – Malicious Software – Firewalls.	12	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI AI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI AII	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)

S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40

(Figures in parenthesis denotes, questions should be asked with the given K level)

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions		PART – A		(10 x 1 = 10 Marks)	
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Analytics for Service Industry			
Course Code	23UCAEC65	L	P	C
Category	Elective	5	-	3

COURSE OBJECTIVES:

- Recognize challenges in dealing with datasets in the service industry.
- Identify and apply appropriate algorithms for analyzing healthcare, human resource, hospitality, and tourism data.
- Make choices for a model for new machine learning tasks.
- Identify employees with high attrition risk.
- Prioritize various talent management initiatives for your organization.

UNIT - I Healthcare Analytics 12

Healthcare Analytics : Introduction to Healthcare Data Analytics - Electronic Health Records – Components of EHR- Coding Systems - Benefits of EHR - Barrier to Adopting HER Challenges – Pheno typing Algorithms. Biomedical Image Analysis and Signal Analysis – Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.

UNIT - II Healthcare Analytics Applications 12

Healthcare Analytics Applications: Applications and Practical Systems for Healthcare – Data Analytics for Pervasive Health – Fraud Detection in Healthcare – Data Analytics for Pharmaceutical Discoveries – Clinical Decision Support Systems – Computer-Assisted Medical Image Analysis Systems – Mobile Imaging and Analytics for Biomedical Data.

UNIT - III HR Analytics 12

HR Analytics: Evolution of HR Analytics, HR information systems and data sources, HR metrics and HR analytics, Intuition versus analytical thinking, HRMS/HRIS and data sources, Analytics frameworks like LAMP, HCM:21(r) Model.

UNIT - IV Performance Analysis 12

Performance Analysis: Predicting employee performance, training requirements, evaluating training and development, optimizing selection and promotion decisions.

UNIT - V Tourism and Hospitality Analytics 12

Tourism and Hospitality Analytics: Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – Optimized Disruption Management – Fraud Detection in Payments.

Total Lecture Hours 60

BOOKS FOR STUDY:

- Chandan K. Reddy and Charu C. Aggarwal, *Healthcare Data Analytics*, Taylor & Francis, 2015.
- Edwards, Martin R., and Edwards, Kirsten (2016), *Predictive HR Analytics: Mastering the HR Metric*, Kogan Page Publishers, ISBN-0749473924.
- Fitz-enz, Jac (2010), *The New HR Analytics: Predicting the Economic Value of Your Company's Human Capital Investments*, AMACOM, ISBN-13: 978-0-8144-1643-3.
- Rajendra Sahu, Manoj Dash, and Anil Kumar, *Applying Predictive Analytics Within the Service Sector*.

BOOKS FOR REFERENCES:

- Hui Yang and Eva K. Lee, *Healthcare Analytics: From Data to Knowledge to Healthcare Improvement*, Wiley, 2016.
- Fitz-enz, Jac, and Mattox II, John (2014), *Predictive Analytics for Human Resources*, Wiley, ISBN-1118940709.

WEB RESOURCES:

- ❖ <https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php>
- ❖ <https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html>
- ❖ <https://www.simplilearn.com/tutorials/data-analytics-tutorial/what-is-data-analytics>

Nature of Course	EMPLOYABILITY				SKILL ORIENTED				ENTREPRENEURSHIP			✓	
Curriculum Relevance	LOCAL		REGIONAL				NATIONAL				GLOBAL	✓	
Changes Made in the Course	Percentage of Change					No Changes Made					New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.													

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Understand and critically apply the concepts and methods of business analytics.	K1 to K4
CO2	Identify, model, and solve decision problems in different settings.	K1 to K4
CO3	Interpret results/solutions and identify appropriate courses of action for a given managerial situation, whether a problem or an opportunity.	K1 to K4
CO4	Create viable solutions to decision-making problems.	K1 to K4
CO5	Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	L	M	M	M
CO2	S	S	S	S	S	S	M	M	M	L
CO3	S	S	S	S	S	S	M	M	L	M
CO4	S	S	S	S	S	S	M	L	M	M
CO5	S	S	S	S	S	S	M	M	M	L
S- STRONG			M – MEDIUM					L - LOW		

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	3	3
CO 3	3	3	2	3	3	2
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
WEIGHTAGE	14	15	14	15	15	14
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	93	100	93	100	100	93

LESSON PLAN:

UNIT	Analytics for Service Industry	HRS	PEDAGOGY
I	Healthcare Analytics : Introduction to Healthcare Data Analytics - Electronic Health Records – Components of EHR- Coding Systems - Benefits of EHR - Barrier to Adopting HER Challenges –Phenotyping Algorithms. Biomedical Image Analysis and Signal Analysis – Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.	12	Black Board/PPT
II	Healthcare Analytics Applications: Applications and Practical Systems for Healthcare – Data Analytics for Pervasive Health – Fraud Detection in Healthcare – Data Analytics for Pharmaceutical Discoveries – Clinical Decision Support Systems – Computer-Assisted Medical Image Analysis Systems – Mobile Imaging and Analytics for Biomedical Data.	12	Black Board/PPT
III	HR Analytics: Evolution of HR Analytics, HR information systems and data sources, HR metrics and HR analytics, Intuition versus analytical thinking, HRMS/HRIS and data sources, Analytics frameworks like	12	Black Board/PPT

	LAMP, HCM:21(r) Model.		
IV	Performance Analysis: Predicting employee performance, training requirements, evaluating training and development, optimizing selection and promotion decisions.	12	Black Board/PPT
V	Tourism and Hospitality Analytics: Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – Optimized Disruption Management – Fraud Detection in Payments.	12	Black Board/PPT

Learning Outcome Based Education & Assessment (LOBE)						
Formative Examination - Blue Print						
Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II							
	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Natural Language Processing			
Course Code	23UCAEC66	L	P	C
Category	Elective	5	-	3
COURSE OBJECTIVES:				
➤ To understand approaches to syntax and semantics in NLP. ➤ To learn natural language processing and how to apply basic algorithms in this field. ➤ To understand approaches to discourse, generation, dialogue, and summarization within NLP. ➤ To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics, etc. ➤ To understand current methods for statistical approaches to machine translation.				
UNIT - I Introduction				12
Introduction: Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues – Applications – The role of machine learning – Probability basics – Information theory – Collocations – N-gram language models – Estimating parameters and smoothing – Evaluating language models.				
UNIT - II Word Level Analysis, Syntactic Analysis				12
Word Level Analysis: Regular expressions – Finite-state automata – Morphological parsing – Spelling error detection and correction – Words and word classes – Part-of-speech tagging. Syntactic Analysis: Context-free grammar – Constituency parsing – Probabilistic parsing.				
UNIT - III Semantic Analysis, Discourse Processing				12
Semantic Analysis: Meaning representation – Lexical semantics – Ambiguity – Word sense disambiguation. Discourse Processing: Cohesion – Reference resolution – Discourse coherence and structure.				
UNIT - IV Natural Language Generation, Machine Translation				12
Natural Language Generation: Architecture of NLG systems – Generation tasks and representations – Applications of NLG. Machine Translation: Problems in machine translation – Characteristics of Indian languages – Machine translation approaches – Translation involving Indian languages.				
UNIT - V Information Retrieval, Lexical Resources				12
Information Retrieval: Design features of information retrieval systems – Classical, non-classical, and alternative models of information retrieval – Evaluation. Lexical Resources: WordNet – Frame Net – Stemmers – POS Tagger – Research corpora – SSAS.				
Total Lecture Hours				60

BOOKS FOR STUDY:

- Daniel Jurafsky, James H. Martin, *Speech and Language Processing*, Pearson Publications.
- Allen, James. *Natural Language Understanding*, Pearson, 1995.

BOOKS FOR REFERENCES:

- Pierre M. Nugues, *An Introduction to Language Processing with Perl and Prolog*, Springer.

WEB RESOURCES:

- ❖ https://en.wikipedia.org/wiki/Natural_language_processing.
- ❖ <https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP>.
- ❖ https://www.tutorialspoint.com/natural_language_processing/index.htm

Nature of Course	EMPLOYABILITY		✓	SKILL ORIENTED		ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL		GLOBAL	✓
Changes Made in the Course	Percentage of Change			No Changes Made			New Course	✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.								

COURSE OUTCOMES:**K LEVEL**

After studying this course, the students will be able to:

CO1	Describe the fundamental concepts and techniques of natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	K1 to K4
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each. Use NLP technologies to explore and gain a broad understanding of text data.	K1 to K4
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions. Use NLP methods to analyze the sentiment of a text document.	K1 to K4
CO4	Analyze large volume text data generated from a range of real-world applications. Use NLP methods to perform topic modeling.	K1 to K4
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of Things may function, including interactions with people, enterprise functions, and environments.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	L	M	M
CO2	S	S	S	S	S	S	M	M	L	M
CO3	S	S	S	S	S	S	L	M	M	M
CO4	S	S	S	S	S	S	M	L	M	M
CO5	S	S	S	S	S	S	M	M	M	L

S- STRONG		M – MEDIUM			L - LOW	
CO / PO MAPPING:						
COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	1
CO 2	2	3	3	3	2	3
CO 3	1	3	3	3	1	3
CO 4	3	2	1	3	2	3
CO 5	3	3	3	3	3	3
WEIGHTAGE	12	14	13	15	11	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	80	93	87	100	73	87
LESSON PLAN:						
UNIT	Natural Language Processing			HRS	PEDAGOGY	
I	Introduction: Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues – Applications – The role of machine learning – Probability basics – Information theory – Collocations – N-gram language models – Estimating parameters and smoothing – Evaluating language models.			12	Black Board/PPT	
II	Word Level Analysis: Regular expressions – Finite-state automata – Morphological parsing – Spelling error detection and correction – Words and word classes – Part-of-speech tagging. Syntactic Analysis: Context-free grammar – Constituency parsing – Probabilistic parsing.			12	Black Board/PPT	
III	Semantic Analysis: Meaning representation – Lexical semantics – Ambiguity – Word sense disambiguation. Discourse Processing: Cohesion – Reference resolution – Discourse coherence and structure.			12	Black Board/PPT	
IV	Natural Language Generation: Architecture of NLG systems – Generation tasks and representations – Applications of NLG. Machine Translation: Problems in machine translation – Characteristics of Indian languages – Machine translation approaches – Translation involving Indian languages.			12	Black Board/PPT	
V	Information Retrieval: Design features of information retrieval			12	Black Board/PPT	

systems – Classical, non-classical, and alternative models of information retrieval – Evaluation.

Lexical Resources: WordNet – FrameNet – Stemmers – POS Tagger – Research corpora – SSAS.

Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)

Articulation Mapping – K Levels with Course Outcomes (COs)						
Internal	Cos	K Level	Section A		Section B Either or Choice	Section C Either or Choice
			MCQs			
			No. of. Questions	K - Level		
CI	CO1	K1 – K4	2	K1,K2	2(K3)	2(K4)
AI	CO2	K1 – K4	2	K1,K2	2(K3)	2(K4)
CI	CO3	K1 – K4	2	K1,K2	2(K3)	2(K4)
AII	CO4	K1 – K4	2	K1,K2	2(K3)	2(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		4	4
		No. of Questions to be answered	4		2	2
		Marks for each question	1		5	8
		Total Marks for each section	4		10	16

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Either / Or Choice)	Section C (Either / Or Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100
CIA II	K1	2			2	3.6	7.2
	K2	2			2	3.6	
	K3		20		20	35.7	35.7
	K4			32	32	57.1	57.1
	Marks	4	20	32	56	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)						
S. No	COs	K - Level	Section A (MCQs)		Section B (Either / or Choice) With K - LEVEL	Section C (Either / or Choice) With K - LEVEL
			No. of Questions	K – Level		
1	CO1	K1-K4	2	K1,K2	2 (K3)	2 (K4)
2	CO2	K1-K4	2	K1,K2	2 (K3)	2 (K4)
3	CO3	K1-K4	2	K1,K2	2 (K3)	2 (K4)
4	CO4	K1-K4	2	K1,K2	2 (K3)	2 (K4)
5	CO5	K1-K4	2	K1,K2	2 (K3)	2 (K4)
No. of Questions to be Asked			10		10	10
No. of Questions to be answered			10		5	5
Marks for each question			1		5	8
Total Marks for each section			10		25	40
(Figures in parenthesis denotes, questions should be asked with the given K level)						

Distribution of Marks with K Level						
K Level	Section A (Multiple Choice Questions)	Section B (Either or Choice)	Section C (Either/ or Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5			5	3.57	3.57
K2	5			5	3.57	3.57
K3		50		50	35.72	35.72
K4			80	80	57.14	57.14
Marks	10	50	80	140	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.						

Summative Examinations - Question Paper – Format

Q. No.	Unit	CO	K-level		
Answer ALL the questions PART – A (10 x 1 = 10 Marks)					
1.	Unit - I	CO1	K1		
				a)	b)
				c)	d)
2.	Unit - I	CO1	K2		
				a)	b)
				c)	d)
3.	Unit - II	CO2	K1		
				a)	b)
				c)	d)
4.	Unit - II	CO2	K2		
				a)	b)
				c)	d)
5.	Unit - III	CO3	K1		
				a)	b)
				c)	d)
6.	Unit - III	CO3	K2		
				a)	b)
				c)	d)
7.	Unit - IV	CO4	K1		
				a)	b)
				c)	d)
8.	Unit - IV	CO4	K2		
				a)	b)
				c)	d)
9.	Unit - V	CO5	K1		
				a)	b)
				c)	d)
10.	Unit - V	CO5	K2		
				a)	b)
				c)	d)

Answer ALL the questions		PART – B		(5 x 5 = 25 Marks)
11. a)	Unit - I	CO1	K3	
OR				
11. b)	Unit - I	CO1	K3	
12. a)	Unit - II	CO2	K3	
OR				
12. b)	Unit - II	CO2	K3	
13. a)	Unit - III	CO3	K3	
OR				
13. b)	Unit - III	CO3	K3	
14. a)	Unit - IV	CO4	K3	
OR				
14. b)	Unit - IV	CO4	K3	
15. a)	Unit - V	CO5	K3	
OR				
15. b)	Unit - V	CO5	K3	

Answer ALL the questions		PART – C		(5 x 8 = 40 Marks)
16. a)	Unit - I	CO1	K4	
OR				
16. b)	Unit - I	CO1	K4	
17. a)	Unit - II	CO2	K4	
OR				
17. b)	Unit - II	CO2	K4	
18. a)	Unit - III	CO3	K4	
OR				
18. b)	Unit - III	CO3	K4	
19. a)	Unit - IV	CO4	K4	
OR				
19. b)	Unit - IV	CO4	K4	
20. a)	Unit - V	CO5	K4	
OR				
20. b)	Unit - V	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER APPLICATIONS

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Cyber Forensics Lab			
Course Code	23UCASP61	L	P	C
Category	Skill	-	2	2

COURSE OBJECTIVES:

- To Understand and Apply Computer Forensics Principles
- To Master Deleted File Recovery Techniques
- To Explore Data Hiding and Extraction Techniques
- To Extract and Analyse EXIF Data from Image Files
- To Conduct Live Forensic Investigations and Evidence Restoration

S. No.	Lab Exercise	30
	1. Study of Computer Forensics and different tools used for forensic investigation 2. Recover Deleted Files using Forensics Tools 3. Hide and extract any text file behind an image file/ Audio file using Command Prompt. 4. Extract Exchangeable image file format (EXIF) Data from Image Files using Exif reader Software 5. Make the forensic image of the hard drive using EnCase Forensics. 6. Restore the Evidence Image using EnCase Forensics 7. Extract Browser Artifacts 8. View Last Activity of Your PC 9. Find Last Connected USB on your system (USB Forensics) 10. Live Forensics Case Investigation using Autopsy	
Total Lecture Hours		30

BOOKS FOR STUDY:

- Eoghan Casey, Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet, Academic Press, 2011.
- Harlan Carvey, Windows Forensic Analysis Toolkit, Syngress, 2011.

BOOKS FOR REFERENCES:

- Brian Carrier, File System Forensic Analysis, Addison-Wesley, 2005.
- Chester Wisniewski and Greg Shipley, The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory, Wiley, 2014.
- Mark M. Pollitt and Peter R. Stephenson, Handbook of Digital Forensics and Investigation, Academic Press, 2009.

WEB RESOURCES:

- ❖ <https://www.forensicfocus.com/>
- ❖ <https://www.geeksforgeeks.org/digital-forensics-in-information-security/>
- ❖ <https://codehs.com/tutorial/14571>

Nature of Course	EMPLOYABILITY				SKILL ORIENTED		✓	ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			GLOBAL	✓
Changes Made in the Course	Percentage of Change				No Changes Made			New Course		✓
* Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.										

COURSE OUTCOMES:	K LEVEL
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After studying this course, the students will be able to:

CO1	Ability to Conduct Forensic Investigations Using Industry Tools	K1 to K4
CO2	Proficiency in Recovering and Analyzing Deleted Files	K1 to K4
CO3	Skill in Hiding and Extracting Data within Media Files	K1 to K4
CO4	Competence in Extracting and Interpreting EXIF Metadata from Images	K1 to K4
CO5	Capability to Perform Live Forensic Investigations and Evidence Restoration	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	L	S	M	M	M	M
CO2	M	M	S	M	M	M	M	S	L	M
CO3	S	M	M	S	M	M	L	S	M	M
CO4	M	S	L	M	M	S	S	M	M	M
CO5	S	M	S	M	S	L	M	S	M	M

S- STRONG

M – MEDIUM

L - LOW

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	2	2	2
CO 2	3	2	3	2	2
CO 3	3	3	2	2	2
CO 4	3	2	3	2	1
CO 5	3	2	2	2	2
WEIGHTAGE	15	11	12	10	9
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100	73	80	67	60

LESSON PLAN:

UNIT	Cyber Forensics Lab	HRS	PEDAGOGY
1	Study of Computer Forensics and different tools used for forensic investigation	30	Demonstration Hands-on Training
2	Recover Deleted Files using Forensics Tools		
3	Hide and extract any text file behind an image file/ Audio file using Command Prompt.		
4	Extract Exchangeable image file format (EXIF) Data from Image Files using Exif reader Software		
5	Make the forensic image of the hard drive using EnCase Forensics.		
6	Restore the Evidence Image using EnCase Forensics		
7	Extract Browser Artifacts		
8	View Last Activity of Your PC		
9	Find Last Connected USB on your system (USB Forensics)		
10	Live Forensics Case Investigation using Autopsy		

Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print Articulation Mapping – K Levels with Course Outcomes (COs)							
Internal	Cos	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding & Implementation	Debugging & Output
CIAI	CO1	K1	5				
	CO2	K2		5			
	CO3	K3			5		
	CO4	K3				5	
	CO5	K4					5
Question Pattern CIA		No. of Questions to be asked	2	2	2	2	2
		No. of Questions to be answered	2	2	2	2	2
		Marks for each question	2.5	2.5	2.5	2.5	2.5
		Total Marks for each section	5	5	5	5	5

Distribution of Marks with K Level CIA									
	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding	Debugging & Output	Total Marks	% of (Marks without choice)	Consolidated %
CIA	K1	5					5	20	20
	K2		5				5	20	20
	K3			5	5		10	40	40
	K4					5	5	20	20
	Marks						25	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No.	Cos	K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding & Implementation	Debugging & Output	
1	CO1	K1	15					
2	CO2	K2		15				
3	CO3	K3			15			
4	CO4	K3				15		
5	CO5	K4					15	
Question Pattern		No. of Questions to be asked	2	2	2	2	2	
		No. of Questions to be answered	2	2	2	2	2	
		Marks for each question	7.5	7.5	7.5	7.5	7.5	
		Total Marks for each section	15	15	15	15	15	

Distribution of Marks with K Level								
K Level	Syntax & Semantics	Programming principles	Concept Applications	Coding	Debugging & Output	Total Marks	% of (Marks without choice)	Consolidated %
K1	15					15	20	20
K2		15				15	20	20
K3			15	15		30	40	40
K4					15	15	20	20
Marks	15	15	15	15	15	75	100	100