

B.Sc., COMPUTER SCIENCE

Syllabus

Program Code: UCS

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****B.SC COMPUTER SCIENCE 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 / Alternative Course					
23UTAGT11	தமிழ் இலக்கிய வரலாறு - I	6	3	25	75	100
Part – II	English					
23UENGE11	General English - I	6	3	25	75	100
Part - III	Core Courses					
23UCSCC11	Programming in C	5	5	25	75	100
23UCSCP11	Programming in C Lab	5	5	25	75	100
Part - III	Elective Course					
23UMTEA12	Numerical Methods	4	3	25	75	100
Part IV	Non Major Elective					
23UCSNM11	Fundamentals of Information Technology	2	2	25	75	100
Part IV	Foundation Course					
23UCSFC11	Problem Solving Techniques	2	2	25	75	100
Total		30	23	175	525	700
SECOND SEMESTER						
Part – I	Tamil / Alternative Course					
23UTAGT21	தமிழ் இலக்கிய வரலாறு – II	6	3	25	75	100
Part – II	English					
23UENGE21	General English - II	6	3	25	75	100
Part - III	Core Courses					
23UCSCC21	Data Structures and Algorithms	5	5	25	75	100
23UCSCP21	Data Structures and Algorithms Lab	5	5	25	75	100
Part - III	Elective Course					
23UMTEA22	Discrete Mathematics – I	4	3	25	75	100
Part IV	Non Major Elective					
23UCSNM21	Office Automation	2	2	25	75	100
Part IV	Skill Enhancement course					
23UCSSP21	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	தமிழக வரலாறும் பண்பாடும்	6	3	25	75	100
Part – II	English					
23UENGE31	General English - III	6	3	25	75	100
Part - III	Core courses					
23UCSCC31	Python Programming	5	5	25	75	100
23UCSCP31	Python Programming 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					
23UCSSC31	Multimedia Systems	1	1	25	75	100
23UCSSP31	Web Designing 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	தமிழும் அறிவியலும்	6	3	25	75	100
Part – II	English					
23UENGE41	General English - IV	6	3	25	75	100
Part - III	Core courses					
23UCSCC41	Java Programming	5	5	25	75	100
23UCSCP41	Java Programming Lab	5	5	25	75	100
Part - III	Elective course					
23UMTEA41	Resource Management Techniques	4	4	25	75	100
Part IV	Skill Based courses					
23UCSSC41	Software Testing	1	1	25	75	100
23UCSSP41	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	Cred its	Maximum Marks		
				Int	Ext	Total
FIFTH SEMESTER						
Part - III	Core courses					
23UCSCC51	Software Engineering	5	4	25	75	100
23UCSCC52	Database Management System	5	4	25	75	100
23UCSCP51	Database Management System Lab	5	4	25	75	100
Part - III	Core project					
23UCSPR51	Project with Viva - Voce	5	4	25	75	100
Part - III	Elective courses - I					
23UCSEC51	Operating System	4	3	25	75	100
23UCSEC52	Human Computer Interaction					
23UCSEC53	Introduction to Data Science					
Part - III	Elective courses - II					
23UCSEC54	Big Data Analytics	4	3	25	75	100
23UCSEC55	Virtual Reality					
23UCSEC56	Agile Project Management					
Part - IV	Mandatory course					
23UVLEG51	Value Education	2	2	25	75	100
23UCSIN51	Internship	-	2	25	75	100
Total		30	26	200	600	800
SIXTH SEMESTER						
Part - III	Core courses					
23UCSCC61	Computer Networks	6	4	25	75	100
23UCSCC62	.Net Programming	6	4	25	75	100
23UCSCP61	.Net Programming Lab	6	4	25	75	100
Part - III	Elective courses - I					
23UCSEC61	Image Processing	5	3	25	75	100
23UCSEC62	IoT and its Applications					
23UCSEC63	Cloud Computing					
Part - III	Elective courses - II					
23UCSEC64	Artificial Intelligence	5	3	25	75	100
23UCSEC65	Robotics and its Applications					
23UCSEC66	Computational Intelligence					
Part - IV	Skill course					
23UCSSP61	Data Analytics using R 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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Software Engineering			
Course Code	23UCSCC51	L	P	C
Category	Core	5	-	4
COURSE OBJECTIVES:				
➤ Gain basic knowledge of analysis and design of systems ➤ Ability to apply software engineering principles and techniques ➤ Model a reliable and cost-effective software system ➤ Ability to design an effective model of the system ➤ Perform Testing at various levels and produce an efficient system.				
UNIT - I Software Life Cycle Models				15
Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.				
UNIT - II Requirements Analysis and Specification & Software Design				15
Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS) Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design				
UNIT - III Function-Oriented Software Design & User-Interface design				15
Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.				
UNIT - IV Coding and Testing:				15
Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. Software Reliability and Quality Management: Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.				
UNIT - V Computer Aided Software Engineering and Software Maintenance				15
Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.				
Total Lecture Hours				75

BOOKS FOR STUDY:

- Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018.

BOOKS FOR REFERENCES:

- Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.
- Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997
- James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.

WEB RESOURCES:

- ❖ <https://www.geeksforgeeks.org/software-engineering/>
- ❖ <https://gist.github.com/vineus/06c9760cbe922e97d549962768ad0146>
- ❖ <https://www.capgemini.com/careers/career-paths/professions/software-engineering/>
- ❖ <https://abseil.io/resources/swe-book>
- ❖ <https://isc.strath.ac.uk/blog/importance-of-software-engineering>

Nature of Course	EMPLOYABILITY			SKILL ORIENTED			ENTREPRENEURSHIP		✓
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			✓
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	Gain basic knowledge of analysis and design of systems	K1 to K4
CO2	Ability to apply software engineering principles and techniques	K1 to K4
CO3	Model a reliable and cost-effective software system	K1 to K4
CO4	Ability to design an effective model of the system	K1 to K4
CO5	Perform Testing at various levels and produce an efficient system.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

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

CO5	S	S	S	M	M	S	M	M	M	M
S- STRONG			M – MEDIUM				L - LOW			
CO / PO MAPPING:										
COS		PSO1	PSO2	PSO3		PSO4		PSO5	PO6	
CO 1		3	2	3		2		2	3	
CO 2		3	2	2		2		1	2	
CO 3		3	3	3		2		3	2	
CO 4		3	3	3		2		2	2	
CO 5		3	3	3		2		2	2	
WEIGHTAGE		15	13	14		10		10	11	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		100	87	93		67		73	74	
LESSON PLAN:										
UNIT	Software Engineering						HRS	PEDAGOGY		
I	Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.						15	BLACK BOARD/ LCD		
II	Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS) Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design						15	BLACK BOARD/ LCD		
III	Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component-based GUI development, a user interface methodology.						15	BLACK BOARD/ LCD		
IV	Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. Software Reliability and Quality Management: Software reliability;						15	BLACK BOARD/ LCD		

	statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.		
V	Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.	15	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,K3)	2 (K4,K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Database Management System			
Course Code	23UCSCC52	L	P	C
Category	Core	5	-	4

COURSE OBJECTIVES:

- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understand the concepts of data base management system, design simple Database Models
- To learn and understand to write queries using SQL, PL/SQL.
- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understand the concepts of data base management system, design simple Database models

UNIT - I Database Concepts: 15 Hrs

Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks -Business rules - Evolution of Data models - Degrees of Data Abstraction

UNIT - II Design Concepts: 15 Hrs

Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram

UNIT - III Normalization of Database Tables: 15 Hrs

Database tables and Normalization – The Need for Normalization –TheNormalization Process – Higher level Normal Form. **Introduction to SQL:** Data Definition Commands –Data Manipulation Commands – SELECT Queries –Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables. **Sub Queries and Correlated Queries:** WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function –Conversion Function

UNIT - IV Advanced SQL: 15 Hrs

Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS. SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join

UNIT - V PL/SQL: 15 Hrs

A Programming Language : History – Fundamentals – Block Structure – Comments – DataTypes – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. **Control Structures and Embedded SQL:** Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements.

PL/SQL Cursors and Exceptions: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

Total Lecture Hours	75
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BOOKS FOR STUDY:

- Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
- Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016

BOOKS FOR REFERENCES:

- Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", McGraw Hill International Publication, VI Edition
- Shio Kumar Singh, "Database Systems", Pearson publications, II Edition

WEB RESOURCES:

- ❖ https://studyglance.in/dbms/index.php#google_vignette
- ❖ https://www.ktunotes.in/ktu-database-management-systems-notes-cst204/#google_vignette
- ❖ <https://csiplearninghub.com/chapter-8-introduction-to-dbms-notes/>
- ❖ <https://codewithcurious.com/dbms-handwritten-notes/>

Nature of Course	EMPLOYABILITY	✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Curriculum Relevance	LOCAL		REGIONAL		NATIONAL	GLOBAL ✓
Changes Made in the Course	Percentage of Change	45%	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 basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	K1 to K4
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity- Relationship Model.	K1 to K4
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	K1 to K4
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	K1 to K4
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	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	M	M	M
CO2	S	S	M	M	M	M	M	M	M	M
CO3	M	M	M	S	M	S	M	M	M	M
CO4	M	M	M	S	S	S	M	M	M	M
CO5	M	M	S	M	S	M	M	M	M	M
S- STRONG			M – MEDIUM					L - LOW		

CO / PO MAPPING:

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

LESSON PLAN:

UNIT	Database Management System	HRS	PEDAGOGY
I	Database Concepts: Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	75 Hrs	Lecture Method, Open inquiry Method
II	Design Concepts: Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram		
III	Normalization of Database Tables: Database tablesand Normalization – The Need for Normalization –TheNormalization Process – Higher level Normal Form. Introduction to SQL: Data Definition Commands –Data Manipulation Commands – SELECT Queries –Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables		
IV	Advanced SQL: Relational SET Operators: UNION – UNION ALL –		

	INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.Sub Queries and Correlated Queries: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function –Conversion Function		
V	PL/SQL: A Programming Language: History – Fundamentals – Block Structure – Comments – DataTypes – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.		

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,K3)	2 (K4,K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Database ManagementSystem Lab			
Course Code	23UCSCP51	L	P	C
Category	Core	-	5	4

COURSE OBJECTIVES:

- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understood the concepts of data base management system, design simple Database Models
- To learn and understand to write queries using SQL, PL/SQL.
- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.

UNIT**75**

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Implement Aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Write user defined functions and stored procedures in SQL.
6. Execute complex transactions and realize DCL and TCL commands.
7. Write SQL Triggers for insert, delete, and update operations in a database table.
8. Create View and index for database tables.
- 9.To write PL/SQL program to find Fibonacci series.
10. To write PL/SQL program to find Armstrong number.
11. To write PL/SQL program to find Electricity Bill Calculation.
12. To write PL/SQL program to handle exception.
13. To write PL/SQL program to using cursors
- 14 To write PL/SQL program to Library management system.
15. To write PL/SQL program to use procedure.

Total Lecture Hours**75**

BOOKS FOR STUDY:

- Coroneel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
- Nilesch Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016

BOOKS FOR REFERENCES:

- Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", McGraw Hill International Publication, VI Edition
- Shio Kumar Singh, "Database Systems", Pearson publications, II Edition

WEB RESOURCES:

- ❖ <https://sites.google.com/view/dbms-labwebsite?usp=sharing>
- ❖ <https://www.lbrce.ac.in/L130%20-%20DATABASE%20MANAGEMENT%20SYSTEMS%20LAB.pdf>
- ❖ <https://www.studocu.com/in/document/sant-longowal-institute-of-engineering-and-technology/object-oriented-programming/dbms-lab-manual/53485175>

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 various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	K1 to K4
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity- Relationship Model.	K1 to K4
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	K1 to K4
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	K1 to K4
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	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	M	M	M
CO2	S	S	M	M	M	M	M	M	M	M
CO3	M	M	M	S	M	S	M	M	M	M
CO4	M	M	M	S	S	S	M	M	M	M
CO5	M	M	S	M	S	M	M	M	M	M
S- STRONG			M – MEDIUM					L - LOW		

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	3	3	3	3
CO 2	3	3	1	2	2	1
CO 3	2	2	3	3	3	3
CO 4	2	2	3	3	3	3
CO 5	2	3	3	3	3	3
WEIGHTAGE	12	12	13	14	14	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	80%	80%	87%	93%	93%	87%

LESSON PLAN:

S.No	Database Management System Lab	HRS	PEDAGOGY
I	1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands. 2. Create a set of tables, add foreign key constraints and incorporate referential integrity. 3. Implement Aggregate functions. 4. Query the database tables and explore sub queries and simple join operations. 5. Write user defined functions and stored procedures in SQL. 6. Execute complex transactions and realize DCL and TCL commands. 7. Write SQL Triggers for insert, delete, and update operations in a	75	Lecture Method

	database table. 8. Create View and index for database tables . 9.To write PL/SQL program to find Fibonacci series . 10. To write PL/SQL program to find Armstrong number . 11. To write PL/SQL program to find Electricity Bill Calculation. 12. To write PL/SQL program to handle exception. 13. To write PL/SQL program to using cursors 14 To write PL/SQL program to Library management system. 15. To write PL/SQL program to use procedure.		
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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	Syntax & Semantics	Programming principles	Concept Applications	Coding & Implementation	Debugging & Output
CI A	CO1	K1	5				
	CO2	K3		5			
	CO3	K4			5		
	CO4	K4				5	
	CO5	K2-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 with out choice)	Consolidated %
CIA	K1	5					5	20	20
	K2		5				5	20	20
	K3			5			5	20	20
	K4				5	5	10	20	20
	Marks	5	5	5	5	5	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	K4				15	
5	CO5	K4					15
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	20	20
K4				15	15	30	40	40
Marks	6	9	15	15	30	75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.								

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
CIA	CO1	K1	5				
	CO2	K3		5			
	CO3	K4			5		
	CO4	K5, K6				5	
	CO5	K2					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	2					2	8	8
	K2		3				3	12	12
	K3			5			5	20	20
	K4				5		5	20	20
	K5					5	5	20	20
	K6					5	5	20	20
	Marks	2	3	5	5	10	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

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



DEPARTMENT OF COMPUTER SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Project with Viva - Voce			
Course Code	23UCSPR51	L	P	C
Category	Core	-	5	4

COURSE OBJECTIVES:

- Expose to the various phases of Software Development Life Cycle.
- Learn to apply the Skills and Knowledge in Design, Coding and Testing with appropriate
- Technological Tools and Procedures.
- Learn to Develop Applications with 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. The Candidates need to identify and analyze real world problems on the selected project domain.
3. During the course of study, the Candidates need to Develop, Design, Test, etc., the
4. Applications as per the directions by the Guide.
5. Then the Candidates have to prepare and submit the manuscript of the Project Work as a
6. Report as per the requirements of the Institution / Department for Evaluation.
7. The submission of the Project Report will be done at the end of the Semester for Presentation and Viva-Voce during the Practical Examinations of the Semester.
8. The Passing Minimum for Project Work is 50%.
9. If the Candidate fails to score 50% in the Project Work, the Candidate has to improve it during the next attempt.
10. A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Project Work.
11. The Faculty Member will act as the Internal Examiner during the course of Project Work as well as at the time of conducting the Viva-Voce Examination.
12. The Internal Marks for the Project Work will be awarded by the concerned Guide / Internal Examiner.
13. The Internal and External Examiners shall both evaluate the Project Report, 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			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
CO 1		3	2		3		3		3	3

CO 2	3	3	3	3	3	2
CO 3	3	3	3	3	3	3
CO 4	3	2	3	3	3	3
CO 5	3	3	3	3	2	3
WEIGHTAGE	15	13	15	15	14	14
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTI ON TO POS	100%	87%	93%	100%	93%	93%

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)



DEPARTMENT OF COMPUTER SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Operating Systems			
Course Code	23UCSEC51	L	P	C
Category	Elective	4	-	3
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. ➤ Explain the Job and processor scheduling ➤ To understand the Virtual Memory organization				
UNIT - I				12
Introduction: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. Process concepts: definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations, suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing.				
UNIT - II				12
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- Lamports Bakery Algorithm. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. Concurrent programming: monitors, message passing				
UNIT - III				12
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				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				12
Real Memory organization and 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 organization: virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. Virtual Memory Management: Demand Paging, Page replacement strategies				
Total Lecture Hours				60

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.
- Silberschatz, and P.B. Galvin., Operating Systems Concepts, Ninth Edition, John Wiley & Sons(ASIA) Pte Ltd., 2012

WEB RESOURCES:

- ❖ [Web resources from NDL Library, E-content from open-source libraries](#)
- ❖ <https://www.techtarget.com/whatis/definition/operating-system-OS>
- ❖ <https://www.geeksforgeeks.org/operating-systems/>
- ❖ <https://www.tpointtech.com/operating-system>
- ❖ https://www.tutorialspoint.com/operating_system/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	Define the fundamentals of OS and identify the concepts relevant to process , process life cycle, Scheduling Algorithms, Deadlock and Memory management								K1 to K4	
CO2	know the critical analysis of process 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 Algorithmsand 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	M	M	M	M	M	M
CO2	S	S	M	M	M	M	M	M	M	M
CO3	S	S	S	S	S	M	M	M	M	M
CO4	S	M	M	S	S	S	M	M	M	M
CO5	S	S	M	S	M	M	M	M	M	M

S- STRONG		M – MEDIUM			L - LOW	
CO / PO MAPPING:						
COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	2	3	3	2
CO 2	3	3	2	3	3	2
CO 3	3	3	3	3	3	2
CO 4	3	3	2	3	3	2
CO 5	3	3	2	3	3	2
WEIGHTAGE	15	14	11	15	15	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100%	93%	73%	100%	100%	66%

LESSON PLAN:

UNIT	Operating Systems	HRS	PEDAGOGY
I	Introduction: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. Process concepts: definition of process, process states-Life cycle of a process, process management- process state transitions, process controlblock(PCB), process operations , suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing.	12	Black Board/LCD
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- Lamports Bakery Algorithm. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. Concurrent programming: monitors, message passing	12	Black Board/LCD
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	12	Black Board/LCD
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,	12	Black Board/LCD

	multilevel feedback queues, Fair share scheduling		
V	Real Memory organization and 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 organization: virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems.	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, K3)	2 (K4, K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE

FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Human Computer Interaction			
Course Code	23UCSEC52	L	P	C
Category	Elective	4	-	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				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				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				12
MODELS AND THEORIES:				
HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.				
UNIT - IV				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. - CaseStudies				
UNIT - V				12
WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and VirtualPages, Process Flow - Case Studies				
Total Lecture Hours				60

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:

- 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://link.springer.com/10.1007/978-0-387-39940-9_192
- ❖ <https://www.geeksforgeeks.org/introduction-to-human-computer-interface-hci/>
- ❖ https://www.tutorialspoint.com/human_computer_interface/quick_guide.htm
- ❖ <https://www.cl.cam.ac.uk/teaching/1011/HCI/HCI2010.pdf>

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	M	M	M	M	M	M	M	M
CO2	S	S	M	M	M	M	M	M	M	M
CO3	S	M	S	S	M	S	M	M	M	M
CO4	S	M	M	S	S	S	M	M	M	M
CO5	S	M	S	S	M	M	M	M	M	M
S- STRONG			M – MEDIUM					L - LOW		

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	2	3	2	2
CO 2	3	3	2	3	2	2
CO 3	3	3	3	3	2	2
CO 4	3	3	2	3	2	2
CO 5	3	3	2	3	3	2
WEIGHTAGE	15	14	11	15	11	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100%	93%	73%	100%	73%	66%

LESSON PLAN:

UNIT	Human Computer Interaction	HRS	PEDAGOGY
I	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 /LCD
II	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 /LCD
III	HCI Models: Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models- Hypertext, Multimedia and WWW.	12	Black Board /LCD
IV	Mobile Ecosystem: Platforms, Application frameworks – Types of Mobile Applications: Widgets, Applications, Games -Mobile Information Architecture, Mobile 2.0,	12	Black Board /LCD

	Mobile Design: Elements of Mobile Design, Tools. - CaseStudies		
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 /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, K3)	2 (K4, K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Introduction to Data Science			
Course Code	23UCSEC53	L	P	C
Category	Elective	4	-	3
COURSE OBJECTIVES:				
➤ To learn about basics of Data Science and Big data. ➤ To learn about overview and building process of Data Science. ➤ To learn about various Algorithms in Data Science. ➤ To learn about Hadoop Framework. ➤ To learn about case study about Data Science.				
UNIT - I				12
Introduction: Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science				
UNIT - II				12
The Data science process: Overview – research goals - retrieving data -transformation – Exploratory Data Analysis – Model building.				
UNIT - III				12
Algorithms: Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised				
UNIT - IV				12
Introduction to Hadoop: Hadoop framework – Spark – replacingMapReduce– NoSQL – ACID – CAP – BASE – types				
UNIT - V				12
Case Study: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentationand automation				
Total Lecture Hours				60

BOOKS FOR STUDY:

- Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, manning publications 2016

BOOKS FOR REFERENCES:

- Roger Peng, “The Art of Data Science”, lulu.com 2016.
- MurtazaHaider, “Getting Started with Data Science – Making Sense of Data with Analytics”, IBM press, E-book.
- Davy Cielen, Arno D.B. Meysman, Mohamed Ali, “Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools”, Dreamtech Press 2016.
- Annalyn Ng, Kenneth Soo, “Numsense! Data Science for the Layman: No Math Added”, 2017, 1st Edition.
- Cathy O'Neil, Rachel Schutt, “Doing Data Science Straight Talk from the Frontline”, O'Reilly Media 2013.
- Lillian Pierson, “Data Science for Dummies”, 2017 II Edition

WEB RESOURCES:

- ❖ <https://www.w3schools.com/datascience/>
- ❖ https://en.wikipedia.org/wiki/Data_science
- ❖ <http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/>

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 basics in Data Science and Big data.	K1 to K4
CO2	Understand overview and building process in Data Science.	K1 to K4
CO3	Understand various Algorithms in Data Science.	K1 to K4
CO4	Understand Hadoop Framework in Data Science.	K1 to K4
CO5	Case study in Data Science.	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	M	M	M
CO2	S	M	S	M	M	M	M	M	M	M
CO3	M	M	M	S	M	S	M	M	M	M
CO4	M	M	M	S	S	M	S	M	M	M

CO5	M	M	S	M	S	M	M	M	M	M
S- STRONG			M – MEDIUM				L - LOW			
CO / PO MAPPING:										
COS		PSO1	PSO2	PSO3		PSO4		PSO5	PSO6	
CO 1		3	2	2		3		2	3	
CO 2		3	3	2		3		2	2	
CO 3		3	3	3		3		3	3	
CO 4		3	3	3		3		2	3	
CO 5		3	3	2		3		3	3	
WEIGHTAGE		15	14	12		15		12	14	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		100	93	80		100		80	93	
LESSON PLAN:										
UNIT	Introduction to Data Science						HRS	PEDAGOGY		
I	Introduction: Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science						12	Chalk and Talk		
II	The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.						12	Chalk and Talk		
III	Algorithms: Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised						12	Chalk and Talk		
IV	Introduction to Hadoop: Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types						12	Chalk and Talk		
V	Case Study: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation						12	Chalk and Talk		

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, K3)	2 (K4, K4)
	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI AII	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Big Data Analytics			
Course Code	23UCSEC54	L	P	C
Category	Elective	4	-	3

COURSE OBJECTIVES:

- Understand the Big Data Platform and its Use cases, Map Reduce Jobs
- 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 stream
- Understand the concepts of No SQL Databases

UNIT - I**12**

Data Explosion and Big Data Analytics: An Overview: Introduction, Evolution of Database Technology and Big Data, Elements of Big Data, Big Data System Components, Big Data Analytics – Data Analytics. Types of Big Data Analytics, Applications of Big Data Technology, Challenges and Skills required with Big Data Technology.

UNIT - II**12**

Analytical Theory: Introduction about Classification Algorithms, Regression Techniques, Domain Specific Analytic Techniques: In Database Analytics, Text Analytics.

Real – Time Analysis: Introduction: Real-time System, Types of Real-time System, Characteristics of Real-time Systems, Real-time Processing Systems for Big Data: Introduction, Data Integration and Analytics, Big Data Engine-Hadoop, Real-time System Architecture, Real-time Data Analytics.

UNIT - III**12**

Big Data: Hardware, Technology Foundations: Introduction, Big Data Stack, Virtualization and Big Data. **Understanding NoSQL and Hadoop Ecosystem:** Introduction, NoSQL: CouchDB, MongoDB, Hadoop Ecosystem – HDFS, HBase, Yarn.

UNIT - IV**12**

High Dimensional Data: A Big Data Perspective: Introduction – What is Dimensionality? Dimensionality Reduction: Approaches for Dimensionality Reduction, Dimensionality Reduction Techniques.

User Interface and Visualization: Desirable Properties, Visualization Techniques.

R Programming Basics: Introduction, Data Types, Data Structures and Operators – Basic Data Types in R, R Operators, Vectors, List, Factor, Arrays and Matrix, Data Frame, R Programming Structure – Control Statements of R: if, if-else, if-else ladder, Switch-Case, Return, Loops and Loop Control Statements.

UNIT - V**12**

Interfacing R - Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear Models – Time Series and Auto-Correlation – Clustering.

Total Lecture Hours**60**

BOOKS FOR STUDY:

- Big Data Analytics – Concepts, Techniques, Tools and Technologies – First Edition, Dr.M.Thangaraj, Dr. S. Suguna, G. Sudha, PHI Learning Private Limited, Delhi,2022.

Unit I	: Chapter 1
Unit II	: Chapter 2.2.2, 2.2.4, 2.3.2, 2.3.2 Chapter 3 (3.1.1, 3.1.2, 3.2, 3.3.1 – 3.3.4, 3.4)
Unit III	: Chapter 4 (4.1 – 4.3) Chapter 5 (5.1, 5.2, 5.3.1 - 5.3.3)
Unit IV	: Chapter 6.1, 6.3 Chapter 7.3 Chapter 8 (8.1 – 8.3)
Unit V	: Chapter 8 (8.4 – 8.7)

BOOKS FOR REFERENCES:

- David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier 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.simplilearn.com/tutorials/big-data-tutorial>
- ❖ <https://www.geeksforgeeks.org/data-analysis-tutorial/>
- ❖ <https://data-flair.training/blogs/big-data-tutorials-home/>
- ❖ <https://aisel.aisnet.org/cais/vol34/iss1/65/>

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	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	M	M	M	M	M	
CO2	S	S	M	M	M	M	M	M	M	M	
CO3	M	M	M	S	S	M	M	M	M	M	
CO4	M	M	S	M	S	S	M	M	M	M	
CO5	M	M	S	S	M	M	M	M	M	M	
S- STRONG			M – MEDIUM					L - LOW			
CO / PO MAPPING:											
COS		PSO1		PSO2		PSO3		PSO4		PSO5	
CO 1		3		2		2		3		3	
CO 2		3		3		2		3		3	
CO 3		3		3		3		3		3	
CO 4		3		3		2		3		3	
CO 5		3		3		2		3		3	
WEIGHTAGE		15		14		11		15		15	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		100		93		73		100		100	
LESSON PLAN:											
UNIT	Big Data Analytics							HRS	PEDAGOGY		
I	Data Explosion and Big Data Analytics: An Overview: Introduction, Evolution of Database Technology and Big Data, Elements of Big Data, Big Data System Components, Big Data Analytics – Data Analytics. Types of Big Data Analytics, Applications of Big Data Technology, Challenges and Skills required with Big Data Technology.							12	BLACK BOARD/ LCD		
II	Analytical Theory: Introduction about Classification Algorithms, Regression Techniques, Domain Specific Analytic Techniques: In Database Analytics, Text Analytics.							12	BLACK BOARD/ LCD		

	Real – Time Analysis: Introduction: Real-time System, Types of Real-time System, Characteristics of Real-time Systems, Real-time Processing Systems for Big Data: Introduction, Data Integration and Analytics, Big Data Engine-Hadoop, Real-time System Architecture, Real-time Data Analytics.		
III	Big Data: Hardware, Technology Foundations: Introduction, Big Data Stack, Virtualization and Big Data. Understanding NoSQL and Hadoop Ecosystem: Introduction, NoSQL: CouchDB, MongoDB, Hadoop Ecosystem – HDFS, HBase, Yarn.	12	BLACK BOARD/ LCD
IV	High Dimensional Data: A Big Data Perspective: Introduction – What is Dimensionality? Dimensionality Reduction: Approaches for Dimensionality Reduction, Dimensionality Reduction Techniques. User Interface and Visualization: Desirable Properties, Visualization Techniques. R Programming Basics: Introduction, Data Types, Data Structures and Operators – Basic Data Types in R, R Operators, Vectors, List, Factor, Arrays and Matrix, Data Frame, R Programming Structure – Control Statements of R: if, if-else, if-else ladder, Switch-Case, Return, Loops and Loop Control Statements.	12	BLACK BOARD/ LCD
V	Interfacing R - Interfacing R to other languages – Parallel R–Basic Statistics – Linear Model – Generalized Linear models–Non-linear Models – TimeSeries and Auto-Correlation– Clustering.	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, K3)	2 (K4, K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE****FOR THOSE WHO JOINED IN 2023-2024 AND AFTER**

Course Name	Virtual Reality			
Course Code	23UCSEC55	L	P	C
Category	Elective	4	-	3
COURSE OBJECTIVES:				
➤ To provide knowledge on basic principles of virtual & augmented reality ➤ To have the ability to use its technology as a platform for real-world applications.				
UNIT - I	Virtual Reality:	12		
The Three I's of VR – History – Early commercialVR Technology – Components of a VR System – Input Devices: Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces.				
UNIT - II	Output Devices:	12		
Graphics Displays – Sound Displays – HapticFeedback - Computer Architecture for VR: The Rendering Pipeline- PC Graphics Architecture - VR Programming: Toolkitsand Scene Graphs – Traditional and Emerging Applications of VR.				
UNIT - III	Augmented Reality:.	12		
Introduction – Augmented Reality Concepts: Working Principle of AR –Concepts related to AR- Ingredients of an Augmented Reality Experience				
UNIT - IV	Augmented Hardware and Software	12		
Augmented Reality Hardware– Augmented Reality Software–Software to create content for AR Application – Tools and Technologies				
UNIT - V	Augmented Reality Content:	12		
Introduction- Creating Content forVisual, Audio, and other senses – Interaction in AR – Mobile Augmented Reality: Introduction – Augmented RealityApplications Areas- Collaborative Augmented Reality				
Total Lecture Hours				60

BOOKS FOR STUDY:

- Grigore C. Burdea and Philippe Coiffet, “Virtual Reality Technology”, Wiley Student Edition , Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9)
- Alan B. Craig(2013), “Understanding Augmented Reality: Concepts and Applications”(Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8)
- Jon Peddie (2017), “Augmented Reality: Where We Will All Live”, Springer, IstEdition (Unit IV: Chapter 7 (Tools & Technologies))

BOOKS FOR REFERENCES:

- Alan Craig & William R. Sherman & Jeffrey D. Will, Morgan Kaufmann(2009), “Developing Virtual Reality Applications: Foundations of Effective Design”, Elsevier(Morgan Kaufmann Publishers)
- Paul Mealy (2018), “Virtual and Augmented Reality”, Wiley
- Bruno Arnaldi & Pascal Guitton & Guillaume Moreau(2018), “Virtual Reality and Augmented Reality: Myths and Realities”, Wiley

WEB RESOURCES:

- ❖ <http://msl.cs.uiuc.edu/vr/>
- ❖ <https://mobidev.biz/blog/augmented-reality-development-guide>
- ❖ <https://www.vrs.org.uk/>
- ❖ <https://www.techradar.com/news/augmented-reality-guide>

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	Outline the basic terminologies, techniques and applications of VR and AR	K1 to K4
CO2	Describe different architectures and principles of VR and AR systems	K1 to K4
CO3	Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications	K1 to K4
CO4	Analyze and explain the behavior of VR and AR technology relates to human perception and cognition	K1 to K4
CO5	Assess the importance of VR/AR content and interactions to implement for the real-world problem	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

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

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	2	3	2	2
CO 2	3	3	2	3	2	2
CO 3	3	3	3	3	2	3
CO 4	3	3	2	3	2	3
CO 5	3	3	2	3	3	3
WEIGHTAGE	15	14	11	15	11	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100%	93%	93%	93%	100%	86%

LESSON PLAN:

UNIT	Virtual Reality	HRS	PEDAGOGY
I	Virtual Reality, The Three I's of VR , History , Early commercial VR Technology, Components of a VR System ,Input Devices: Trackers, Navigation and Manipulation Interfaces, Gesture Interfaces	12	Smart Board / LCD
II	Output Devices, Graphics Displays, Sound Displays , Haptic Feedback, Computer Architecture for VR, The Rendering Pipeline, PC Graphics Architecture, VR Programming, Toolkits and Scene Graphs , Traditional and Emerging Applications of VR	12	Black Board / LCD
III	Augmented Reality, Introduction, Augmented Reality Concepts, Working Principle of AR , Concepts related to AR, Ingredients of an Augmented Reality Experience	12	Smart Board / LCD
IV	Augmented Reality Hardware, Augmented Reality Software, Software to create content for AR Application, Tools and Technologies	12	Black Board / LCD
V	Augmented Reality Content, Introduction, Creating Content for Visual,	12	Black Board

Audio, and other senses, Interaction in AR - Mobile Augmented Reality, Introduction, Augmented Reality Applications Areas, Collaborative Augmented Reality	/ 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	CO1	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Agile Project Management			
Course Code	23UCSEC56	L	P	C
Category	Elective	4	-	3

COURSE OBJECTIVES:

- Learning of software design, software technologies and APIs.
- Detailed demonstration about Agile development and testing techniques.
- Learning about Agile Planning and Execution.
- Understanding of Agile Management Design and Quality Check.
- Detailed examination of Agile development and testing techniques.

UNIT - I Modernizing Project Management: 12

Introduction: Project Management Needed a Makeover – Introducing Agile Project Management. **Applying the Agile Manifesto and Principles:** Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. **Why Being Agile Works Better:** Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.

UNIT - II Being Agile :Agile Approaches: 12

Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming – Summary. **Agile Environments in Action:** Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools. **Agile Behaviours in Action:** Establishing Agile roles – Establishing new values – Changing team philosophy

UNIT - III Agile Planning and Execution 12

Defining the Product Vision and Roadmap: Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog.

Planning Releases and Sprints: Refining requirements and estimates – Release planning – Sprint planning. **Working Throughout the Day:** Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. **Showcasing Work, Inspecting and Adapting:** The sprint review – The sprint retrospective. **Preparing for Release:** Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment

UNIT - IV Agile Management Managing Scope and Procurement: 12

What's different about Agile scope management – Managing Agile scope – What's different about Agile procurement – Managing Agile procurement. **Managing Time and Cost:** What's different about Agile time management – Managing Agile schedules – What's different about Agile cost management – Managing Agile budgets. **Managing Team Dynamics and Communication:** What's different about Agile team dynamics – Managing Agile team dynamics – What's different about Agile communication – Managing Agile communication. **Managing Quality and Risk:** What's different about Agile quality – Managing Agile quality – What's different about Agile risk management – Managing Agile risk.

UNIT - V	Implementing Agile Building a Foundation:	12
Organizational and individual commitment – Choosing the right pilot team members – Creating and environment that enables Agility – Support Agility initially and over time. Being a Change Agent: Becoming Agile requires change – why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls – Signs your changes are slipping. Benefits, Factors for Success and Metrics: Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.		
Total Lecture Hours		60

BOOKS FOR STUDY:

- Mark C. Layton, Steven J. Ostermiller, Agile Project Management for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
- Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin, 2014.

BOOKS FOR REFERENCES:

- Mark C. Layton, David Morrow, Scrum for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.
- Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010.
- Alex Moore, Agile Project Management, 2020.
- Alex Moore, Scrum, 2020.
- Andrew Stellman and Jennifer Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, Shroff/O'Reilly, First Edition, 2014.

WEB RESOURCES:

- ❖ www.agilealliance.org/resources

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	Learning of software design, software technologies and APIs.	K1 to K4
CO2	Detailed demonstration about Agile development and testing techniques.	K1 to K4
CO3	Learning about Agile Planning and Execution.	K1 to K4
CO4	Understanding of Agile Management Design and Quality Check.	K1 to K4
CO5	Detailed examination of Agile development and testing techniques.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	L	S	M	S	S	M	S	S	M
CO2	M	M	L	L	L	M	M	M	M	L
CO3	S	M	S	M	S	M	L	M	S	M
CO4	L	L	S	S	M	S	S	M	S	M
CO5	M	S	S	M	M	L	S	M	S	M
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	3	3	2	3	2	3
CO 3	3	3	3	3	3	3
CO 4	2	3	2	3	3	3
CO 5	3	3	3	2	3	3
WEIGHTAGE	14	15	14	13	14	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	93%	100%	93%	86%	93%	100%

LESSON PLAN:

UNIT	Agile Project Management	HRS	PEDAGOGY
I	Introduction :Modernizing Project Management, Applying the Agile Manifesto and Principles, Why Being Agile Works Better	12	Black Board / LCD
II	Being Agile, Agile Approaches, Agile Environments in Action, Agile Behaviours in Action	12	Smart Board / LCD
III	Agile Planning and Execution, Defining the Product Vision and Roadmap, Planning Releases and Sprints, Working Throughout the Day, Showcasing Work, Inspecting and Adapting, Preparing for Release	12	Black Board / LCD
IV	Agile Management, Managing Scope and Procurement, Managing Time and Cost, Managing Team Dynamics and Communication, Managing Quality and Risk	12	Smart Board / LCD
V	Implementing Agile, Building a Foundation, Being a Change Agent, Benefits, Factors for Success and Metrics	12	Smart 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 AI	CO1	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI AII	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Internship			
Course Code	23UCSIN51	L	P	C
Category	Summer Internship	-	-	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce the Working Ambience, Attitude, Adaptability, Problem Solving Ability,
- Ability to work with Supervisor, Ability to take Directions, etc.,
- Expose on the different phases of Developing a Computer Solution with Team Spirit.
- Learn about Problem Solving Skills and Soft Skills
- To learn the working Skills required for the Industry.

REGULATIONS

1. The Candidates have to undergo a Minimum of 30 Hours of Internship Programme in the Industry during the holidays of the Fourth Semester of the Course of Study.
2. The Candidates need to get a Project, Analyze, learn the various stages of Developing a solution, Test, Validate and carryout the other related requirements.
3. During the course of Third Semester, the Candidates need to refine the work carried out during the Internship at the Industry, progress towards developing a better Solution as per the standards of the Industry and by carrying out the constructive comments received from the Industry and / or Institution during the Reviews.
4. Then the Candidates have to prepare and submit the manuscript of the Internship experience as a Report as per the requirements of the Institution / Department for Evaluation.
5. The submission of the Internship Report will be done at the end of the Third Semester for Presentation and Viva-Voce during the Practical Examinations of the Semester. The Passing Minimum for Internship is 50%.
7. If the Candidate fails to score 50% in the Internship, the Candidate has to improve it during the next attempt.
8. A Faculty Member from the Department will act as a Guide to Supervise and Monitor the progress of the Candidates during the course of Internship.
9. The Faculty Member will act as the Internal Examiner during the course of Internship as well as at the time of conducting the Viva-Voce Examination.
10. The Internal Marks for the Internship will be awarded by the concerned Guide / Internal Examiner.
11. The Internal and External Examiners shall both evaluate the Internship Report, Presentation and conduct the Viva-Voce Examination

Total Hours	30 hours
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INTERNAL MARKS AWARDED FOR THE INTERNSHIP – 25 Marks										
1. Learning the Work Culture leading towards Performance, Organizations Skills and Relationship with Team Members – 5 Marks 2. Internship Review 1 (During the beginning of the Semester) – 5 Marks 3. Internship Review 2 (During the end of the Semester) – 5 Marks 4. 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 – 25Marks 3. Viva-Voce Examination – 25 Marks										
Total – 100 Marks										

Mapping with Program Outcomes:													
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	S	S	S	M	S	S	M	S	S	M			
CO2	M	M	M	L	S	M	M	M	M	L			
CO3	S	M	S	M	S	M	L	M	S	M			
CO4	S	S	S	S	M	S	S	S	S	M			
CO5	M	S	S	M	M	S	S	M	S	M			
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		3		3		3		3		3		3	
CO 3		3		3		3		3		3		3	
CO 4		3		3		3		3		3		3	
CO 5		3		3		3		3		3		3	
Weightage		14		15		15		15		15		15	
Weighted Percentage of Course Contribution to POS		100%		100%		100%		100%		100%		100%	

SIXTH SEMESTER

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Computer Networks			
Course Code	23UCSCC61	L	P	C
Category	Core	6	-	4

COURSE OBJECTIVES:

- To learn the basic concepts of Data Communication and Computer Network
- To learn about wireless Transmission
- To learn about Networking and Data Link Layer.
- To study about Network Communication.
- To learn the concept of Transport layer

UNIT - I	18
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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	18
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Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.

UNIT - III	18
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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	18
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Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.

UNIT - V	18
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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
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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”, Tata McGraw Hill, 4th Edition, 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>

Nature of Course	EMPLOYABILITY			✓	SKILL ORIENTED			ENTREPRENEURSHIP		
Curriculum Relevance	LOCAL		REGIONAL			NATIONAL			GLOBAL	✓
Changes Made in the Course	Percentage of Change			5%	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 on Telephone systems using wireless network							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, DNS							K1 to K4

MAPPING WITH PROGRAM OUTCOMES:										
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	M	M	M
CO2	S	S	M	M	S	M	M	M	M	M
CO3	S	S	S	S	S	S	M	M	M	M
CO4	S	S	M	S	S	S	M	M	M	M

CO5	S	S	S	S	S	M	M	M	M	M
S- STRONG			M – MEDIUM					L - LOW		
CO / PO MAPPING:										
COS		PSO1	PSO2	PSO3		PSO4		PSO5	PSO6	
CO 1		3	3	2		3		2	3	
CO 2		3	2	2		2		2	2	
CO 3		3	2	3		3		2	3	
CO 4		3	2	2		2		2	2	
CO 5		3	2	2		2		2	3	
WEIGHTAGE		15	11	11		12		10	13	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS		100%	73%	73%		80%		66%	86%	
LESSON PLAN:										
UNIT	Computer Networks						HRS	PEDAGOGY		
I	Introduction – Network Hardware – Software – Reference Models – OSIand TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media						18	Black Board, LCD		
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.						18	Smart Board, LCD		
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel AllocationProblem – Multiple Access Protocols – Bluetooth.						18	Black Board, LCD		
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.						18	Smart Board, LCD		
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, 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 AI	CO1	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI AII	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	.Net Programming			
Course Code	23UCSCC62	L	P	C
Category	Core	6	-	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 handles SQL Server Database using ADO.NET.
- Understand the Grid view control and XML classes.

UNIT - I	18
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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	18
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Introduction to ASP.NET - IDE-Languages supportedComponents -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.

UNIT - III	18
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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 Deletingfiles – File uploading.

UNIT - IV	18
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ADO.NET Overview – Database Connections – Commands– Data Reader - Data Adapter - Data Sets - Data Controlsandits Properties – DataBinding

UNIT - V	18
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Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating aWeb application.

Total Lecture Hours	90
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BOOKS FOR STUDY:

- Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.
- Mathew, Mac Donald, 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, Dreamtechpres, 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>

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	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	M	M	M
CO2	M	S	S	M	S	M	M	M	M	M
CO3	S	M	S	M	M	S	M	M	M	M
CO4	M	S	M	M	M	S	M	M	M	M
CO5	S	M	S	M	M	S	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	3
CO 2	3	2	2	3	3	2
CO 3	3	3	3	2	3	2
CO 4	2	2	1	3	3	3
CO 5	3	3	3	3	3	3
WEIGHTAGE	14	13	12	14	14	13
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTI ON TO POS	93%	87%	80%	93%	93%	87%
LESSON PLAN:						
UNIT	.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.			18	Black Board, LCD	
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.			18	Black Board, LCD	
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.			18	Black Board, LCD	
IV	ADO.NET Overview – Database Connections – Commands– Data Reader - Data Adapter - Data Sets - Data Controlsand its Properties – DataBinding			18	Black Board, LCD	
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.			18	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 AI	CO1	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI AII	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	.Net Programming Lab			
Course Code	23UCSCP61	L	P	C
Category	Core	-	6	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				
				90
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 operation. 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				90

BOOKS FOR STUDY:

- SvetlinNakov, VeselinKolev& Co, Fundamentals of Computer Programming with C#, Faber publication,2019.
- Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.

BOOKS FOR REFERENCES:

- Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
- Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
- Anne Boehm, Joel Murach, Murach"s C# 2015, Mike Murach& Associates Inc.2016.
- DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,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>

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 web pages 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/P O	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	M	M	M	M	M
CO2	M	M	S	M	S	M	M	M	M	M
CO3	S	M	M	S	S	M	M	M	M	M
CO4	M	S	M	S	M	S	M	M	M	M
CO5	S	M	S	M	S	S	M	M	M	M
S- STRONG			M - MEDIUM				L - LOW			

CO / PO MAPPING:

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

LESSON PLAN:

UNIT	.Net Programming Lab	HRS	PEDAGOGY
I	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 operation. 12. Implement the Xml classes. 13. Implement Authentication – Authorization. 14. Ticket reservation using ASP.NET controls. 15. Online examination using ASP.NET controls	90	LCD, Projector

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 A	CO1	K1	5				
	CO2	K3		5			
	CO3	K4			5		
	CO4	K4				5	
	CO5	K2-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	20	20
	K4				5	5	10	20	20
	Marks	5	5	5	5	5	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	K4				15	
5	CO5	K4					15
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	20	20
K4				15	15	30	40	40
Marks	6	9	15	15	30	75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.								

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Image Processing			
Course Code	23UCSEC61	L	P	C
Category	Elective	5	-	3

COURSE OBJECTIVES:

- To learn Fundamentals of digital image processing.
- To learn about 2D Image transformations.
- To learn about various image enhancement processing methods and filters.
- To study about various classification of Image segmentation techniques.
- To learn the various image compression techniques.

UNIT - I**15**

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**15**

2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform - Singular Value Decomposition.

UNIT - III**15**

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**15**

Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edgedetection - Hough transform- Active contour.

UNIT - V**15**

Image Compression: Need for compression - Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression - Transform based compression,

Total Lecture Hours**75**

BOOKS FOR STUDY:

- S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGrawHill, 2015
- Gonzalez Rafel 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-%20Vijaya%20Raghavan.pdf>
- ❖ http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%20rd%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>

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	S	M	S	M	M	M	M	M	M
CO2	S	S	M	M	M	M	M	M	M	M
CO3	S	S	S	S	M	S	M	M	M	M
CO4	S	S	M	S	M	S	M	M	M	M
CO5	S	S	S	S	M	M	M	M	M	M

S- STRONG
M – MEDIUM
L - LOW
CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	2	3	2	2
CO 2	3	3	2	3	2	2
CO 3	3	3	3	3	2	2
CO 4	3	3	2	3	2	2
CO 5	3	3	2	3	2	2
WEIGHTAGE	15	14	11	15	10	10
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100%	93%	73%	100%	66%	66%

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 -2DConvolution Through Matrix Analysis	15	Chalk & Talk
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition	15	Chalk & Talk
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.	15	Chalk & Talk
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges-	15	Chalk & Talk

	Edge detection - Hough transform- Active contour.		
V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman codingArithmetic coding-Dictionary based compression -Transform based compression,	15	Chalk & Talk

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, K3)	2 (K4, K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3, K3)	2 (K4, 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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE****FOR THOSE WHO JOINED IN 2023-2024 AND AFTER**

Course Name	IoT and its Applications			
Course Code	23UCSEC62	L	P	C
Category	Elective	5	-	3
COURSE OBJECTIVES:				
➤ Use of Devices, Gateways and Data Management in IoT. ➤ Design IoT applications in different domain and be able to analyze their performance ➤ Implement basic IoT applications on embedded platform ➤ To gain knowledge on Industry Internet of Things ➤ To Learn about the privacy and Security issues in IoT				
UNIT - I				15
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				15
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				15
IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views				
UNIT - IV				15
IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management				
UNIT - V				15
Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security				
Total Lecture Hours				75

BOOKS FOR STUDY:

- Vijay Madiseti and ArshdeepBahga, “Internet of Things: (A Hands-on Approach)”, 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 World”, kindle version.
- Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications 2013, 1st Edition,.
- WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, “Getting Started with the Internet of Things”, O’Reilly Media 2011.

WEB RESOURCES:

- ❖ <https://www.educative.io/>
- ❖ <https://www.codechef.com/>
- ❖ <https://hackr.io/>
- ❖ <https://www.khanacademy.org/computing/computer-programming>

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									
CO2	S	S								
CO3				S		S				
CO4				S	S	S				
CO5			S		S					

S- STRONG		M – MEDIUM			L - LOW	
CO / PO MAPPING:						
COS	PSO1	PSO2	PSO3	PSO4	PSO5	
CO 1	3	2	2	3	3	
CO 2	3	2	2	3	3	
CO 3	3	2	3	3	3	
CO 4	3	3	2	3	3	
CO 5	3	3	3	3	3	
WEIGHTAGE	15	12	12	15	14	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100%	80%	80%	100%	93%	
LESSON PLAN:						
UNIT	Internet of Things 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	Smart Board / LCD	
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 designprinciples and needed capabilities, An IoT architecture outline, standards considerations.			15	Smart Board / LCD	
III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction,Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views			15	Black Board / LCD	
IV	IoT Applications for Value Creations Introduction, IoTapplications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management			15	Smart Board / LCD	
V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT inSmart Cities, Security			15	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,K3)	2 (K4,K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Cloud Computing			
Course Code	23UCSEC63	L	P	C
Category	Elective	5	-	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 theCloud
- To learn the various Case Studies in Cloud Computing.

UNIT - I

15

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

15

Compute Services: Amazon Elastic Computer 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 Dynamo DB - 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 MapReduceService - Google BigQuery - Windows Azure HDInsight

Deployment and Management Services: Amazon Elastic Beanstack -Amazon CloudFormation

Identity and Access Management Services: Amazon Identity and AccessManagement - Windows Azure Active Directory

Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack

UNIT - III

15

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)

UNIT – IV	15
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.	
UNIT - V	15
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.	
Total Lecture Hours	75

BOOKS FOR STUDY:

- Arshdeep Bahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018.

BOOKS FOR REFERENCES:

- Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
- Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
- David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015.
- Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.

WEB RESOURCES:

- ❖ https://en.wikipedia.org/wiki/Cloud_computing
- ❖ https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7
- ❖ <https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf>

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 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	S	S	M	M	S	M	S
CO2	S	S	M	S	S	M	M	S	M	S
CO3	S	S	S	S	S	M	M	S	S	M
CO4	S	S	M	S	S	M	S	S	S	M
CO5	S	S	S	M	S	M	M	S	S	M
S- STRONG			M – MEDIUM					L - LOW		

CO / PO MAPPING:						
COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	2	3	2	3
CO 2	3	3	2	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	2	3	3	3
WEIGHTAGE	15	12	11	15	13	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100%	80%	73.5%	100%	86.6%	100%

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	15	Black Board & Chalk/ LCD

	– Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.		
II	Compute Services: Amazon Elastic Computer 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 Dynamo DB - 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 MapReduceService - Google BigQuery - 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: CloudStack – Eucalyptus - OpenStack	15	Black Board & Chalk/ LCD
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).	15	Black Board & Chalk/ LCD
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.	15	Black Board & Chalk/ LCD
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.	15	Black Board & Chalk/ 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,K3)	2 (K4,K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Artificial Intelligence			
Course Code	23UCSEC64	L	P	C
Category	Elective	5	-	3
COURSE OBJECTIVES:				
➤ To learn various concepts of AI Techniques. ➤ To learn various Search Algorithm in AI. ➤ To learn probabilistic reasoning and models in AI. ➤ To learn about Markov Decision Process. ➤ To learn various type of Reinforcement learning.				
UNIT - I	CONCEPT OF AI			15
Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graphstructures, State space representation, Search graph and Search tree.				
UNIT - II	ALGORITHM			15
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	REASONING AND MODELS			15
Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks-representation, construction and inference, temporal model, hidden Markov model.				
UNIT - IV	MARKOV DECISION PROCESS			15
Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observableMDPs				
UNIT - V	REINFORCEMENT			15
Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.				
Total Lecture Hours				75

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.

WEB RESOURCES:

- ❖ <https://github.com/dair-ai/ML-Course-Notes>
- ❖ <https://www.fast.ai/>
- ❖ <https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html>
- ❖ <https://www.coursera.org/specializations/deep-learning>

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 understand the Artificial Intelligence concepts like	K1 to K4
CO2	To understand different Search Algorithm in AI.	K1 to K4
CO3	To understanding the different probabilistic reasoning and models in AI.	K1 to K4
CO4	To gain knowledge on about Markov Decision Process.	K1 to K4
CO5	Able to understand various type of Reinforcement learning.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

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

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	2	3	3
CO 2	3	3	2	3	3
CO 3	3	3	3	3	3
CO 4	3	3	2	3	3
CO 5	3	3	2	3	3
WEIGHTAGE	15	14	11	15	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100	93.3	93.3	100	100

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.	15	Black Board & Chalk/ LCD
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.	15	Black Board & Chalk/ LCD
III	Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	15	Black Board & Chalk/ LCD
IV	Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs	15	Black Board & Chalk/ LCD
V	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.	15	Black Board & Chalk/ 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 AI	CO1	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
	CO2	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
CI AII	CO3	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
	CO4	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Robotics and its Applications			
Course Code	23UCSEC65	L	P	C
Category	Elective	5	-	3
COURSE OBJECTIVES: ➤ To understand the robotics fundamentals ➤ Understand the sensors and matrix methods. ➤ Understand the Localization: Self-localizations and mapping ➤ To study about the concept of Path Planning, Vision system ➤ To learn about the concept of robot artificial intelligence				
UNIT - I				15
Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.				
UNIT - II				15
Actuators and sensors : Types of actuators, stepper-DC- servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor- proximity and distance measuring sensors Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot				
UNIT - III				15
Localization: Self-localizations and mapping -Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.				
UNIT - IV				15
Path Planning: Introduction, path planning-overview- road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization- depth measurement- image data compression-visual inspection-software considerations				
UNIT - V				15
Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling- continuous arc welding-spot welding-spray painting- assembly operation-cleaning-etc.				
Total Lecture Hours				75

BOOKS FOR STUDY:

- RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001.
- SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2nd edition 2011.

BOOKS FOR REFERENCES:

- Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008.
- Robotics technology and flexible automation by S.R.Deb, THH-2009

WEB RESOURCES:

- ❖ [Robotics: Types, Applications and Challenges - Rau's IAS \(rau.ias.com\)](http://rau.ias.com)
- ❖ [Microsoft Word - unit3appln \(iitd.ac.in\)](http://iitd.ac.in)
- ❖ [Lecture Notes on Robotics - Course Code \(M1596\) \(bu.edu.eg\)](http://bu.edu.eg)

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 understand the robotics fundamentals	K1 to K4
CO2	To understand the sensors and matrix methods.	K1 to K4
CO3	To understanding the Localization: Self-localizations and mapping	K1 to K4
CO4	To gain knowledge on about the concept of Path Planning, Vision system.	K1 to K4
CO5	Able to understand the concept of robot artificial intelligence.	K1 to K4

MAPPING WITH PROGRAM OUTCOMES:

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

CO / PO MAPPING:

COS	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	2	3	3
CO 2	3	3	2	3	3
CO 3	3	3	3	3	3
CO 4	3	3	2	3	3
CO 5	3	3	2	3	3
WEIGHTAGE	15	14	11	15	15
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100	93.3	93.3	100	100

LESSON PLAN:

UNIT	Robotics and its Applications	HRS	PEDAGOGY
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	15	LCD
II	Actuators and sensors: Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor- proximity and distance measuring sensors Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D- H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot.	15	LCD
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.	15	LCD
IV	Path Planning: Introduction, path planning-overview- road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-	15	LCD

	object recognition-and categorization- depth measurement-image data compression-visual inspection-software considerations		
V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian-and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling- continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.	15	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,K3)	2 (K4,K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE
FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Computational Intelligence			
Course Code	23UCSEC66	L	P	C
Category	Elective	5	-	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				15
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				15
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				15
Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (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				15
Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.				
UNIT - V				15
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				75

BOOKS FOR STUDY:

- S.N. Sivanandam and S.N. Deepa, “Principles of Soft Computing”, 2nd Edition, WileyIndia 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
- 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/>

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	M	M	M	M	M
CO2	S	S	M	M	M	M	M	M	M	M
CO3	M	M	M	S	M	S	M	M	M	M
CO4	M	M	M	S	S	S	M	M	M	M

CO5	M	M	S	M	S	M	M	M	M	M
S- STRONG			M – MEDIUM					L - LOW		
CO / PO MAPPING:										
COS		PSO1	PSO2	PSO3		PSO4		PSO5	PSO6	
CO 1		3	2	1		2		1	2	
CO 2		3	3	2		2		3	2	
CO 3		3	3	2		3		3	3	
CO 4		3	2	3		2		2	2	
CO 5		3	2	2		2		3	3	
WEIGHTAGE		15	12	10		11		12	12	
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTI ON TO POS		100	80	67		73		80	80	
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.						15	BLACK BOARD/ LCD		
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.						15	BLACK BOARD/ LCD		
III	Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (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						15	BLACK BOARD/ LCD		
IV	Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.						15	BLACK BOARD/ LCD		

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	15	BLACK BOARD/ 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	CO1	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
AI	CO2	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
CI	CO3	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
AII	CO4	K1 – K4	2	K1,K2	2 (K3,K3)	2 (K4,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,K3)	2 (K4,K4)
2	CO2	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
3	CO3	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
4	CO4	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,K4)
5	CO5	K1-K4	2	K1,K2	2 (K3,K3)	2 (K4,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			
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 SCIENCE FOR THOSE WHO JOINED IN 2023-2024 AND AFTER

Course Name	Data Analytics Using R Lab			
Course Code	23UCSSP61	L	P	C
Category	Skill	-	2	2

COURSE OBJECTIVES:

- To understand the problem-solving approaches
- To learn the basic programming constructs in R Programming
- To practice various computing strategies for R Programming -based solutions to real world problems
- To use R Programming data structures - lists, tuples, and dictionaries.
- To do input/output with files in R Programming.

List of Programmes

- Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
- Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
- Write a program to find list of even numbers from 1 to n using R-Loops.
- Create a function to print squares of numbers in sequence.
- Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
- Implement different String Manipulation functions in R.
- Implement different data structures in R (Vectors, Lists, Data Frames)
- Write a program to read a csv file and analyze the data in the file in R.
- Create pie chart and bar chart using R.
- Create a data set and do statistical analysis on the data using R.
- Program to find factorial of the given number using recursive function
- Write a R program to count the number of even and odd numbers from array of N numbers.

Total Lecture Hours

30

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.simplilearn.com>

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	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	Visualize and summarize the data.	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	M	M	M
CO2	S	M	S	M	M	M	M	M	M	M
CO3	M	M	M	S	M	M	M	S	M	M
CO4	M	S	M	M	S	M	S	M	M	M
CO5	M	M	S	M	S	M	M	M	M	M

S- STRONG**M – MEDIUM****L - LOW****CO / PO MAPPING:**

COS	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	2	3	2	3
CO 2	3	3	3	3	3	2

CO 3	3	3	3	3	3	3
CO 4	3	3	2	3	2	3
CO 5	3	3	3	3	3	3
WEIGHTAGE	15	14	13	15	11	14
WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS	100	93	87	100	87	93

LESSON PLAN:

UNIT	Data Analytics Using R Lab	HRS	PEDAGOGY
I	• Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice. • Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user. • Write a program to find list of even numbers from 1 to n using R-Loops.	12	Chalk and Talk, LCD Projector
II	• Create a function to print squares of numbers in sequence. • Write a program to join columns and rows in a data frame using cbind() and rbind() in R. • Implement different String Manipulation functions in R.	12	Chalk and Talk, LCD Projector
III	• Implement different data structures in R (Vectors, Lists, Data Frames) • Write a program to read a csv file and analyze the data in the file in R.	12	Chalk and Talk, LCD Projector
IV	• Create pie chart and bar chart using R. • Create a data set and do statistical analysis on the data using R.	12	Chalk and Talk, LCD Projector
V	• Program to find factorial of the given number using recursive function • Write a R program to count the number of even and odd numbers from array of N numbers.	12	Chalk and Talk, LCD Projector

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
CIA	CO1	K1	5				
	CO2	K3		5			
	CO3	K4			5		
	CO4	K4				5	
	CO5	K2-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	20	20
	K4				5	5	10	20	20
	Marks	5	5	5	5	5	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	K4				15	
5	CO5	K4					15
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	20	20
K4				15	15	30	40	40
Marks	6	9	15	15	30	75	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.								