B.Sc.,

COMPUTER SCIENCE

SYLLABUS

FROM THE ACADEMIC YEAR
2023 - 2024

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005

CONTROLLER OF EXAMINATIONS
25 AUG 2023
K.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

DEPARTMENT OF COMPUTER SCIENCE

B.SC., COMPUTER SCIENCE

TANSCHE SYLLABUS 2023 -2024

Kunthavai Naacchiyaar Govt. Arts College for Women (Autonomous), Thanjavur - 7.

2023 - 2024 - UG Course Structure - Science

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	H
1.1 Part 1 Language – Tamil	3	6	2.1 Part1 Language – Tamil	3	6	3.1 Part1 Language – Tamil	3	6	4.1 Part 1 Language – Tamil	3	6	5.1 Core Course –CC IX	5	6	6.1 Core Course – CC XIII	6	7
1.2 Part 2 English	3	6	2. 2 Part 2 English	3	6	3.2 Part 2 English	3	6	4.2 Part 2 English	3	6	5.2 Core Course – CC X	5	6	6.2 Core Course – CC XIV	6	7
1.3 Core Course – CC I	5	5	2.3 Core Course – CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	4	4	5. 3.Core Course CC - XI	5	6	6.3 Core Course – CC XV	6	7
1.4 Core Course – CC II (Lab)	3	3	2.4 Core Course – CC IV (Lab)	3	3	3.4 Core Course – CC VI (Lab)	3	3	4.4 Core Course – CC VIII (Lab)	3	3	5. 4.Core Course / Project with viva-voce CC -XII	4	6	6.4 Elective VIII Generic/Discipline Specific	3	7
1.5 Elective I Generic/ Discipline Specific	4	4	2.5 Elective II Generic/ Discipline Specific	2	2	3.5 Elective IV Generic/ Discipline Specific	4	4	4.5 Elective V Generic/ Discipline Specific	2	2	5.5 Elective VII Generic/ Discipline Specific	3	4	6.5 Skill Enhancement Course SEC-8 / Professional Competency Skill	2	2
1.6 Elective II Generic/ Discipline Specific	-	2	2.6 Elective III Generic/ Discipline Specific	3	4	3.6 Elective V Generic/ Discipline Specific	-	2	4.6 Elective VI Generic/ Discipline Specific	3	4	5.6 Value Education	2	2	6.6 Extension Activity	1	-
1.7 Skill Enhancement Course - SEC -1	2	2	2.7 Skill Enhancement Course SEC -2	2	2	3.7 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.7 Skill Enhancement Course SEC-6	2	2	5.7 Summer Internship /Industrial Training	2	-			
1.8 Skill Enhancement - (Foundation Course)	2	2	2.8 Skill Enhancement Course –SEC-3	2	2	3.8 Skill Enhancement Course SEC-5	2	2	4.8 Skill Enhancement Course SEC-7	2	2						
						3.9 E.V.S.	-	1	4.9 E.V.S	2	1						
						ECC 1: Self Study / Mooc	3	-	ECC 3: Self Study / Mooc	3	-						
						ECC 2: Add on course	4	-									
	22	30		23	30		21	30		24	30		26	30		24	30

Total – 140 Credit + Extra Credit Maximum 10

Kunthavai Naacchiyaar Govt. Arts College for Women (Autonomous), Thanjavur - 7.

B.Sc. Computer Science Course Structure under CBCS

(For the candidates admitted from the academic year 2023 - 2024 onwards)

Semester	Part	Course	Subject Code	Title of the Paper	Inst. Hrs.	Credit	Exam. Hrs.	Marks		Total
								Int.	Ext.	
I	I	LC 1	23K1T1	செய்யுள் (இக்கால இலக்கியம்), சிறுகதை, இலக்கிய வரலாறு, பயன்முறைத் தமிழ்	6	3	3	25	75	100
	II	ELC 1	23K1E1	English Made Easy – I	6	3	3	25	75	100
	III	CC 1	23K1CS01	Python Programming	5	5	3	25	75	100
		CC 2 (P)	23K1CS02P	Python Programming Lab	3	3	3	25	75	100
		EC1	23K1CH/P/CSECM1:1	Algebra and Calculus	4	4	3	25	75	100
			23K1CH/P/CSECM1:2	Numerical Methods with Applications						
		EC2		Differential Equations and Laplace Transforms	2	-	-	-	-	-
				Number Theory						
	IV	SEC1	23K1CSSEC1	Introduction to HTML	2	2	3	25	75	100
		FC	23K1CSFC	Foundation Course Problem Solving Techniques	2	2	3	25	75	100
				Total	**30**	**22**	-	-	-	**700**
II	I	LC 2	23K2T2	செய்யுள் (இடைக்கால இலக்கியம்), புதினம், தமிழில் பிறசொல் கலப்பு, இலக்கிய வரலாறு	6	3	3	25	75	100
	II	ELC 2	23K2E2	English Made Easy – II	6	3	3	25	75	100
	III	CC 3	23K2CS03	Data Structure and Algorithms	5	5	3	25	75	100
		CC 4 (P)	23K2CS04P	Data Structure and Algorithms Lab	3	3	3	25	75	100
		EC2	23K2CH/P/CSECM2:1	Differential Equations and Laplace Transforms	2	2	3	25	75	100
			23K2CH/P/CSECM2:2	Number Theory						
		EC3	23K2CH/P/CSECM3:1	Discrete Mathematics	4	3	3	25	75	100
			23K2CH/P/CSECM3:2	Mathematical Statistics						
	IV	SEC2	23K2CSSEC2	PHP Programming	2	2	3	25	75	100
		SEC3	23K2CSSEC3	Office Automation	2	2	3	25	75	100
				Total	**30**	**23**				**800**
III	I	LC 3	23K3T3	செய்யுள் (காப்பியங்கள்), உரைநடை, அலுவல்முறை மடல்கள், இலக்கிய வரலாறு	6	3	3	25	75	100
	II	ELC 3	23K3E3	Fluency in English – I	6	3	3	25	75	100
	III	CC 5	23K3CS05	Microprocessor and Microcontroller	5	5	3	25	75	100
		CC 6 (P)	23K3CS06P	Microprocessor and Microcontroller Lab	3	3	3	25	75	100

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III		EC4	23K3CSECP4:1	Allied Physics - I	4	4	3	25	75	100
			23K3CSECP4:2	Applied Physics - I						
		EC5		Allied Physical Practical	2	-	-	-	-	-
	IV	SEC4	23K3CSSEC4	Advanced Excel	1	1	3	25	75	100
		SEC5	23K3CSSEC5	Cyber Forensics	2	2	3	25	75	100
		ES		Environmental Studies	1	-	-	-	-	-
		ECC1	23K3CSECC1:1	Competitive Skills	-	3	3	-	-	100
			23K3CSECC1:2	MOOC (Valued Added)						
		ECC2	23K3CSECC2	Add-On Course	-	4	-	-	-	-
				Total	**30**	**21**	-	-	-	**700**
IV	I	LC 4	23K4T4	செய்யுள் (பண்டைய இலக்கியம்), இலக்கிய வரலாறு, நாடகம், பொதுக்கட்டுரை	6	3	3	25	75	100
	II	ELC 4	23K4E4	Fluency in English – II	6	3	3	25	75	100
	III	CC 7	23K4CS07	Java Programming	4	4	3	25	75	100
		CC 8(P)	23K4CS08P	Java Programming Lab	3	3	3	25	75	100
		EC5	23K4CSECP5P	Allied Physics Practical	2	2	3	25	75	100
		EC6	23K4CSECP6:1	Allied Physics - II	4	3	3	25	75	100
			23K4CSECP6:2	Applied Physics - II						
	IV	SEC6	23K4CSSEC6	Software Testing	2	2	3	25	75	100
		SEC7	23K4CSSEC7	Pattern Recognition	2	2	3	25	75	100
		ES	23K4EVS	Environmental Studies	1	2	3	25	75	100
		ECC3	22K4CSECC3:1	Reasoning Ability	-	3	3	-	-	100
			22K4CSECC3:2	MOOC (Valued Added)						
				Total	**30**	**24**	-	-	-	**900**
V	III	CC 9	23K5CS09	Software Engineering	6	5	3	25	75	100
		CC 10	23K5CS10	Database Management System	6	5	3	25	75	100
		CC 11(P)	23K5CS11P	Database Management System Lab	6	5	3	25	75	100
		CC12P	23K5CS12PW	Core /Project with Viva voce	6	4	-	-	100	100
		EC7	23K5CSEC7:1	Cloud Computing	4	3	3	25	75	100
			23K5CSEC7:2	Human Computer Interaction						
	IV	VE	23K5VE	Value Education	2	2	3	25	75	100
			23K5I	Internship / Industrial Training (Summer vacation at the end of IV Semester Activity	-	2				
				Total	**30**	**26**				**600**
VI	III	CC 13	23K6CS13	Computer Networks	7	6	3	25	75	100
		CC 14	23K6CS14	.NET Programming	7	6	3	25	75	100
		CC 15(P)	23K6CS15P	.NET Programming Lab	7	6	3	25	75	100
		EC8	23K6CSEC8:1	Fuzzy Logic	7	3	3	25	75	100
			23K6CSEC8:2	Artificial Neural Networks						
	IV	SEC8	23K6CSSEC8	Quantitative Aptitude	2	2	3	25	75	100
	V	Extn. Act.	23K6CSEA	Extension Activity	-	1	-	-	-	-
				Total	**30**	**24**				**500**
Grand Total					**180**	**140**				**4200**

23/3/23

Depatment of Computer Science

Allied Course: (Second Allied for B.Sc., Mathematics - Additional Section & SSS)

Sem	Part	Course	Subject Code	Title of the Paper	Inst. Hrs.	Credit	Exam. Hrs.	Marks		Total
								Int.	Ext.	
III	III	EC4	23K3MECCS4:1	Introduction to Data Science	4	4	3	25	75	100
			23K3MECCS4:2	Robatics and its Applications						
III	III	EC5	23K3MECCS5:1	Big Data Analytics	2	-	-	-	-	-
IV			23K3MECCS5:2	IOT and Its Applications	2	3	3	25	75	100
IV	III	EC6	23K3MECCS6:1	Cryptography	4	3	3	25	75	100
			23K3MECCS:2	Image Processing						

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FIRST SEMESTER

CORE PAPER

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23K1CS01	Python programming	Core	-	5	-	-	5	25	75	100

Learning Objectives	
LO1	To make students understand the concepts of Python programming.
LO2	To apply the OOPs concept in PYTHON programming.
LO3	To impart knowledge on demand and supply concepts.
LO4	To make the students learn best practices in PYTHON programming.
LO5	To know the costs and profit maximization.

UNIT	Contents	No. of Hours
I	**Basics of Python Programming:** History of Python - Features of Python - Literal – Constants - Variables – Identifiers - Keywords - Built-in Data Types - Output Statements – Input Statements - Comments – Indentation - Operators – Expressions - Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	15
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: While loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements.	15
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. **Python Strings:** String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	15
IV	**Lists:** Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	15

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V	**Python File Handling:** Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods-append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	**15**
	TOTAL HOURS	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	ReemaThareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
2	Dr. R. NageswaraRao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.

Reference Books	
1.	VamsiKurama, "Python Programming: A Modern Approach", Pearson Education.
2.	Mark Lutz, "Learning Python", Orielly.
3.	Adan Stewarts, "Python Programming", Online.
4.	Fabio Nelli, "Python Data Analytics", APress.
5.	Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.

Web Resources	
1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	**15**	**14**	**15**	**15**	**13**	**14**

S-Strong-3 M-Medium-2 L-Low-1

23/8/2023

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23K1CS02P	Python Programming Lab	Core	-	-	3	-	3	25	75	100

Learning Objectives	
LO1	Be able to design and program Python applications.
LO2	Be able to create loops and decision statements in Python.
LO3	Be able to work with functions and pass arguments in Python.
LO4	Be able to build and package Python modules for reusability.
LO5	Be able to read and write files in Python.

LAB EXERCISES	Required Hours
1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	60

Course Outcomes	
On completion of this course, students will	
CO1	Demonstrate the understanding of syntax and semantics of PYTHON language
CO2	Identify the problem and solve using PYTHON programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
23K1CSSEC1	INTRODUCTION TO HTML	Skill Enha. Course (SEC)	-	2	-		2	25	75	100

Learning Objectives

LO1	Insert a graphic within a web page.
LO2	Create a link within a web page.
LO3	Create a table within a web page.
LO4	Insert heading levels within a web page.
LO5	Insert ordered and unordered lists within a web page. Create a web page.

UNIT	Contents	No. Of. Hours
I	Introduction : WebBasics: WhatisInternet–Webbrowsers–WhatisWebpage – HTMLBasics:Understandingtags.	6
II	TagsforDocumentstructure(HTML,Head,BodyTag).Blockleveltextelements :Headingsparagraph(<p> tag)– Fontstyleelements:(bold,italic,font,small,strong,strike,bigtags)	6
III	Lists:Typesoflists:Ordered,Unordered– NestingLists– Othertags:Marquee,HR,BR-UsingImages –CreatingHyperlinks.	6
IV	Tables:CreatingbasicTable,Tableelements,Caption– Tableandcellalignment–Rowspan,Colspan–Cellpadding.	6
V	Frames:Frameset–TargetedLinks–Noframe–Forms:Input, Textarea,Select,Option.	6
	TOTAL HOURS	**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6

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Textbooks	
1	"Mastering HTML5 and CSS3 Made Easy", TeachUComp Inc., 2014.
2	**Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"**
Web Resources	
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	https://www.w3schools.com/html/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K1CSFC	Problem Solving Techniques	FC	-	2	-	-	2	2	25	75	100

Learning Objectives	
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
LO2	Implement different programming constructs and decomposition of problems into functions.
LO3	Use data flow diagram, Pseudo code to implement solutions.
LO4	Define and use of arrays with simple applications
LO5	Understand about operating system and their uses

UNIT	Contents	No. Of. Hours
I	**Introduction:** History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. **Programming Languages:** Machine language, Assembly language, High-level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	6
II	**Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC). **Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. **Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.	6
III	**Selection Structures:** Relational and Logical Operators – Selecting from Several Alternatives – Applications of Selection Structures.**Repetition Structures:** Counter Controlled Loops – Nested Loops– Applications of Repetition Structures.	6
IV	**Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as	6

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	Arrays of Characters.	
V	**Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms - Value and Reference parameters- Scope of a variable - Functions – Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files.	6
	TOTAL HOURS	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	**Stewart Venit,** "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.
Web Resources	
1.	https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2.	http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3.	http://utubersity.com/?page_id=876

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	2	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	**15**	**14**	**14**	**15**	**15**	**14**

S-Strong-3 M-Medium-2 L-Low-1

Semester II

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K2CS03	DATA STRUCTURE AND ALGORITHMS	Core	-	4	-	-	4	4	25	75	100

Learning Objectives	
LO1	To understand the concepts of ADTs
LO2	To learn linear data structures-lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph strutures and and application of graphs
LO5	To understand various sorting and searching

UNIT	Contents	No. of Hours
I	**Abstract Data Types (ADTs)-** List ADT-array-based implementation-linked list implementationsingly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal	15
II	**Stack ADT- Operations** - Applications - Evaluating arithmetic expressions – Conversion of infix topostfix expression-Queue ADT-Operations-Circular Queue- Priority Queue- deQueueapplications of queues.	15
III	Tree ADT- Tree traversals-Binary Tree ADT – Expression trees -Applications of trees - Binary search tree ADT - Threaded Binary Trees - AVL Trees - B-Tree- B+ Tree – Heap - Applications of heap.	15
IV	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal - Topological sort - Bi-connectivity – Cut vertex - Euler circuits-Applications of graphs.	15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-RehashingExtendible Hashing	15
	Total	**75**

Course Outcomes		Programmeme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory	PO1,PO6

	management, data types, algorithms, Big O notation	
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6
Text Book		
1	1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.	
2	ReemaThareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1.	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003	
Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

S-Strong-3 M-Medium-2 L-Low-1

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Head, Dept. of Computer Science
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Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K2CS04P	DATA STRUCTURE AND ALGORITHMS LAB [Note: Practicals may be offered through C / C++ / Python]	Core	-	-	3	-	3	3	25	75	100

Learning Objectives	
LO1	To understand the concepts of ADTs
LO2	To learn linear data structures-lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph strutures and and application of graphs
LO5	To understand various sorting and searching

Sl. No	Contents	No. of Hours
1.	Write a program to implement the List ADT using arrays and linked lists.	
2.	Write a programs to implement the following using a singly linked list. • Stack ADT • Queue ADT	
3.	Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).	
4.	Write a program to implement priority queue ADT.	
5.	Write a program to perform the following operations: • Insert an element into a binary search tree. • Delete an element from a binary search tree. • Search for a key element in a binary search tree.	

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6.	Write a program to perform the following operations • Insertion into an AVL-tree • Deletion from an AVL-tree	60
7.	Write a programs for the implementation of BFS and DFS for a given graph.	
8	Write a programs for implementing the following searching methods: • Linear search • Binary search.	
9.	Write a programs for implementing the following sorting methods: • Bubble sort • Selection sort • Insertion sort • Radix sort.	
	Total	60

Course Outcomes		**Programmem Outcome**
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs, trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6

Text Book	
1	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.
2	ReemaThareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition
Reference Books	
1	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003
Web Resources	
1.	https://www.programiz.com/dsa
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

S-Strong-3 M-Medium-2 L-Low-1

Lo. Levy 23/8/23

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Kunthavai Naachiaar Govt. Arts College (W).
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Govt. Arts College for Women (Autonomous), Thanjavur

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K2CSSEC2	PHP PROGRAMMING	Skill Enha. Course (SEC)	-	2	-	-	2	2	25	75	100

Learn ing Objectives	
LO1	To provide the necessary knowledge on basics of PHP.
LO2	To design and develop dynamic, database-driven web applications using PHP version.
LO3	To get an experience on various web application development techniques.
LO4	To learn the necessary concepts for working with the files using PHP.
LO5	To get a knowledge on OOPS with PHP.

UNIT	Contents	No. of Hours
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP - XAMPP and WAMP Installation	6
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.	6
III	Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements - Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.	6
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6
	Total	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.

CO3	Create PHP Program using the concept of array.	PO3,PO4,PO5.
CO4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5
CO5	Manipulate files and directories.	PO3,PO5,PO6.
Text Book		
1	Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.	
2	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes	
Reference Books		
1.	PHP: The Complete Reference-Steven Holzner.	
2.	DT Editorial Services (Author), "*HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*", Paperback 2016, 2nd Edition.	
Web Resources		
1.	Opensource digital libraries: PHP Programming	
2.	https://www.w3schools.com/php/default.asp	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	**15**	**12**	**10**	**11**	**12**	**13**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K2CSSEC3	OFFICE AUTOMATION	Skill Enha. Course (SEC)	-	2	-	-	2	2	25	75	100

Learning Objectives	
LO1	Understand the basics of computer systems and its components.
LO2	Understand and apply the basic concepts of a word processing package.
LO3	Understand and apply the basic concepts of electronic spreadsheet software.
LO4	Understand and apply the basic concepts of database management system.
LO5	Understand and create a presentation using PowerPoint tool.

UNIT	Contents	No. of Hours
I	Introductory conceptsMemory unit– CPU-Input Devices: Key board,Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages.	6
II	**Word Processing:** Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing–Preview,options,merge.	6
III	**Spreadsheets:** Excel–opening,enteringtextanddata,formatting,navigating;Formulas–entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontodataanalytics.	6
IV	**Database Concepts:** The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).	6
V	**Power point:** Introduction to Power point - Features – Understanding slide typecasting &viewingslides – creating slide shows. Applying special object – including objects & pictures – Slidetransition–Animationeffects,audioinclusion,timers.	6
	Total	**30**

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Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3,PO6,PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3,PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
CO4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5,PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7,PO8
Text Book		
1	PeterNorton,"IntroductiontoComputers"–TataMcGraw-Hill.	
Reference Books		
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGrawHill.	
Web Resources		
1.	https://www.udemy.com/course/office-automation-certificate-course/	
2.	https://www.javatpoint.com/automation-tools	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	3	2	2	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	**15**	**14**	**14**	**15**	**15**	**15**

S-Strong-3 M-Medium-2 L-Low-1

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THANJAVUR-7.

SECOND YEAR

SEMESTER III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3CS05	Microprocessor and Microcontroller	Core	-	5	-	-	5	5	25	75	100

Learning Objectives	
LO1	To introduce the internal organization of Intel 8085 Microprocessor.
LO2	To know about various instruction sets and classifictions
LO3	To enable the students to write assembly language programs using 8085.
LO4	To interface the peripheral devices to 8085 using Interrrupt controller and DMA interface.
LO5	To provide real-life applications using microcontroller.

UNIT	Contents	No. of Hours
I	Digital Computers - Microcomputer Organization- Computer languages –Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated operations.	15
II	8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications.	15
III	BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction - Multibyte Addition and Subtraction - Multiplication and Division.	15

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IV	The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.	15
V	Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture - 8051 pin description. Timers and Counters – Operating Modes- Control Registers. Interrupts – Interrupts in 8051 - Interrupts Control Register – Execution of interrupt.	15
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor..	PO1
CO2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	PO1,PO2
CO3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.	PO4,PO6
CO4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	PO4,PO5,PO6
CO5	An exposure to create real time applications using microcontroller.	PO3,PO6

Text Book

1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications,2009. [For unit I to unit IV]
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [for unit V].

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Reference Books	
1.	Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.
2.	Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
3.	Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008
Web Resources	
1.	E-content from open source libraries
2.	https://www.bing.com/, https://theopennotes.in/

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2
CO2	3	3	3	2	3	2
CO3	3	3	3	3	3	2
CO4	3	3	3	3	3	2
CO5	3	3	3	2	3	2
Weightage of course contributed to each PSO	15	15	14	12	14	10

S-Strong-3 M-Medium-2 L-Low-1

CONTROLLER OF EXAMINATIONS
25 AUG 2023
A.N.Govt. Arts College for Women (Autonomous), Thanjavur-7

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Kunthavai Naachiaar Govt Arts College for W
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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3CS06P	Microprocessor and Microcontroller Lab	Core	-	-	3	-	3	3	25	75	100

Learning Objectives		
LO1	To introduce the internal organization of Intel 8085 Microprocessor.	
LO2	To know about various instruction sets and classifications	
LO3	To enable the students to write assembly language programs using 8085.	
LO4	To interface the peripheral devices to 8085 using Interrrupt controller and DMA interface.	
LO5	To provide real-life applications using microcontroller.	
	Details	**No. of Hours**
	List of Exercises:	
	Addition and Subtraction 1. 8 - bit addition 2. 16 - bit addition 3. 8 - bit subtraction 4. BCD subtraction II. Multiplication and Division 1. 8 - bit multiplication 2. BCD multiplication 3. 8 - bit division III. Sorting and Searching 1. Searching for an element in an array. 2. Sorting in Ascending and Descending order. 3. Finding the largest and smallest elements in an array. 4. Reversing array elements. 5. Block move.	60

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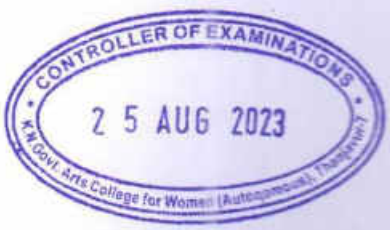
	IV. Code Conversion 1. BCD to Hex and Hex to BCD 2. Binary to ASCII and ASCII to binary 3. ASCII to BCD and BCD to ASCII V. Simple programs on 8051 Microcontroller 1. Addition 2. Subtraction 3. Multiplication 4. Division 5. Interfacing Experiments using 8051 1. Realisation of Boolean Expression through ports. 2. Time delay generation using subroutines. 3. Display LEDs through ports	
	Total	**60**

Course Outcomes		**Programmeme Outcome**
CO	On completion of this course, students will	
CO1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor..	PO1
CO2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	PO1,PO2
CO3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.	PO4,PO6
CO4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	PO4,PO5,PO6
CO5	An exposure to create real time applications using microcontroller.	PO3,PO5



Text Book	
1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications, 2009. [For unit I to unit IV]
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [for unit V].
Reference Books	
1.	Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.
2.	Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
3.	Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008
Web Resources	
1.	E-content from open source libraries
2.	https://www.bing.com/

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**15**	**10**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3CSSEC4	Advanced Excel	Skill Enha. Course (SEC)	-	1	-	-	1	1	25	75	100

Learning Objectives	
LO1	Handle large amounts of data
LO2	Aggregate numeric data and summarize into categories and subcategories
LO3	Filtering, sorting, and grouping data or subsets of data
LO4	Create pivot tables to consolidate data from multiple files
LO5	Presenting data in the form of charts and graphs

UNIT	Contents	No. of Hours
I	Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets	6
II	Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data -Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.	6
III	Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data-	6

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	Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.	
IV	More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager.	6
V	Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.	6
	Total	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No-SQL databases and management.	PO3, PO8

Text Book

1	**Excel 2019 All**
2	**Microsoft Excel 2019 Pivot Table Data Crunching**

Reference Books

1	Excel 2019 All-in-One for Dummies, Greg Harvey, 1st edition

Web Resources

1.	https://www.simplilearn.com
2	https://www.javatpoint.com
3	https://www.w3schools.com

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Mapping with Programme Outcomes:

CO/ PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	3	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	2	2	3	3	3
Weightage of course contributed to each PSO	**15**	**12**	**10**	**15**	**15**	**15**

Strong-3 M-Medium-2 L-Low-1

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THANJAVUR.

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Cyber Forensics	Skill Enha. Course (SEC)	-	2	-	-	2	2	25	75	100

Learning Objectives	
LO1	Understand the definition of computer forensics fundamentals.
LO2	To study about the Types of Computer Forensics Evidence
LO3	Understand and apply the concepts of Duplication and Preservation of Digital Evidence
LO4	Understand the concepts of Electronic Evidence and Identification of Data
LO5	To study about the Digital Detective, Network Forensics Scenario, Damaging Computer Evidence.

UNIT	Contents	No. of Hours
I	**Overview of Computer Forensics Technology:** Computer Forensics Fundamentals: What is Computer Forensics Use of ComputerForensics in Law Enforcement, Computer Forensics Assistance to HumanResources/Employment Proceedings, Computer Forensics Services, Benefits of professionalForensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer.Forensics Technology: Types of Business Computer Forensic, Technology–Types ofMilitary Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.	6
II	**Computer Forensics Evidence and capture:** Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody.	6

III	**Duplication and Preservation of Digital Evidence:** Processing steps, Legal Aspects of collecting and Preserving Computerforensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.	6
IV	**Computer Forensics Analysis:** Discovery of Electronic Evidence: ElectronicDocument Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	6
V	**Reconstructing Past Events:** How to Become a Digital Detective, Useable File Formats,Unusable File Formats, Converting Files.Networks: Network Forensics Scenario, a technical approach, Destruction Of E–Mail, Damaging Computer Evidence, DocumentingThe Intrusion on Destruction of Data, System Testing.	6
	Total	**30**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the definition of computer forensics fundamentals.	PO1
CO2	Evaluate the different types of computer forensics technology.	PO1, PO2
CO3	Analyze various computer forensics systems.	PO4, PO6
CO4	Apply the methods for data recovery, evidence collection and data seizure.	PO4, PO5, PO6
CO5	Gain your knowledge of duplication and preservation of digital evidence.	PO3, PO8

Text Book

1	John R. Vacca, "Computer Forensics: Computer Crime Investigation", 3/E ,Firewall Media, New Delhi, 2002.

Reference Books

1.	Nelson, Phillips Enfinger, Steuart,"Computer Forensics and Investigations" Enfinger,

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	Steuart, CENGAGE Learning, 2004.
2.	Anthony Sammes and Brian Jenkinson,"Forensic Computing: A Practitioner's Guide", Second Edition, Springer–Verlag London Limited, 2007.
3.	.Robert M.Slade," Software Forensics Collecting Evidence from the Scene of a Digital Crime", TMH 2005.
Web Resources	
1.	https://www.vskills.in
2.	https://www.hackingarticles.in/best-of-computer-forensics-tutorials/

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	3	1	2	2	2	2
CO2	2	3	2	3	3	1
CO3	3	2	2	3	3	2
CO4	3	3	1	3	3	2
CO5	3	3	2	3	3	3
Weightage of course contributed to each PSO	**14**	**12**	**9**	**14**	**14**	**10**

Strong-3 M-Medium-2 L-Low-1

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SEMESTER IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	Ext	Total
23K4CS07	Java Programming	Core	-	4	-	-	4	4	25	75	100

Learning Objectives	
LO1	To provide fundamental knowledge of object-oriented programming
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.
LO4	To provide fundamental knowledge of object-oriented programming.
LO5	To equip the student with programming knowledge in Core Java from the basics up.

UNIT	Contents	No. of Hours
I	**Introduction:**ReviewofObjectOrientedconcepts - HistoryofJava - Javabuzzwords - JVMarchitecture - Datatypes - Variables - Scope and life timeofvariables - arrays - operators - controlstatements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - StaticMethodStringandStringBufferClasses.	15
II	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**:Definition-AccessProtection -ImportingPackages. **Interfaces**:Definition–Implementation–Extending Interfaces. **Exception Handling**: *try – catch- throw - throws – finally* – Built-inexceptions - Creating own Exception classes.	15

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III	**Multithreaded Programming**: Thread Class - Runnable interface –Synchronization–Using synchronizedmethods– Using synchronized statement- InterthreadCommunication –Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes	15
V	**Swing:** Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox - JScrollPane.	15
	Total	**75**

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1, PO2, PO6
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO5
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO6

Text Books:

1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010

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2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999
References :	
1.	Head First Java, O'Rielly Publications,
2.	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010
Web Resources	
1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

S-Strong-3 M-Medium-2 L-Low-1

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	1
Weightage of course contributed to each PSO	**14**	**14**	**13**	**14**	**14**	**11**

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K4CS08P	Java Programming Lab	Core	-	-	3	-	3	3	25	75	100

Learning Objectives	
LO1	To provide fundamental knowledge of object-oriented programming.
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to know about Event Handling .
LO4	To enable the students to use String Concepts.
LO5	To equip the student with programming knowledge in to creat GUI using AWT controls.

EXCERCISE	Details
1	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer
2	Write a Java program to multiply two given matrices.
3	Write a Java program that displays the number of characters, lines and words in a text
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.
5	Write a program to do String Manipulation using CharacterArray and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings
6	Write a program to perform the following string operations using String class: a. String Concatenation b. Search a substring c. To extract substring from given string
7	Write a program to perform string operations using String Buffer

	class: a. Length of a string b. Reverse a string c. Delete a substring from the given string	
8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.	
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. ArrayIndexOutofBoundException d. NegativeArraySizeException	60
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	
13	Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).	
14	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.	
	Total	**60**

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Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.	PO1
2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO1, PO2
3	Implement multi-threading and I/O Streams of Core Java	PO4, PO6
4	Implement AWT and Event handling.	PO4, PO5, PO6
5	Use Swing to create GUI.	PO3, PO6
Text Book		
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.	
2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999.	
Reference Books		
1.	Head First Java, O'Rielly Publications,	
2.	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.	
Web Resources		
1.	https://www.w3schools.com/java/	
2.	http://java.sun.com	
3.	http://www.afu.com/javafaq.html	

Mapping with Programme Outcomes:

S-Strong M-Medium L-Low

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	**14**	**14**	**13**	**14**	**14**	**12**

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K4CSSEC5	SoftwareTesting	Skill Enha. Course (SEC)	-	2	-	-	2	2	25	75	100

Learning Objectives	
LO1	To study fundamental concepts in software testing
LO2	To discuss various software testing issues and solutions in software unit test, integration and system testing.
LO3	To study the basic concept of Data flow testing and Domain testing.
LO4	To Acquire knowledge on path products and path expressions.
LO5	To learn about Logic based testing and decision tables

UNIT	Contents	No. of Hours
I	Introduction: Purpose–Productivity and Quality in Software–TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.	6
III	Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing.	6
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.SyntaxTesting–Formats–Test Cases	6
V	Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, StateTesting.	6
	Total	30

Course Outcomes		Program Outcomes
CO	On completion of this course, students will	

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CO1	Students learn to apply software testing knowledge and engineering methods	PO1
CO2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2
CO3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	PO4, PO6
CO4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6
CO5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8

Text Book	
1	B.Beizer,"SoftwareTestingTechniques",IIEdn.,DreamTechIndia,NewDelhi,2003.
2	K.V.K.Prasad,"SoftwareTestingTools",DreamTech.India,NewDelhi,2005
Reference Books	
1.	I.Burnstein,2003,"PracticalSoftwareTesting",SpringerInternationalEdn.
2.	E. Kit, 1995, "Software Testing in the Real World: Improving the Process", PearsonEducation,Delhi.
3.	R. Rajani,andP.P.Oak,2004,"SoftwareTesting",TataMcgrawHill,New Delhi.
Web Resources	
1.	https://www.javatpoint.com/software-testing-tutorial
2.	https://www.guru99.com/software-testing.html

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K4CSSEC6	Pattern Recognition	Skill Enha. Course (SEC)	-	2	-	-	2	2	75	25	100

Learning Objectives	
LO1	To learn the fundamentals of Pattern Recognition techniques
LO2	To learn the various Statistical Pattern recognition techniques
LO3	To learn the linear discriminant functions and unsupervised learning and clustering
LO4	To learn the various Syntactical Pattern recognition techniques
LO5	To learn the Neural Pattern recognition techniques

UNIT	Contents	No. of Hours	Course Objective
I	**PATTERN RECOGNITION OVERVIEW**: Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches	6	CO1
II	**STATISTICAL PATTERN RECOGNITION**: Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches.	6	CO2
III	**LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING**: Introduction-Discrete and binary Classification Problems-Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised learning and classification	6	CO3
IV	**SYNTACTIC PATTERN RECOGNITION**: Overview of Syntactic Pattern Recognition-Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition-Learning via grammatical inference.	6	CO4
V	**NEURAL PATTERN RECOGNITION**: Introduction to Neural Networks-Feed-forward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR	6	CO5
	Total		

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Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	understand the concepts, importance, application and the process of developing Pattern recognition over view	PO1
CO2	To have basic knowledge and understanding about parametric and non-parametric related concepts.	PO1, PO2
CO3	To understand the framework of frames and bit images to animations	PO4, PO6
CO4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO8
Text Book		
1	Robert Schalkoff, "Pattern Recognition: Statistical Structural and Neural Approaches", John wiley& sons.	
2	Duda R.O., P.E.Hart& D.G Stork, " Pattern Classification", 2nd Edition, J.Wiley.	
3	Duda R.O.& Hart P.E., "Pattern Classification and Scene Analysis", J.wiley.	
4	Bishop C.M., "Neural Networks for Pattern Recognition", Oxford University Press.	
Reference Books		
1.	1. Earl Gose, Richard johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India, Pvt Ltd, New Delhi.	
Web Resources		
1.	https://www.geeksforgeeks.org/pattern-recognition-introduction/	
2.	https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	2
CO2	3	3	2	2	3	2
CO3	3	3	3	3	3	2
CO4	3	3	3	3	3	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	15	15	12	12	13	10

Strong-3 M-Medium-2 L-Low-1

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THIRD YEAR

SEMESTER V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K5CS09	Software Engineering	Core	-	6	-	-	5	6	25	75	100

Learning Objectives	
LO1	Gain basic knowledge of analysis and design of systems
LO2	Ability to apply software engineering principles and techniques
LO3	Model a reliable and cost-effective software system
LO4	Ability to design an effective model of the system
LO5	Perform Testing at various levels and produce an efficient system.

UNIT	Contents	No. of Hours
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
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS)	15

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	Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design	
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
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; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	15
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
	Total	**75**

Course Outcomes		Programme Outcomes
On completion of this course, students will;		
CO1	Gain basic knowledge of analysis and design of systems	PO1
CO2	Ability to apply software engineering principles and techniques	PO1, PO2
CO3	Model a reliable and cost-effective software system	PO4, PO6
CO4	Ability to design an effective model of the system	PO4, PO5, PO6
CO5	Perform Testing at various levels and produce an efficient system.	PO3, PO6
Text Books		
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018	
References Books		
1.	Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997	
2.	Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.	
3.	James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	2	2	3
CO2	3	2	2	2	1	2
CO3	3	3	3	2	3	2
CO4	3	3	3	2	2	2
CO5	3	3	3	2	2	2
Weightage of course contribute d to each PO/PSO	**15**	**13**	**14**	**10**	**10**	**11**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K5CS10	Database Management System	Core	-	6	-	-	5	6	25	75	100

Learning Objectives	
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO2	To understood the concepts of data base management system, design simple Database models
LO3	To learn and understand to write queries using SQL, PL/SQL.
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO5	To understood the concepts of data base management system, design simple Database models

UNIT	Contents	No. of Hours
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	15
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	15
III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. **Introduction to SQL**: Data Definition Commands – Data	15

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	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	15
V	**PL/SQL**:A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – 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.	15
	Total	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language.	PO4, PO6

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	Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO5
Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	
Reference Books		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition	
Web Resources		
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	**15**	**12**	**10**	**11**	**12**	**13**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K5CS11P	Database Management System lab	Core	-	-	5	-	5	6	25	75	100

Learning Objectives	
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO2	To understood the concepts of data base management system, design simple Database models
LO3	To learn and understand to write queries using SQL, PL/SQL.
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO5	To understood the concepts of data base management system, design simple Database models

	List of Exercises:	No. of Hours	Course Objective
II	***I. SQL*** 1. DDLCOMMANDS 2. DMLCOMMANDS 3. TCLCOMMANDS ***II. PL/SQL*** 4. FIBONACCI SERIES 5. FACTORIAL 6. STRING REVERSE 7. SUM OF SERIES 8. TRIGGER		75

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	III. CURSOR 9. STUDENT MARK ANALYSIS USING CURSOR ***IV. APPLICATION*** 10. LIBRARY MANAGEMENTSYSTEM 11. STUDENT MARK ANALYSIS		
	Total		**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
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)	PO4, PO6
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO4

Text Book	
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016
Reference Books	
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System

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	Concepts", McGraw Hill International Publication ,VI Edition
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition
Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	3	2
CO2	3	3	1	2	2	2
CO3	2	2	3	3	3	3
CO4	2	2	3	3	3	1
CO5	2	3	3	3	3	3
Weightage of course contributedto each PSO	**12**	**12**	**13**	**14**	**14**	**11**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K5CSEC7:1	Cloud Computing	Elective	4	-	-	-	3	4	25	75	100

Course Objective	
LO1	Learning fundamental concepts and Technologies of Cloud Computing.
LO2	Learning various cloud service types and their uses and pitfalls.
LO3	To learn about Cloud Architecture and Application design.
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.
LO5	To learn the various Case Studies in Cloud Computing.

UNIT	Contents	No. of Hours
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	12
II	Cloud Services 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	12

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	SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack	
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: RelationalApproach (SQL), Non-RelationalApproach (NoSQL).	12
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – WorkloadCharacteristics – Application Performance Metrics – Design Consideration for BenchmarkingMethodology – Benchmarking Tools and Types of Tests – DeploymentPrototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data atrest, securing data in	12

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	motion – Key Management – Auditing.	
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for EnergySystems - Cloud Computing for Transportation Systems - Cloud Computing for ManufacturingIndustry - Cloud Computing for Education.	12
	Total	**60**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO 1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
CO 2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
CO 3	Able to understand Cloud Architecture and Application design.	PO4, PO5
CO 4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO 5	Understand various Case Studies in Cloud Computing.	PO3, PO6

Text Book

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

Reference Books

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

Web Resources

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

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Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage ofcoursecontributedtoeachPSO	15	14	11	15	15	10

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K5CSEC7:1	Human Computer Interaction	Elective	4	-	-	-	3	4	25	75	100

Learning Objectives	
LO1	To learn about the foundations of Human Computer Interaction.
LO2	To learn the design and software process technologies.
LO3	To learn HCI models and theories.
LO4	To learn Mobile Ecosystem.
LO5	To learn the various types of Web Interface Design.

UNIT	Contents	No. of Hours
I	**FOUNDATIONS OF HCI :** • The Human: I/O channels – Memory • Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; • Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies	12
II	**DESIGN & SOFTWARE PROCESS:** • Interactive Design: • Basics – process – scenarios • Navigation: screen design Iteration and prototyping. • HCI in software process: • Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design	12

III	**MODELS AND THEORIES:** • HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.	12
IV	**Mobile HCI:** • Mobile Ecosystem: Platforms, Application frameworks • Types of Mobile Applications: Widgets, Applications, Games • Mobile Information Architecture, Mobile 2.0, • Mobile Design: Elements of Mobile Design, Tools. - Case Studies	12
V	**WEB INTERFACE DESIGN:** Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies	12
	Total	**60**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	Understand thefundementals of HCI.	PO1
CO2	Understand the design and software process technologies.	PO1, PO2
CO3	Understand HCI models and theories.	PO4, PO6
CO4	Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design.	PO4, PO5, PO5
CO5	Understand the various types of Web Interface Design.	PO3, PO4

Text Book

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

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Reference Books	
1.	Shneiderman, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", V Edition, Pearson Education.
Web Resources	
1.	https://www.interaction-design.org/literature/topics/human-computer-interaction
2.	https://link.springer.com/10.1007/978-0-387-39940-9_192
3.	https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**11**	**10**

S-Strong-3 M-Medium-2 L-Low-1

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SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K6CS13	Computer Networks	Core	5	-	-	-	5	7	25	75	100

Course Objective	
LO1	To learn the basic concepts of Data communication and Computer network
LO2	To learn about wireless Transmission
LO3	To learn about networking and data link layer.
LO4	To study about Network communication.
LO5	To learn the concept of Transport layer

UNIT	Contents	No. of Hours
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media	15
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.	15
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth.	15
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.	15
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transporet Protocols (ITP) - Network Security: Cryptography	15
	Total	**75**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	

CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1
CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO4

Text Book	
1	A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.
Reference Books	
1.	B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017
2.	F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008
3.	D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.
4.	Lamarca, "Communication Networks", Tata McGraw- Hill, 2002
Web Resources	
1.	https://en.wikipedia.org/wiki/Computer_network
2.	https://citationsy.com/styles/computer-networks

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	3
CO2	3	2	2	2	2	2
CO3	3	2	3	3	2	3
CO4	3	2	2	2	2	2
CO5	3	2	2	2	2	3
Weightage of course contributed to each PSO	**15**	**11**	**11**	**12**	**10**	**13**

S-Strong-3 M-Medium-2 L-Low-1

\Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K6CS14	**.Net Programming**	Core	6	-	-	-	5	7	25	75	100

Course Objective	
C1	To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.
C2	To develop ASP.NET Web application using standardcontrols.
C3	To implement file handling operations.
C4	To handles SQL Server Database using ADO.NET.
C5	Understand the Grid view control and XML classes.

UNIT	Contents	No. of Hours
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 – Stringoperations.	18
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
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 Deletingfiles – File uploading.	18
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controlsand its Properties – DataBinding	18

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V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating aWeb application.	18
	Total	**90**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1, PO2, PO6
2	To develop a software to solve real-world problems using ASP.NET	PO2, PO3, PO5
3	To Work On Various Controls Files	PO1, PO3, PO6
4	To create a web application using MicrosoftADO.NET.	PO2, PO6
5	To develop web applications using XML	PO1, PO3, PO6

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

Reference Books	
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtechpres,2013.
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010,APRESS,2010.

Web Resources	
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

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Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	2	3
CO2	3	2	2	3	3	3
CO3	3	3	3	2	3	3
CO4	2	2	1	3	3	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	13	12	14	14	14

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K6CS15P	.Net Programming LAB	Core	-	-	5	-	5	7	25	75	100

Course Objective	
LO1	To develop ASP.NET Web application using standardcontrols.
LO2	To create rich database applications usingADO.NET.
LO3	To implement file handling operations.
LO4	To implement XML classes.
LO5	To utilize ASP.NET security features for authenticating the website

Sl. No	Programs	No. of Hours
1.	Create an exposure of Web applications and tools	75
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 Fileconcepts.	
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.	

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12.	Implement the Xml classes.	
13.	Implement Authentication – Authorization.	
14.	Ticket reservation using ASP.NET controls.	
15.	Online examination using ASP.NET controls	
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	To create web applications and implement various controls	PO1, PO2, PO4
CO2	Create web pages in Rich control.	PO3, PO5
CO3	Develop knowledge about file handling operations	PO1, PO4, PO5
CO4	An ability to design XML classes	PO2, PO4, PO6
CO5	To develop a software to solve real-world problems using ASP.NET	PO1,PO3, PO5, PO6

Text Book

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

Reference Books

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

Web Resources

1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K6CSEC8:1	**Fuzzy Logic**	Elective	4	-	-	-	3	7	25	75	100

Course Objective	
CO1	To understand the basic concept of Fuzzy logic
CO2	To learn the various operations on relation properties
CO3	To study about the membership functions
CO4	To learn about the Defuzzification and Fuzzy Rule-Based System
CO5	To learn the concepts of Applications of Fuzzy Logic

UNIT	Contents	No. of Hours
I	Introduction to Fuzzy Logic- Fuzzy Sets- Fuzzy Set Operations, Properties of Fuzzy Sets, Classical and Fuzzy Relations: Introduction-Cartesian Product of Relation-Classical Relations-Cardinality of Crisp Relation.	12
II	Operations on Crisp Relation-Properties of Crisp Relations-Composition Fuzzy Relations, Cardinality of Fuzzy Relations-Operations on Fuzzy Relations-Properties of Fuzzy Relations-Fuzzy Cartesian Product and Composition-Tolerance and Equivalence Relations ,Crisp Relation.	12
III	Membership Functions: Introduction, Features of Membership Function, Classification of Fuzzy Sets, Fuzzification, Membership Value Assignments, Intuition, Inference, Rank Ordering.	12
IV	Defuzzification: Introduction, Lambda Cuts for Fuzzy Sets, Lambda Cuts for Fuzzy Relations, Defuzzification Methods, Fuzzy Rule-Based System: Introduction, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Properties	12

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	of Set of Rules.	
V	Applications of Fuzzy Logic: Fuzzy Logic in Automotive Applications, Fuzzy Antilock Brake System-Antilock-Braking System and Vehicle Speed-Estimation Using Fuzzy Logic.	12
	Total	**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Understand the basics of Fuzzy sets, operation and properties.	PO1
2	Apply Cartesian product and composition on Fuzzy relations and usethe tolerance and Equivalence relations.	PO1, PO2
3	Analyze various fuzzification methods and features of membership Functions.	PO4, PO6
4	Evaluate defuzzification methods for real time applications.	PO3, PO4, PO6
5	Design an application using Fuzzy logic and its Relations.	PO3, PO6

Text Book

1	S. N. Sivanandam, S. Sumathi and S. N. Deepa-Introduction to Fuzzy Logic using MATLAB, Springer-Verlag Berlin Heidelberg 2007.

Reference Books

1.	Guanrong Chen and Trung Tat Pham- Introduction to Fuzzy Sets, Fuzzy Logic and Fuzzy Control Systems
2.	Timothy J Ross , Fuzzy Logic with Engineering Applications

Web Resources

1.	https://www.javatpoint.com/fuzzy-logic
2.	https://www.guru99.com/what-is-fuzzy-logic.html

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K6CSEC8:2	Artificial Neural Networks	Elective	4	-	-	-	3	7	25	75	100

Learning Objectives	
LO1	**Understand the basics of artificial neural networks, learning process, single layer and multi-layer perceptron networks.**
LO2	Understand the Error Correction and various learning algorithms and tasks.
LO3	Identify the various Single Layer Perception Learning Algorithm.
LO4	Identify the various Multi-Layer Perception Network.
LO5	Analyze the Deep Learning of various Neural network and its Applications.

UNIT	Contents	No. of Hours
I	Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms- Error correction - Gradient Descent Rules, Perception Learning Algorithm, Perception Convergence Theorem.	12
II	Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.	12
III	.Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception. Limitation of Perception.	12
IV	Multi-Layer Perception Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions,	12

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	Generalized delta learning rule, Back propagation algorithm	
V	Deep learning- Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Neocognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzman Machines, Training of DNN and Applications	12
	Total	**60**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	Students will learn the basics of artificial neural networks with single layer and multi-layer perception networks.	PO1
CO2	Learn about the Error Correction and various learning algorithms and tasks.	PO1, PO2
CO3	Learn the various Perception Learning Algorithm.	PO4, PO5
CO4	Learn about the various Multi-Layer Perception Network.	PO4, PO5, PO6
CO5	Understand the Deep Learning of various Neural network and its Applications.	PO3, PO5

Text Book	
1	Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill- Second Edition.
2.	"Neural Network- A Comprehensive Foundation"- Simon Haykins, Pearson Prentice Hall, 2nd Edition, 1999.
Reference Books	
1.	Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.
Web Resources	
1.	https://www.w3schools.com/ai/ai_neural_networks.asp
2.	https://en.wikipedia.org/wiki/Artificial_neural_network
3.	https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	2	3	2	3	2	2
Weightage of course contributed to each PSO	**14**	**14**	**11**	**15**	**10**	**10**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K6CSSEC8	Quantitative Aptitude	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	To understand the basic concepts of numbers
LO2	Understand and apply the concept of percentage, profit & loss
LO3	To study the basic concepts of time and work, interests
LO4	To learn the concepts of permutation, probability, discounts
LO5	To study about the concepts of data representation, graphs

UNIT	Contents	No. of Hours
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification-Square root and cube roots - Average-problems on Numbers.	6
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chain rule.	6
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surface area -races and Games of skill.	6
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances-Odd man out & Series.	6
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Pie charts-Line graphs.	6

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	Total	60
Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
CO1	understand the concepts, application and the problems of numbers	PO1
CO2	To have basic knowledge and understanding about percentage, profit & loss related processings	PO1, PO2
CO3	To understand the concepts of time and work	PO4, PO6
CO4	Speaks about the concepts of probability, discount	PO4, PO5
CO5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3, PO6
Text Book		
1	"QuantitativeAptitude",R.S.AGGARWAL.,S.Chand&CompanyLtd.,	
Reference Books		
1.		
Web Resources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.toppr.com/guides/quantitative-aptitude/	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	3	2	1	2	2	2
CO2	2	3	1	3	2	2
CO3	1	3	1	1	3	1
CO4	1	2	1	1	3	1
CO5	1	2	1	1	3	3
Weightage of course contributed to each PSO	**8**	**12**	**5**	**8**	**13**	**9**

S-Strong-3 M-Medium-2 L-Low-1

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Allied Course

(Second Allied for B.Sc., Mathematics - Additional Section & SSS)

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3MECCS4:1	Introduction to Data Science	Elective	4	-	-	-	3	4	25	75	100

Learning Objectives	
LO1	To learn about basics of Data Science and Big data.
LO2	To learn about overview and building process of Data Science.
LO3	To learn about various Algorithms in Data Science.
LO4	To learn about Hadoop Framework.
LO5	To learn about case study about Data Science.

UNIT	Contents	No. of Hours
I	**Introduction:** Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	12
II	**The Data science process**: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building.	12
III	**Algorithms**: Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	12
IV	**Introduction to Hadoop** : Hadoop framework – Spark – Replacing MapReduce– NoSQL – ACID – CAP – BASE – types	12
V	**Case Study**: Prediction of Disease - Setting research goals - Data retrieval – Preparation - Exploration - Disease profiling - Presentation and Automation	12
	Total	**60**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the basics in Data Science and Big data.	PO1
CO2	Understand overview and building process in Data Science.	PO1, PO2

CO3	Understand various Algorithms in Data Science.	PO3, PO6
CO4	Understand Hadoop Framework in Data Science.	PO4, PO5
CO5	Case study in Data Science.	PO3, PO5

Text Book

1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016

Reference Books

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

Web Resources

1.	https://www.w3schools.com/datascience/
2.	https://en.wikipedia.org/wiki/Data_science
3.	http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage ofcoursecontributedtoeachPSO	15	14	11	15	11	10

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3MECCS4:2	Robotics and its Applications	Elective	4	-	-	-	3	4	25	75	100

Learning Objectives	
LO1	To understand the robotics fundamentals
LO2	Understand the sensors and matrix methods
LO3	Understand the Localization: Self-localizations and mapping
LO4	To study about the concept of Path Planning, Vision system
LO5	To learn about the concept of robot artificial intelligence

UNIT	Details	No. of Hours
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.	12
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	12
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.	12
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-object recognition-and categorization-depth measurement- image	12

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	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.	12
	Total	**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Describe the different physical forms of robot architectures.	PO1
CO2	Kinematically model simple manipulator and mobile robots.	PO1, PO2
CO3	Mathematically describe a kinematic robot system	PO4, PO6
CO4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.	PO4, PO5, PO6
CO5	Program robotics algorithms related to kinematics, control, optimization, and uncertainty.	PO3, PO8

Text Book	
1	RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001
2	SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011
Reference Books	
1.	Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008
2.	Robotics technology and flexible automation by S.R.Deb, THH-2009
Web Resources	
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm
2.	https://www.geeksforgeeks.org/robotics-introduction/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**15**	**10**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3MECCS5	Big Data Analytics	Elective	4	-	-	-	3	4	25	75	100

Course Objective	
C1	Understand the Big Data Platform and its Use cases, Map Reduce Jobs
C2	To identify and understand the basics of cluster and decision tree
C3	To study about the Association Rules,Recommendation System
C4	To learn about the concept of stream
C5	Understand the concepts of NoSQL Databases

UNIT	Contents	No. of Hours
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value - Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model	12
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.	12
III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding	12

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	Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.	
IV	Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	12
V	NoSQL Databases : Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	12
	Total	**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO5
4	Perform analytics on data streams.	PO3, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO4

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Text Book	
1	AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
Reference Books	
1.	David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013
2.	EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
Web Resources	
1.	https://www.simplilearn.com
2.	https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weightage ofcoursecontributedtoeach PSO	**15**	**14**	**11**	**15**	**15**	**13**

S-Strong-3 M-Medium-2 L-Low-1

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Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3MECCS6:1	CRYPTOGRAPHY	Elect	4	-	-	-	3	4	25	75	100

	Learning Objectives
LO1	To understand the fundamentals of Cryptography
LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
LO3	To understand the various key distribution and management schemes.
LO4	To understand how to deploy encryption techniques to secure data in transit across data networks
LO5	To design security applications in the field of Information technology

UNIT	Contents	No. Of. Hours
I	**Introduction:** The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.	12
II	**Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography	12
III	**Block Cipher and DES:** Block Cipher Principles – DES – The Strength of DES –**RSA:** The RSA algorithm.	12
IV	**Network Security Practices**: IP Security overview - IP Security architecture – Authentication Header. **Web Security**: SecureSocketLayer and Transport Layer Security – Secure Electronic Transaction.	12
V	Intruders – Malicious software – Firewalls.	12
	TOTAL HOURS	60

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	PO1, PO2, PO3, PO4, PO5, PO6

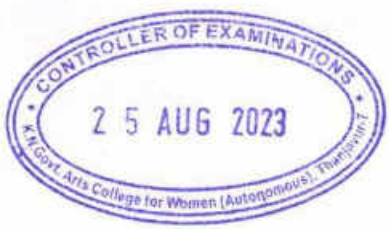
CO3	Apply the different cryptographic operations of public key cryptography	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate different applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand various Security practices and System security standards	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks		
1		**William Stallings,** "Cryptography and Network Security Principles and Practices".
Reference Books		
1.		**Behrouz A. Foruzan,** "Cryptography and Network Security", Tata McGraw-Hill, 2007.
2		**AtulKahate**, *"Cryptography and Network Security"*, Second Edition, 2003,TMH.
3		**M.V. Arun Kumar**, *"Network Security"*, 2011, First Edition,USP.
Web Resources		
1		https://www.tutorialspoint.com/cryptography/
2		https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightageof coursecontributedtoeachPSO	14	13	15	12	14	14

S-Strong-3 M-Medium-2 L-Low-1



Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
23K3MECCS6:2	**Image Processing**	Elective	4	-	-	-	3	4	25	75	100

Learning Objective	
LO1	To learn fundamentals of digital image processing.
LO2	To learn about various 2D Image transformations
LO3	To learn about various image enhancement processing methods and filters
LO4	To learn about various classification of Image segmentation techniques
LO5	To learn about various image compression techniques

UNIT	Content	No. of Hours
I	**Digital Image Fundamentals:** Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis	12
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition	12
III	Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.	12
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.	12
V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,	12
	Total	**60**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	

1	Understand the fundamental concepts of digital image processing.	PO1
2	Understand various 2D Image transformations	PO1, PO2
3	Understand image enhancement processing techniques and filters	PO4, PO6
4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
5	Understand various image compression techniques	PO3, PO5
Text Book		
1	S Jayaraman, S Esakkirajan, T Veerakumar, "Digital image processing",Tata McGraw Hill, 2015	
2	Gonzalez Rafel C, "Digital Image Processing, Pearson Education", 2009	
Reference Books		
1.	1. Jain Anil K , "Fundamentals of digital image processing", PHI,1988	
2.	Kenneth R Castleman , "Digital image processing", Pearson Education,2/e,2003	
3.	Pratt William K , "Digital Image Processing: , John Wiley,4/e,2007	
Web Resources		
1.	https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf	
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf	
3.	https://dl.acm.org/doi/10.5555/559707	
4.	https://www.ijert.org/image-processing-using-web-2-0-2	

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Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**10**	**10**

S-Strong-3 M-Medium-2 L-Low-1

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