PSGR
Krishnammal College for Women
Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

DEPARTMENT OF COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)
&
LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (LOCF)

BACHELOR OF COMPUTER SCIENCE

2023 - 2026 BATCH

Programme Learning Outcomes

After completion of the programme, the student will be able to

PLO1	:	Demonstrate a solid foundation in the discipline of computer science and computer-based problem-solving skills
PLO2	:	Formulate, model, design and solve real world problem by using software tools
PLO3	:	Apply cognitive, design thinking and critical problem-solving skills to establish a productive career in industry, research and academia
PLO4	:	Meet the demands of IT industry with hands-on experience on current technological tools, effective communicative skills and teamwork
PLO5	:	Pursue higher studies / employ themselves either as software professionals or entrepreneurs through their technical competencies

Programme Specific Outcomes

The students at the time of graduation will

PSO1	:	Apply domain knowledge and problem-solving skills to solve real world problems and to work independently on software projects as an effective team member
PSO2	:	Design and develop applications in the area like artificial intelligence and machine learning algorithms, networking, web design, cloud computing, IoT and data analysis

Evaluation Pattern 2023-26 Batch onwards

Examination System

One test for continuous assessment will be conducted on pre-determined dates i.e., commencing on the 50th day from the date of reopening. The Model exam will be conducted after completing 85th working days. Marks for ESE and CA with reference to the maximum for the courses will be as follows

CA Question Paper Pattern and distribution of marks UG

Language and English

Section A 5 x 1 (No choice): 5 Marks

Section B 4 x 5 (4 out of 6): 20 Marks (250 words)

Section C 2 x 10 (2 out of 3): 20 Marks (500 words)

Total: 45 Marks

Core and Allied - (First 3 Units)

CA Question from each unit comprising of

One question with a weightage of 2 Marks: 2 x 3 = 6

One question with a weightage of 5 Marks (Internal Choice at the same CLO level) :5 x 3 =15

One question with a weightage of 8 Marks (Internal Choice at the same CLO level) :8 x 3 =24

Total: 45 Marks

ALC

Section A (Paragraph answer) (4 out of 6) 4 x 4: 16 Marks

Section B (Essay type) 1 out of 2: 9 Marks

Total: 25 Marks

End Semester Examination – Question Paper Pattern and Distribution of Marks

Language and English – UG

Section A 10 x 1 (10 out of 12): 10 Marks

Section B 5 x 5 (5 out of 7): 25 Marks (250 words)

Section A 4 x 10 (4 out of 6): 40 Marks (600 - 700 words)

Total: 75 Marks

Core and Allied courses:

ESE Question Paper Pattern: 5 x 15 = 75 Marks

Question from each unit comprising of

One question with a weightage of 2 Marks: 2 x 5=10

One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 x 5 =25

One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40

ESE Question Paper Pattern :(for Accounts Paper) 5 x 15 = 75 Marks

Question from each unit comprising of

One question with a weightage of 2 Marks: 2 x 5=10

One question with a weightage of 5 Marks: 5 x 5 =25

One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 x 5 =40

End Semester for UG / PG - Advance Learner Courses

Section A 5 questions out of 8 - open choice 5x5: 25 marks

Section B 5 questions out of 8-open choice 5x10: 50 marks

Total: 75 marks

Continuous Internal Assessment Pattern

Theory

I Year UG / PG (23 Batch)

CIA Test: 5 marks **(conducted for 45 marks after 50 days)**

Model Exam: 7 marks **(Conducted for 75 marks after 85 days (Each Unit 15 Marks))**

Seminar/Assignment/Quiz: 5 marks

Class Participation: 5 marks

Attendance: 3 marks

Total: 25 Marks

Practical

Lab Performance: 7 marks

Regularity: 5 marks

Model Exam: 10 marks

Attendance: 3 marks

Total: 25 marks

ESE Practical Pattern

The End Semester Examination will be conducted for a maximum of 75 marks respectively with a maximum 15 marks for the record and other submissions if any.

Project:

Evaluation of Individual / Group Project & Viva Voce for UG & PG

I Review - Selection of the field of study: 5 Marks

Topic & literature collection

II Review - Research Design: 10 Marks

& Data Collection

III Review - Analysis & Conclusion: 10 Marks

Preparation of rough draft

Total: 25 Marks

End semester examination:

Evaluation of the project: 25 Marks

Viva Voce: 50 Marks

Total: 75 Marks

Part IV

Introduction to Entrepreneurship / Women Studies / Value education / Environmental Studies / Design Thinking

Quiz: 50 marks

Assignment: 25marks

Project / Case study: 25 marks

Total: 100 Marks

Professional English

The course offered in alignment with TANSCHE norms with 2 credits.

Quiz (5 x 20 Marks): 100 Marks

Cyber Security I & II

Quiz: 60 Marks

Case Study: 20 Marks

Poster: 20 Marks

BACHELOR OF COMPUTER SCIENCE
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LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2023 – 2026 BATCH
SEMESTER I

Semester	Part	Course Code	Title of Course	Course Type	Instruction Hours / Week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
I	I	TAM2301A/ HIN2301A / FRE2301A	Language I	Language	4	58	2	3	25	75	100	3
I	II	ENG2301A	English Paper I	English	4	58	2	3	25	75	100	3
I	III	CS23C01	Programming in C	CC	4	58	2	3	25	75	100	3
I	III	CS23CP1	C Programming Lab	CC	3	45	-	3	15	35	50	2
I	III	PC22C02	Computational and Algorithmic Thinking for Problem Solving	CC	3	45	-	-	100	-	100	3
I	III	CS23C03	Computer Organization and Architecture	CC	4	58	2	3	25	75	100	3
I	III	TH23A03	Numerical and Statistical Techniques	GE	6	88	2	3	25	75	100	5
I	IV	NME23ES	Introduction to Entrepreneurship/	AEC	2	30	-	-	100	-	100	2
		NME23A1/ NME23B1	Advance Tamil / Basic Tamil			28	2	2				

CC : Core Course
GE : Generic Elective
AEC : Ability Enhancement Course
CA : Continuous Assessment
ESE : End Semester Examination

Course Code	Course Title	Category	L	T	P	Credit
CS23C01	Programming in C	Theory	58	2	-	3

Preamble

This course introduces fundamental programming constructs in C. It covers the concepts such as arrays, functions, structures, pointers and file handling. It provides comprehensive coverage on industry 4.0.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the programming constructs and structure of C programming and Industry 4.0 technologies	K1
CLO2	Understand the purpose of arrays, strings, structures, pointers, and files to solve problems	K2
CLO3	Apply functions to solve problems using procedure-oriented approach	K3
CLO4	Analyze the problems and solve it by applying appropriate logic	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	M	S
CLO3	S	M	S	S	M
CLO4	S	S	S	S	S

S-Strong; M-Medium.

Programming in C - CS23C01 - (58 Hrs)

Unit I **12 Hrs**

Overview of C -Constants, Variables and Data Types - Operators and Expressions - Managing Input and Output Operations - Decision Making and Branching - Decision Making and Looping.

Unit II **12 Hrs**

Arrays: One-Dimensional - Two Dimensional - Multidimensional Arrays. Character Arrays and Strings: Declaring and Initializing String Variables - Reading Strings from Terminal - Writing Strings to Screen - String Handling Functions.

Unit III **12 Hrs**

User-Defined Functions: Need -Return Values and Types - Function Calls - Function Declaration - Category of Functions - No Arguments and No Return Values - Arguments but No Return Values - Arguments with Return Values - Recursion - Scope Visibility and Life Time of Variables. Structure Definition: Structure Initialization - Comparison of Structure Variables - Arrays of Structures - Arrays within Structures.

Unit IV **12 Hrs**

Pointers: Understanding Pointers - Accessing the Address of a Variable - Declaring and Initializing Pointers - Accessing a Variable through its Pointers - Pointers and Arrays - Pointers and Character Strings - Pointers and Functions.

File Management in C: Defining and Opening a File - Closing File - I/O Operations on Files - Error Handling during I/O Operations - Command Line Arguments.

Unit V **10 Hrs**

Introduction to Industry 4.0 - Need - Reasons for Adopting Industry 4.0 - Definition - Goals and Design Principles - Technologies of Industry 4.0- Skills required for Industry 4.0 - Advancements in Industry 4.0 - Impact of Industry 4.0 on Society, Business, Government and People - Introduction to 5.0.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	E. Balagurusamy	Programming In ANSI C	Tata Mc Graw Hill	8th Edition, 2019
2	P.Kaliraj, T. Devi	Higher Education for Industry 4.0 and Transformation to Education 5.0	CRC Press - Taylor & Francis Group	1st Edition, 2021

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Byron Gottfried	Programming with C	Tata McGraw Hill	4th Edition,2018
2	Yashwvant Kanetkar	Let Us C: Authentic Guide To C Programming Language	BPB Publications	17th Edition, 2020

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Dr. K. Padmavathi

Course Code	Course Title	Category	L	T	P	Credit
CS23CP1	C Programming Lab	Practical	-	-	45	2

Preamble

The lab course provides a way to explore the C programming constructs. It enables to experience pointers, structures and file handling techniques through simple programs.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the basic programming in C language	K1
CLO2	Differentiate built-in functions and apply user defined functions to solve problems	K2
CLO3	Demonstrate the concepts of arrays, strings, pointers, structures	K3
CLO4	Design and develop the programs to solve real-world problems	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	S	M	S
CLO3	M	M	S	S	M
CLO4	S	S	M	M	S

S- Strong; M-Medium.

C Programming Lab – CS23CP1 – 45 Hrs

Lis t of Programs

- Exercise using different data types
- Exercise using different operators
- Exercise to implement control structures
- Exercise using loop statements
- Exercise using arrays
- Exercise to explore built-in functions
- Exercise to create user defined function
- Exercise using structures
- Exercise using pointers
- Exercise to work with files

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Mrs. K. Padmavathi

Course Code	Course Title	Category	L	T	P	Credit
PC22C02	Computational and Algorithmic Thinking for Problem Solving	Theory	45	-	-	3

Preamble

This course aims to kindle the young minds to think like a computer scientist, with the idea thatComputing, and computers will enable the spread of computational thinking. Computational thinking is thinking recursively, reformulating a seemingly difficult problem into one which we know how to solve and taking an approach to solving problems, designing systems, and understanding human behaviour that draws on concepts fundamental to computer science.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Define the basic principles of logical reasoning, problem solving in computational thinking	K1
CLO2	Understanding the applications of propositional logic, problem representation and techniques	K2
CLO3	Apply algorithmic thinking to problem solving using tools	K3
CLO4	Apply and analyze to solve domain specific problems using computational thinking concepts	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	M	S	S	S	S
CLO2	S	S	S	M	S
CLO3	S	M	S	S	S
CLO4	S	S	M	S	S

S-Strong; M-Medium.

Computational and Algorithmic Thinking for Problem Solving - PC22C02 - (45 Hrs)

Unit I **7 Hrs**

Basics: Introduction to Computational Thinking - Data Logic - History of Computational Thinking-Applications of Computational Thinking.

Unit II **8 Hrs**

Data- Information and Data - Data Encoding - Logic - Boolean logic - Applications of simple Propositional Logic. Tool: Flowgorithm and Scratch.

Unit III **10 Hrs**

Problem Solving and Algorithmic Thinking: Problem definition- Logical reasoning- Problem decomposition- Abstraction- Problem representation via Algorithmic thinking: Name binding-

Selection-Repetition and Control Abstraction - Simple Algorithms - Comparison of performance of Algorithms.

Unit IV **8 Hrs**

Activities in Class: Sudoku-Towers of Hanoi- Graph Coloring-Geographical Map reading- Poem reading-Novel reading- Data analysis on news.

Unit V **12 Hrs**

Problem Solving Techniques- Factoring and Recursion Techniques- Greedy Techniques-Divide and Conquer- Search and SortAlgorithms- Text Processing and Pattern matching. Tool: iPython

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	David Riley and Kenny Hunt	Computational Thinking for Modern Solver	Chapman & Hall/CRC	2014
2	Paolo Ferragina, FabrizioLuccio	Computational Thinking First Algorithms	Springer	2018
3	Karl Beecher	Computational Thinking - A beginner's guide to problem solving	BSC publication	2017

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Mrs. S. Kavitha

Evaluation Pattern

Assessment	Number	Marks
Quiz (online or offline)	5	50
Class Activity	5	25
Group Project (Domain Specific)	1	25
Total		100

Course Code	Course Title	Category	L	T	P	Credit
CS23C03	**Computer Organization and Architecture**	**Theory**	**58**	**2**	**-**	3

Preamble

This course provides the principles and practices of digital electronics and computer system. It covers data transfer techniques, computer arithmetic operations, I/O and memory organization.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand number systems, conversions, boolean algebra and karnaugh map	K1
CLO2	Differentiate the functioning of flip-flops, multiplexer and decoder	K2
CLO3	Illustrate the concepts of register transfer, micro-operation, arithmetic operations, addressing modes and instruction format	K3
CLO4	Analyze various I/O and memory organizations	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	S	S	M
CLO3	S	M	S	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

Computer Organization and Architecture - CS23C03 - (58 Hrs)

Unit I **12 Hrs**

Data Representation: Data Types - Number Systems: Octal & Hexadecimal Numbers, Decimal Representation, Alphanumeric Representation. Logic Circuits: Gates - AND, OR, NOT, NAND, NOR Gates and Truth Tables - Boolean Algebra.

Unit II **12 Hrs**

Flip Flops: SR, JK, D, T Flip Flops. Karnaugh Maps - Product of Sums Method - Sum of Products Method- Don't Care Condition - Decoders-Multiplexer -Demultiplexer.

Unit III **11 Hrs**

Register Transfer and Micro Operations: Register Transfer Language - Register Transfer-Bus and Memory Transfers - Arithmetic Micro Operations-Logic Micro Operations - Shift Micro Operation. Instruction Format: Three Address Instruction-Two Address Instruction-One Address Instruction-Zero Address Instruction.

Unit IV **12 Hrs**

Input / Output Organization: Input Output Interface - Asynchronous Data Transfer - DMA. Memory Organization: Memory Hierarchy - Main Memory - Cache Memory - Virtual Memory.

Unit V **11 Hrs**

Case study: 32bit /64bit processor architecture, Next generation computer architecture: Introduction to Graphics Processing Units (GPU) -CPU and GPU difference - Quantum Computers – Neuromorphic chips.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	M Morris Mano	Computer System Architecture	Pearson Education	3rd Edition, 2017
2	Jim Ledin	Modern Computer Architecture and Organization: Learn x86, ARM, and RISC-V architectures and the design of smartphones, PCs, and cloud servers	Packt Publishing Limited	1st Edition, 2020

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Yale N. Patt& Sanjay Patel	Introduction to Computing Systems: From Bits and Gates to C and Beyond	McGraw-Hill Education	3rd Edition, 2019
2	John .L. Hennessy	Computer Architecture - A Quantitative approach	Elsevier	6thEdition, 2018
3	William Stallings	Computer Organization & Architecture	Pearson Education	11th Edition,2022

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Mrs. M. Dhivya

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SYLLABUS & SCHEME OF EXAMINATION
2023 – 2026 BATCH
SEMESTER II

Semester	Part	Course Code	Title of the Course	Course Type	Instruction Hours / Week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
II	I	TAM2302A/ HIN2302A / FRE2302A	Language II	Language	4	58	2	3	25	75	100	3
II	II	ENG2302A	English Paper II	English	4	58	2	3	25	75	100	3
II	III	CS23C03	Java Programming	CC	5	73	2	3	25	75	100	3
II	III	CS23CP2	Java Programming Lab	CC	5	75	-	3	15	35	50	3
II	III	CS23C04	Data Structures	CC	4	58	2	3	25	75	100	3
II	III	TH23A06	Discrete Mathematics	GE	6	88	2	3	25	75	100	5
II	IV		Open Course (Self-Study - Online)	AEC	-	-	-	-	-	-	-	Grade
		NME23A2/ NME23B2	** Advanced Tamil / Basic Tamil	AEC	-	-	-	-	-	-	-	Grade
II	V	23PEPS1	Professional English for Physical Sciences	AEC	2	25	5	2	100	-	100	2
II	VI	NM12GAW	General Awareness	AEC	Self-Study	-	-	OT	100	-	-	Grade

CC : Core Course
GE : Generic Elective
AEC : Ability Enhancement Course
OT : Online Test
CA : Continuous Assessment
ESE : End Semester Examination

Course Number	Course Name	Category	L	T	P	Credit
CS23C03	Java Programming	Theory	73	2	-	3

Preamble

The course introduces object-oriented programming concepts and it covers arrays, strings, threads, interfaces, files and exceptions. It introduces collection framework and database connectivity.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the object-oriented concepts, programming constructs in Java	K1
CLO2	Understand the usage of various packages, classes and collections in Java to solve problems	K2
CLO3	Apply Java APIs to solve problems using object-oriented approach	K3
CLO4	Analyze the problems and solve it by applying appropriate logic using Java language	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	S	M	S
CLO3	M	M	S	M	S
CLO4	S	S	S	M	S

S- Strong; M-Medium.

Java Programming - CS23C03 - (73 Hrs)

Unit I **14 Hrs**

Introduction to Java - Naming conventions and data types - Literals - Operators in Java -Control statements in Java -Classes and objects- Instance variables, *set* Methods and *get* methods - Initializing objects with constructors.

Unit II **15 Hrs**

Arrays - String, StringBuffer and StringBuilder Class - Inheritance: Inheritance - super keyword - Protected Specifier - Types of Inheritance - Polymorphism - Type Casting - Abstract Classes.

Unit III **14 Hrs**

Interface: Interface -Multiple Inheritance using Interfaces - Abstract Classes Vs Interfaces. Packages: Package - Different Type of Package - JAR files -Creating Sub-Package - Exception Handling - Wrapper Classes- Streams and Files -Threads.

Unit IV **15 Hrs**

Collection Framework: Collection Objects -Retrieving Elements From Collections – Hash Set- Linked List- Array List- Vector –Hash Map-Hash table- Arrays - String Tokenizer - Calendar - Date Class.

Unit V **15 Hrs**

Java Database Connectivity: Database Server - Database Clients - JDBC - Working with Oracle DB - Registering the Driver - Connecting to a Database - Preparing SQL Statements - Using JDBC- ODBC Bridge Driver to Connect to Oracle Database - Types of ResultSets.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	R.Nageswara Rao	Core Java - An Integrated Approach	Dream Tech	2016
2	Paul Deitel and Harvey Deitel	Java How to Program	PHI Learning Pvt Ltd	2017

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Herbert Schildt	Java: The complete Reference	McGraw Hill Professional	2017
2	Robert Sedgewick& Kevin Wayne	Introduction to Programming in Java	Addison Wesley	2017
3	Y. Daniel Liang	Introduction to Java Programming	Pearson Education	2017

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Dr. S. Karpagavalli
- Mrs. M. Sowmya

Course Code	Course Title	Category	L	T	P	Credit
CS23CP2	Java Programming Lab	Practical	-	-	75	3

Preamble

The lab course is intended to explore object-oriented concepts using the Java programming language. It enables students to perform data manipulation operations, establish database connectivity, and analyze data using appropriate tools.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the object-oriented concepts through java programming constructs	K2
CLO2	Demonstrate principle of inheritance, interface, file and exception handling	K3
CLO3	Implement data structures using Java collection framework	K3
CLO4	Construct database connectivity applications	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	S	M	S
CLO3	M	M	S	M	S
CLO4	S	S	S	M	S

S- Strong; M-Medium.

Java Programming Lab - CS23CP2 - (75 Hrs)

List of Programs

- Exercises using classes and objects
- Exercises using a string
- Exercises using inheritance
- Exercises using interfaces
- Exercises using packages
- Exercises to implement built-in and user defined exception handling
- Exercises using streams and files
- Exercises using collection framework - Stack class
- Exercises using collection framework – Linked List and Array List
- Exercises using collection framework - HashMap and Hashtable
- Exercises using collection framework - Date and Calendar class
- Exercises using JDBC

Pedagogy

- Demonstration of working environment / Tools / Software / Programs

Course Designers

- Dr. S. Karpagavalli
- Mrs. M. Sowmya

Course Code	Course Title	Category	L	T	P	Credit
CS23C04	Data Structures	Theory	58	2	-	3

Preamble

This course covers the basic concepts, terminologies in data structure. It provides knowledge on data representation, storage and retrieval in various data structures as well as sorting and searching techniques.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic data structures and data representations	K1
CLO2	Understand different data structures, operations and applications	K2
CLO3	Apply specific data structures like stack, queue, linked list, trees, and graph to solve problems	K3
CLO4	Analyze and evaluate the use of data structures in computerized problem solving	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	M	S	S	S	S
CLO2	S	S	S	M	S
CLO3	M	S	S	M	S
CLO4	S	M	S	M	M

S-Strong; M-Medium.

Data Structures- CS23C04 - (58 Hrs)

Unit I **12 Hrs**

Introduction and Overview: Introduction - Basic Terminology; Elementary Data Organization - Data structures - Data structure operations - Algorithms: Complexity, Time- Space Trade-off. Preliminaries: Algorithmic Notation - Control Structures- Variables, Data Types. Arrays, Records and Pointers: Introduction - Linear Arrays – Operations in Linear Arrays.

Unit II **12 Hrs**

Stack, Queues, Recursion: Introduction -Stacks - Array Representation of Stacks - Linked Representation of Stacks - Arithmetic Expressions - Polish Notation - Recursion- Towers of Hanoi - Implementation of Recursive Procedures by Stacks -Queues - Linked Representation of Queues – Circular Queue - Dequeue – Priority Queue.

Unit III **11 Hrs**

Linked Lists: Introduction - Linked Lists - Representation of Linked Lists in Memory- Traversing a Linked List - Memory Allocation-Garbage Collection–Insertion in Linked List- Deletion from a Linked List - Header LinkedLists– Circular Linked List.

Unit IV **12 Hrs**

Trees: Introduction - Binary Trees - Representing Binary Trees in Memory - traversing binary trees - AVL Tree - B Tree - Graphs: Terminology and Representations- Sequential Representation of Graphs- Adjacency Matrix, PathMatrix – Graph Traversal – Shortest Path Problems - Spanning Trees.

Unit V **11 Hrs**

Sorting and Searching: Introduction - Sorting - Insertion Sort - Selection Sort - Merging - Merge Sort - Radix Sort -Bubble Sort-Quick Sort. Searching and Data Modification – Hashing - Linear Search - BinarySearch.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Seymour Lipschutz	Data Structures	Tata Mc-Graw Hill	5th Edition, 2014

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Ellis Horowitz SartajSahni	Fundamentals of Data Structures	Galgotia Book House	2014
2	Harry Hariom Choudhary	Data Structures	Create Space Independent Publishing Platform	2014
3	Rajdev Tiwari and Nagesh Sharma	Design and Analysis of Algorithms	Pearson Education	2014

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Dr. J. Viji Gripsy

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SYLLABUS & SCHEME OF EXAMINATION
2023 – 2026 BATCH
SEMESTER III

Semester	Part	Course Code	Title of the Course	Course Type	Instruction hours / week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
III	I	TAM2303A/ HIN2303A / FRE2303A	Language III - T / H / F	L	4	58	2	3	25	75	100	3
III	II	ENG2303A	English Paper III	E	4	58	2	3	25	75	100	3
III	III	CS23C06	Operating System	CC	4	58	2	3	25	75	100	3
III	III	CS23C07	Computer Networks	CC	4	58	2	3	25	75	100	3
III / IV	III	CS23SCE1 / CS23SBA1	Robotic Process Automation / Gen - AI	SEC	3	45 /44	-/1	-	100	-	100	3
III	III	TH23A13	Optimization Techniques	GE	4	58	2	3	25	75	100	3
III	III	CS23CP3	DBMS Lab	CC	5	75	-	3	15*	35*	50	4
III	IV	NM23DTG	Design Thinking	FSPA	2	30	-	-	100	-	100	2
III	IV	NM22EVS	Environmental Studies (Self Study)	AEC	-	-	-	-	100	-	100	Grade
I - V	VI	16BONL1 16BONL2	Online Course - I Online Course – II	-	-	-	-	-	-	-	-	-
III & IV	IV		Amazon Web services/ Cisco Certified Network Associate/ Microsoft windows server administration/ Microsoft Power BI	-	-	-	-	-	-	-	-	-

*CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

CC : Core Course
GE : Generic Elective
AEC : Ability Enhancement Course
CA : Continuous Assessment
ESE : End Semester Examination
FSPA : Finishing School Part A
SEC : Skill Enhancement Course

Course Code	Course Title	Category	L	T	P	Credit
CS23C06	Operating System	Theory	58	2	-	3

Preamble

This course provides the basic operating system functionalities. The course covers deadlock, storage management, file system, and I/O systems. It also introduces Linux commands and shell programming.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamental operating system abstractions such as processes, resources, threads, semaphores, memory files and Linux operating system	K1
CLO2	Understand the basic functionality of operating system like process, resource, memory, disk management	K2
CLO3	Apply the various operating system algorithms and techniques in solving problems	K3
CLO4	Analyse the abstractions of operating system in solving problems	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	M	S
CLO2	S	S	M	M	S
CLO3	S	S	S		M
CLO4	S	S	S	S	M

S- Strong; M-Medium.

Operating System- CS23C06 - (58 Hrs)

Unit I **12 Hrs**

Introduction: Operating Systems - Operating-System Structure -Operating System operations. Operating System Structures: Operating System Services - User and Operating System Interface - System Calls - System Programs - Operating System Design and Implementation - Operating System Generation.

Unit II **12 Hrs**

Process Management: Process Concept - Process Scheduling - Operations on Processes. Threads: Overview - Multicore Programming - Multithreading Models. Process Synchronization: Synchronization Hardware - Mutex Locks - Semaphores. CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms.

Unit III **12 Hrs**

Deadlock: System Model - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock.

Storage Management: Overview of Mass Storage Structure -Disk Structure - Disk Attachment - Disk Scheduling - Disk Management.

Unit IV **12 Hrs**

File System Interface: File Concept- Access Methods -Directory and Disk Structure- File-System Mounting - File Sharing - Protection. I/O Systems: Overview- I/O Hardware - Application I/O Interface- Kernel I/O Subsystem.

Unit V **10 Hrs**

Linux System: Introduction - Programming Linux. Shell Programming: Shell Introduction - Pipes and Redirection – The Shell as a Programming Languages- Shell Syntax - Working with Files: Linux File Structure -The Standard i/o Library - Formatted Input Output - File and Directory Maintenance.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Abraham G Silberschatz	Operating System	Wiley Publisher	2017, 10th Edition
2	Richard Stones, Neil Matthew	Beginning: Linux Programming	Wiley Publisher	2007, 4th Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Andrew .S. Tannenbaum	Modern operating System	Pearson Education	2014, 1st Edition
2	Abraham Silberschatz, Peter B. Galvin, Greg Gane	Operating System Concepts	Wiley Global Education	2012, 9th Edition
3	Mark G. Sobell	A Practical Guide to Linux commands, Editors, and Shell Programming	Addison Wesley	2011, 2nd Edition

Note

- Blended mode topics are highlighted. Links will be provided.

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Mrs. M. Dhivya

Course Code	Course Title	Category	L	T	P	Credit
CS23C07	Computer Networks	Theory	58	2	-	3

Preamble

The course is designed to provide in depth knowledge of the various network types, protocols, components, security and basics of data communication.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic network terminologies, hardware, architectures and security	K1
CLO2	Understand various reference models, protocols, functioning of layers and cryptography algorithms	K2
CLO3	Apply the network concepts in problem solving	K3
CLO4	Analyze the characteristics of networks, routing protocols and security techniques	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	M	M
CLO2	S	S	M	M	S
CLO3	S	S	M	M	S
CLO4	S	S	M	M	S

S- Strong; M-Medium.

Computer Networks -CS23C07 - (58 Hrs)

Unit I **12 Hrs**

Data Communications: Components- data representation- Dataflow Networks: Distributed processing-network criteria -physical structures -network models-categories of networks- Interconnection of Networks: Internetwork- Protocols and Standards: protocols – standards -internet standards the OSI model- layers in the OSI model-TCP/IP protocol suite.

Unit II **12 Hrs**

Guided Media: Twisted-pair cable-coaxial cable - fibre-optic cable- unguided media: - Telephone Network: Major components - Latas -signalling services provided by telephone networks dial-up modems: Modem standards digital subscriber line- cable TV networks. Wireless LANS: Bluetooth- connecting devices.

Unit III **11 Hrs**

Data Link Layer: Introduction- block coding-framing- flow and error control- protocols- noiseless channels- noisy channels. Network Layer: IPV4 addresses- IPV6 addresses- delivery-forwarding- unicast routing protocols.

Unit IV **11 Hrs**

Transport layer: Process-to-Process delivery- user datagram protocol - TCP- congestion control and quality a TCP connection- congestion control - quality of service.

Unit V **12 Hrs**

Application Layer: Name space- domain name space- distribution of name space- DNS in the internet- resolution- remote logging - cryptography: Introduction- symmetric-key cryptography- asymmetric-key cryptography.

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Behrouz A Forouzan	Data communications and networking	Tata McGraw Hill	2017, 4th Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Robert Orfali, Dan Harkey, Jerry Edwards	Client/Server Survival Guide	John Wiley & sons	2008, 3rd Edition
2	Larry L Peterson, Bruce S Davie	Computer Networks - A systems approach	Elsevier Press	2012, 5th Edition
3	Andrew S Tanenbaum	Computer Networks	Pearson education	2011, 5th Edition
4	William Stallings	Data and Computer Communications	Prentice Hall of India Private Limited, New Delhi	2011, 8th Edition

Pedagogy

- Lecture, Demonstration, Case Studies

Course Designer

- Mrs. S. Kavitha

Course Code	Course Title	Category	L	T	P	Credit
CS23SCE1	**Robotic Process Automation**	**Theory**	**-**	**-**	**-**	**3**

Course Contents **(45 Hrs)**

- RPA Basics and Introduction to UiPath (6 Hrs)
- Data Manipulation in RPA (9 Hrs)
- UI Automation and Selectors (8 Hrs)
- Control Flow in RPA (7 Hrs)
- Automation Techniques in RPA (9 Hrs)
- UiPath Orchestrator and Capstone Projects (6 Hrs)

Course Code	Course Title	Category	L	T	P	Credit
CS23SBA1	SBS I - Gen-AI	Theory	44	1	-	3

Preamble

The objective of this course is to understand the breadth and depth of Generative Artificial Intelligence (Gen AI) and to impart knowledge on its ethical implications, practical applications, and emerging trends.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the fundamental concepts and ethical considerations of Generative AI.	K2
CLO2	Apply AI principles in practical settings using basic AI tools and platforms	K3
CLO3	Develop advanced skills in specialized AI applications such as text analysis, natural language processing, and image recognition.	K3
CLO4	Explore emerging trends in AI, integrating advanced AI tools into diverse professional practices.	K4

Mapping with Programme Outcomes

CLOs	PO1	PO2	PO3	PO4	PO5
CLO1	S	S	S	S	M
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	M	S	M	S

S- Strong; M-Medium.

SBS I: Gen-AI - CS23SBA1 - (45 Hrs)

Unit 1: Introduction to Gen AI (9 hours)

Understanding Gen AI: Definition and scope of Gen AI - Overview of its applications in various fields - Introduction to essential skills needed for Gen AI. Ethical Considerations: Discussion on ethical guidelines and responsible use of AI - Understanding the impact of AI on society and individuals.

Hands-on Activity: Exploring AI Tools

- Working with appropriate content creation Gen-AI tools to engage with ChatGPT to explore various subjects, simulate interviews, or create imaginative written content.
- Working with appropriate writing and rephrasing Gen-AI tools to drafting essays on designated topics and refining the content with improved clarity, coherence, and correctness.

Unit 2: Basic AI Concepts (8 hours)

Introduction to AI: Basic concepts and terminology of artificial intelligence - Examples of AI in everyday life - Real-world examples of AI applications in different domains. Machine Learning Basics: Understanding the principles of machine learning - Overview of supervised and unsupervised learning.

Hands-on Activity: Simple AI Projects

- Working with appropriate educational content creation Gen-AI tools to generate quizzes and flashcards based on classroom material.
- Working with appropriate language learning Gen-AI tools to practice and enhance language skills through interactive exercises and games across multiple languages.

Unit 3: AI in Practice (9 hours)

Text Analysis and Natural Language Processing (NLP): Introduction to NLP concepts and techniques - Hands-on exercises analyzing text data and extracting insights. Image Recognition and Processing: Basics of image recognition algorithms and techniques - AI Tools for Text and Image Processing

Hands-on Activity: Text and Image Projects

- Working with appropriate image processing Gen-AI tools to experiment with AI-generated images.
- Working with appropriate object recognition Gen-AI tools to identify various objects such as text, images, products, plants, animals, artworks, barcodes, and QR codes.

Unit 4: AI for Productivity and Creativity (9 hours)

AI-enhanced Productivity and creativity Tools: Overview of productivity and creativity tools enhanced with AI capabilities - Tips for integrating AI into daily tasks and workflows. AI and Jobs: Exploring how AI impacts jobs and industries - Discussion on opportunities and challenges - Exploration of AI-powered creative tools and applications.

Hands-on Activity: Productivity and Creativity

- Working with appropriate content creation Gen-AI tools to generate interactive videos / blog posts / art / drawing / music and storytelling experience.
- Working with appropriate resume generation Gen-AI tools to create professional resumes efficiently.

Unit 5: Future of Gen AI and Final Project (9 hours)

Emerging Trends in Gen AI - Applications of Generative AI - Ethical and Societal Impact of Gen AI - Future Directions and Challenges - Case Studies in Generative AI.

Hands-on Activity: Trends in Gen AI

- Working with appropriate speech generation Gen-AI tools to customize synthetic speech for virtual assistance across different applications.
- Working with appropriate data analysis Gen-AI tools to perform data analysis, visualization, and predictive modeling tasks.
- Working with appropriate Gen-AI design tools to simplify the creation of visually appealing presentations.
- Working with appropriate website builder Gen-AI tools to develop professional websites with AI assistance.

Pedagogy

Demonstration of AI Tools, Lectures and Case studies.

Course Designer

Mrs. S. Ponmalar

Evaluation pattern for Gen-AI

Quiz	: 50 Marks (5 quizzes with each 10 marks)
Case study	: 25 Marks
Online Exam	: 25 Marks (Departments to plan and conduct the exam)
Total	: **100 Marks**

Course Code	Course Title	Category	L	T	P	Credit
CS23CP3	DBMS Lab	Practical	-	-	75	4

Preamble

The lab course provides a way to explore storing and accessing data in database through query languages and PL/SQL programming language. It enables to give systematic database design approaches and project-oriented learning through real time applications.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand basic SQL query statements	K2
CLO2	Gain knowledge on various constraints	K2
CLO3	Apply functions, packages, views, joins and Exception handling on data	K3
CLO4	Demonstrate PL/SQL programming on real time applications	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	M	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	M

S - Strong; M - Medium.

DBMS Lab - CS23CP3 - (75 Hrs)

List of Programs

- Exercise using different data types and operators
- Exercise to implement database schema using constraints
- Exercise to implement queries using DDL and DML
- Exercise to implement built-in functions
- Exercise to implement views
- Exercise to implement PL/SQL basics
- Exercise to implement PL/SQL table and record
- Exercise to implement joins
- Exercise using Functions
- Exercise using Packages

- Exercise using Cursors
- Exercise using Triggers
- Exercise using Exception Handling

Pedagogy

- Demonstration of working environment/Tools/Software/Program

Course Designer

- Mrs. J. Gayathri
- Mrs. M. Dhivya

JOB ORIENTED COURSE

Title : Amazon Web Services

Duration : 60 Hrs

Introduction to Cloud Computing: Overview of Cloud Computing - Types of Cloud Computing - Advantages of Cloud Computing - Characteristics of Cloud Computing – Cloud Computing Terminology - Overview of Amazon Web Services (AWS) AWS Architecture Fundamentals - AWS Global Infrastructure - AWS Regions and Availability Zones – AWS Services Overview -AWS Management Console

Compute Services: Amazon Elastic Compute Cloud (EC2)-Amazon Elastic Container Service (ECS) - Amazon Elastic Load Balancing (ELB) -Auto Scaling Amazon Lightsail - AWS Lambda **Storage Services**: Amazon Simple Storage Service (S3) – Amazon Elastic Block Storage (EBS) - Amazon Glacier - Amazon Elastic File System (EFS) – Amazon Storage Gateway

Networking Services: Amazon Virtual Private Cloud (VPC)- Amazon Direct Connect-AWS Elastic Load Balancing (ELB)-Amazon Route53- Amazon Cloud Front- AWS Web Application Firewall (WAF) **Database Services:** Amazon Relational Database Service (RDS) –Amazon DynamoDB -Amazon Redshift –Amazon Aurora

Security & Identity Services: Amazon Identity and Access Management (IAM) -Amazon Cognito -AWS Certificate Manager -AWS Key Management Service (KMS) – Amazon Cloud HSM AWS Shield Management & Developer Tools- AWS Cloud Formation – AWS Cloud Trail-AWS Command Line Interface (CLI)-AWS Systems Manager-AWS Code Commit - AWS Code Build - AWS Code Deploy - AWS Code Pipeline Amazon Kinesis – Amazon EMR –Amazon Athena -Amazon Redshift- Amazon Quick Sight

Analytics Services: Application Services: Amazon Simple Queue Service (SQS) –Amazon Simple Notification Service (SNS)-Amazon Simple Workflow Service (SWF)-Amazon API Gateway - Amazon MQ - Amazon AppStream 2.0 **AWS Best Practices:** Cost Optimization - Security - Performance & Scalability - High Availability & Disaster Recovery –Operational Excellence -Automation & Continuous Delivery-Monitoring& Logging.

Title : Cisco Certified Network Associate
Duration : 60 Hrs

Network Devices - Routers - Layer 2 and Layer 3 switches - Next-generation firewalls and IPS - Access points - Controllers (Cisco DNA Center and WLC) – Endpoints –Servers – PoE - Network Topologies – Cablings – Connections and it types – Communication Protocols – Casting – Wireless Principles – Frames and Switching – MAC Tables.

Configuring VLAN – CDP and LLDP – LACP – Rapid PVST – Spanning Tree protocols – Port Forward and Block – Wireless Architectures and AP Modes - WLC, access/trunk ports, and LAG - Telnet, SSH, HTTP, HTTPS, console, and TACACS+/RADIUS –IP Connectivity - Components of routing table - Routing protocol metric - Configure

IPv4 and IPv6 static routing - Configure single area OSPFv2 - Concepts of first hop redundancy protocols -NAT using static and pools - NTP operating in a client and server mode – Configure DHCP & DNS - SNMP - Syslog - Configure and verify DHCP client and relay - per-hop behavior (PHB) - Remote access using SSH - TFTP/FTP in the network

Concepts of Security threats, vulnerabilities, exploits, and mitigation - security program elements - Configure and verify device access control using local passwords - security password policies elements - IPsec remote access and site-to-site VPNs - Configure and verify access control lists - Configure and verify Layer 2 security features DHCP snooping, dynamic ARP inspection, and port security - wireless security protocols WPA, WPA2, and WPA3 - Configure and verify WLAN within the GUI using WPA2 PSK

Automation and Programmability - Control plane and Data plane - Northbound and Southbound APIs - REST-based APIs (CRUD, HTTP verbs, and data encoding) - Puppet, Chef, and Ansible - Recognize components of JSON-encoded data

Title : Microsoft Windows Server Administration

Duration : 60 Hours

Manage Microsoft Entra users and groups - Create users and groups -Manage user and group properties -Manage licenses in Microsoft Entra ID -Manage external users -Configure self-service password reset (SSPR) -Manage access to Azure resources -Manage built-in Azure roles -Assign roles at different scopes - Interpret access assignments

Manage Azure subscriptions and governance: Implement and manage Azure Policy - Configure resource locks - Apply and manage tags on resources -Manage resource groups - Manage subscriptions -Manage costs by using alerts, budgets, and Azure Advisor recommendations -Configure management groups -Implement and manage storage (15–20%) - Configure access to storage -Configure Azure Storage firewalls and virtual networks - Create and use shared access signature (SAS) tokens -Configure stored access policies -Manage access keys -Configure identity-based access for Azure Files

Configure and manage storage accounts: Create and configure storage accounts -Configure Azure Storage redundancy -Configure object replication -Configure storage account encryption -Manage data by using Azure Storage Explorer and AzCopy - Configure Azure Files and Azure Blob Storage -Create and configure a file share in Azure Storage -Create and configure a container in Blob – Storage - Configure storage tiers - Configure snapshots and soft delete for Azure Files - Configure blob lifecycle management - Configure blob versioning

Automate deployment of resources by using Azure Resource Manager (ARM) templates or Bicep files: Interpret an Azure Resource Manager template or a Bicep file - Modify an existing Azure Resource Manager template - Modify an existing Bicep file - Deploy resources by using an Azure Resource Manager template or a Bicep file - Export a deployment as an Azure Resource Manager template or convert an Azure Resource Manager template to a Bicep file

Create and configure virtual machines: Create a virtual machine - Configure Azure Disk Encryption - Move a virtual machine to another resource group, subscription, or region - Manage virtual machine sizes - Manage virtual machine disks - Deploy virtual machines to availability zones and availability sets - Deploy and configure an Azure Virtual Machine Scale Sets

Provision and manage containers in the Azure portal: Create and manage an Azure container registry - Provision a container by using Azure Container Instances - Provision a container by using Azure Container Apps - Manage sizing and scaling for containers, including Azure Container Instances and Azure Container Apps

Create and configure Azure App Service: Provision an App Service plan - Configure scaling for an App Service plan - Create an App Service - Configure certificates and Transport Layer Security (TLS) for an App Service - Map an existing custom DNS name to an App Service - Configure backup for an App Service - Configure networking settings for an App Service -

Configure deployment slots for an App Service - Implement and manage virtual networking (15–20%)

Configure and manage virtual networks in Azure: Create and configure virtual networks and subnets - Create and configure virtual network peering - Configure public IP addresses - Configure user-defined network routes - Troubleshoot network connectivity

Configure secure access to virtual networks: Create and configure network security groups (NSGs) and application security groups - Evaluate effective security rules in NSGs - Implement Azure Bastion - Configure service endpoints for Azure platform as a service (PaaS) - Configure private endpoints for Azure PaaS

Configure name resolution and load balancing: Configure Azure DNS - Configure an internal or public load balancer - Troubleshoot load balancing - Monitor and maintain Azure resources (10–15%)

Monitor resources in Azure: Interpret metrics in Azure Monitor - Configure log settings in Azure Monitor - Query and analyze logs in Azure Monitor - Set up alert rules, action groups, and alert processing rules in Azure Monitor -Configure and interpret monitoring of virtual machines, storage accounts, and networks by using Azure Monitor Insights - Use Azure Network Watcher and Connection Monitor

Implement backup and recovery: Create a Recovery Services vault -Create an Azure Backup vault -Create and configure a backup policy -Perform backup and restore operations by using Azure Backup - Configure Azure Site Recovery for Azure resources - Perform a failover to a secondary region by using Site Recovery - Configure and interpret reports and alerts for backups

Provision and manage containers in the Azure portal: Create and manage an Azure container registry - Provision a container by using Azure Container Instances - Provision a container by using Azure Container Apps -Manage sizing and scaling for containers, including Azure Container Instances and Azure Container Apps

Create and configure Azure App Service: Provision an App Service plan -Configure scaling for an App Service plan -Create an App Service -Configure certificates and Transport Layer Security (TLS) for an App Service -Map an existing custom DNS name to an App Service - Configure backup for an App Service - Configure networking settings for an App Service - Configure deployment slots for an App Service

Monitor resources in Azure: Interpret metrics in Azure Monitor - Configure log settings in Azure Monitor -Query and analyze logs in Azure Monitor -Set up alert rules, action groups, and alert processing rules in Azure Monitor - Configure and interpret monitoring of virtual machines, storage accounts, and networks by using Azure Monitor Insights -Use Azure Network Watcher and Connection Monitor

Configure and manage virtual networks in Azure: Create and configure virtual networks and subnets - Create and configure virtual network peering -Configure public IP addresses -Configure user-defined network routes -Troubleshoot network connectivity

Implement backup and recovery: Create a Recovery Services vault -Create an Azure Backup vault -Create and configure a backup policy -Perform backup and restore operations by using Azure Backup -Configure Azure Site Recovery for Azure resources -Perform a failover to a secondary region by using Site Recovery -Configure and interpret reports and alerts for backups

Title : Microsoft Power BI

Duration : 60 Hrs

Introduction to Power BI and Data Analysis: Introduction to Power BI: Overview of Power BI features and capabilities- Importance of data visualization in decision-making - Fundamentals of Data Analysis - Roles in Data Analysis - Tasks of a Data Analyst: Data collection, cleaning, and transformation - Creation of meaningful visualizations and reports - Extracting actionable insights from data. CRISP DM FRAMEWORK. Using Power BI - Building Blocks of Power BI- Understanding Power BI Desktop and Power BI Service - Differentiating between datasets, reports, and dashboards Collaborative aspects of Power BI, including sharing and collaboration.

Data Cleaning and Transformation in Power BI : Data Acquisition in Power BI - Importing data from various sources - Data transformation and cleaning techniques - Connecting Power BI to relational databases - Importing and querying data from SQL Server and other relational databases.

Data Modelling and DAX Functions: Creating Calculated Columns - Understanding the need for calculated columns - Hands-on exercises on creating and using calculated columns - Exploring Time-Based Data - Handling date and time data in Power BI - Time-based calculations and analysis. DAX Calculations in Data Analysis - Guidelines for choosing and implementing DAX calculations - Practical applications and examples. Star Schema Design - Understanding star schema and its advantages - Implementing star schema in Power BI data models.

Data Visualization in Power BI: Writing DAX Formulas - In-depth exploration of DAX syntax and functions - Advanced DAX calculations for complex data analysis. Designing Detailed Reports - Advanced report design techniques - Utilizing features like tooltips and drill-throughs. Statistical Analysis in Power BI- Advanced statistical functions in DAX - Use of advanced visuals for statistical insights. Creating Dashboards in Power BI - Detailed steps for creating interactive dashboards.

Power BI Services vs Desktop: Configuring Row-Level Security - Implementing security measures at the row level - Best practices for securing sensitive data. Setting Up Data Alerts - Configuring alerts for monitoring changes - Troubleshooting common alert issues. Preparing for PL-300 - Model the Data - Overview of PL-300 exam and key concepts - Practical exercises and scenarios for data modelling.

BACHELOR OF COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2023 – 2026 BATCH
SEMESTER IV

Semester	Part	Subject Code	Title of Paper	Course type	Instruction Hours / Week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
IV	I	TAM2304A/ HIN2304A / FRE2304A	Tamil Paper I Hindi Paper I French Paper I	L	4	58	2	3	25	75	100	3
IV	II	ENG2304A	English Paper IV	E	4	58	2	3	25	75	100	3
IV	III	CS23C08	Data Mining	CC	4	58	2	3	25	75	100	4
IV	III	CS23C09	Principles of Compiler Design	CC	4	58	2	3	25	75	100	3
III/IV	III	CS23SCE1/ CS23SBGP	Robotics Process Automation / Gen AI	SEC	3	45	-	-	100	-	100	3
IV	III	BP23A05 AP23A01 CS23A02	Business Accounting Digital Marketing M-Commerce	GE	4	58	2	3	25	75	100	3
IV	III	CS23CP4	Python Programming Lab	CC	5	75	-	3	15	35	50*	4
IV	IV	NM23EII	Entrepreneurship and Innovation (Ignite X)	AEC	2	30	-	-	100	-	100	2
IV	IV	NM23EVS	Environment Studies	AECC	-	-	-	-	100	-	100	Gr.
IV	V	COCOACT	Co-Curricular Activities	GC	-	-	-	-	-	-	100	1
I – IV	VI	COM15SER	Community Services 30Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	16BONL1 16BONL2	Online Course 1 Online Course 2	ACC	-	-	-	-	-	-	-	-

*CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

CC	:	Core Course	CA	:	Continuous Assessment
GE	:	Generic Elective	AEC	:	Ability Enhancement Course
OT	:	Online Test	AECC	:	Ability Enhancement Core Course
ESE	:	End Semester	SEC	:	Skill Enhancement Course
Gr.	:	Grade	ACC	:	Additional Credit Course

Course Code	Course Title	Category	L	T	P	Credit
CS23C08	Data Mining	Theory	58	2	-	4

Preamble

This course covers the basic concepts of data mining principles and methods. It provides insight on classification, and clustering techniques and focuses on applications like web mining, text mining and biological data mining.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts of data mining and applications	K1
CLO2	Understand the algorithms and techniques in data mining	K2
CLO3	Apply data mining algorithms in solving real world problems	K3
CLO4	Analyze various data mining concepts to work with different kind of data	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	M
CLO2	S	M	S	S	M
CLO3	M	M	S	M	M
CLO4	S	S	M	S	S

S- Strong; M-Medium.

Data Mining - CS23C08 - (58 Hrs)

Unit I **11 Hrs**

Introduction: Data Mining - KDD vs Data mining-DBMS vs Data Mining-Other Areas-Data mining techniques-Issues and challenges-Application areas.

Unit II **12 Hrs**

Association Rule: Introduction-Methods in association rule- Apriori algorithm. Clustering: Introduction- Clustering paradigms -K-medoid algorithms- CLARA- CLARANS - Hierarchical clustering-DBSCAN.

Unit III **12 Hrs**

Decision Tree: Introduction-Tree construction principles- Best split-splitting indices- splitting criteria- Tree construction algorithms: CART-ID3-C4.5.

Unit IV **12 Hrs**

Other Techniques: Introduction-Neural Networks-Learning in NN-Unsupervised Learning-Genetic Algorithm-Support Vector Machine

Unit V **11 Hrs**

Data Mining for Bioinformatics: Introduction-Biomedical data analysis. Web Mining: Introduction-Web mining-content mining- structure mining-usage mining-Text mining-unstructured text-Episode rule discovery for texts- hierarchy of categories-Text clustering.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Arun K Pujari	Data Mining Techniques	University Press	3rd Edition, 2013

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Yi Ping Phoebe Chen	Bio Informatics Technologies	Springer	2nd reprint, 2014
2	Pang-Ning Tan, Michael Steinbach and Vipin Kumar.	Introduction to Data Mining	Pearson Education	2016
3	Max Barmer	Principles of Data Mining	Springer	3rd Edition,2016

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Mrs. J. Gayathri

Course Code	Course Title	Category	L	T	P	Credit
CS23C09	Principles of Compiler Design	Theory	58	2	-	3

Preamble

The main objectives of this course are to understand the use of translators and compilers. It covers the concept of the phases of a compiler and is familiar with context-free grammars, regular expressions and parsing techniques, intermediate codes, and code generations.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the use of translators and complier, structure of a compiler and lexical analyses	K1
CLO2	Understand and apply the context free grammars and parsing techniques	K2
CLO3	Understand and apply the syntax directed translations, intermediate codes, the run time storage schemes, error detection and recovery	K3
CLO4	Analyse the problems and apply knowledge on code optimization and code generator	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	M	S
CLO3	S	M	S	S	M
CLO4	S	S	S	S	S

S-Strong; M-Medium.

Principles of Compiler Design - CS23C09 - (58 Hrs)

UNIT I **12 Hrs**

Introduction to Compiling: Complier- Analysis of the source program- the phase of a compiler- The grouping of phases- Compiler construction tools-A compiler one-pass Compiler: syntax definition-Syntax Translation-Parsing – A translator for simple expressions-Lexical Analysis-Incorporate a symbol table.

UNIT II **11 Hrs**

Lexical Analysis: The role of the lexical analyzer-input buffering -Specification of tokens-Recognition of tokens -A language for specifying lexical analyzers-Finite automata -From a regular expression to an NFA -Design of a lexical analyzer generator-Optimization of DFA based patter matches.

UNIT III **11 Hrs**

Syntax Analysis: The role of a parser- Content free grammars-Writing a grammar-top down rsing -bottom up parsing -Operator-precedence parsing -LR parsing -using ambiguous grammars-parser generators.

UNIT IV **12 Hrs**

Syntax-Directed Translation: Syntax-directed definition -Constructures of Syntax trees-L-attributed definition-Top-down translation-Bottom-up evaluation of inherited attributes. Runtime Environments: Storage organization- storage allocation strategies-parameter passing -symbol table- dynamic storage allocation techniques.

UNIT V **12 Hrs**

Intermediate Code Generation: Intermediate languages -Declarations – Assignment statement-Boolean expressions – case statements. Code Generation: The target machine-Runtime storage management-basic blocks and flow graphs- A simple code generator -The dag representation of basic blocks-Generation code from dags. Code Optimization: The principal sources of optimization-optimization-loop in flow graphs-introduction to global data flow analysis-code improving transformations.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Alfred V.Aho, Jeffrey D.Ullman	Compilers:Principles, Techniques and Tools	Narosa Publishing House	2007

References Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Randy Allen, Ken Kennedy	Optimizing Compilers for Modern Architectures: A Dependence-based Approach	Morgan Kaufmann Publishers	2002
2	Steven S. Muchnick	Advanced Compiler Design and Implementation,	Morgan Kaufmann Publishers Elsevier Science	2003
3	Keith D Cooper and Linda Torczon	Engineering a Compiler	Morgan Kaufmann Publishers Elsevier Science	2004
4	Charles N. Fischer, Richard. J. LeBlanc	Crafting a Compiler with C	Pearson Education	2008

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Dr. K. Sathiyakumari

Course Code	Course Title	Category	L	T	P	Credit
AP23A01	Digital Marketing	Theory	58	2	-	3

Preamble

This course provides an overall understanding of the various digital marketing platforms and tools available for creating an effective digital marketing strategy. It provides technical skills to design and develop an integrated digital marketing plan for an organization.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the role of digital marketing in marketing strategy	K1
CLO2	Understand the key elements of a digital marketing strategy	K2
CLO3	Apply the role that social marketing plays in the digital marketing	K3
CLO4	Analyze common digital marketing tools such as SEO and social media and apply conceptual frame works of digital marketing	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	M
CLO3	S	S	S	M	M
CLO4	S	S	S	M	S

S- Strong; M-Medium.

Digital Marketing - AP23A01 - (58 Hrs)

Unit I **12 Hrs**

Introduction to Digital Marketing: Introduction - Original and Development of Digital Marketing - Internet Users: Penetration and Kind of Internet Use - Digital Marketing strategy - Digital Advertising Marketing Plan - Ethical and legal of framework of Digital Marketing - Skills Required in Digital Marketing - Digital Advertising: Introduction - Concept of display advertising - Digital Metrics - Types of Digital Ad - Targeting in digital marketing - Challenges faced by display marketing**.**

Unit II **11 Hrs**

Search Engine Advertising: Introduction - Why pay for search advertising? - Understanding Ad Placement - Understanding Ad Ranks - Why is the Ad rank important? - Create your first Ad Campaign - Google Ads Account - Best practices for creating effective Ads - Enhance your Ad Campaign - Performance Reports - E-Commerce.

Unit III **12 Hrs**

Facebook Marketing: Introduction - Organic Marketing - Paid Marketing - Facebook Insights LinkedIn: Introduction - LinkedIn Strategy - Content Strategy - LinkedIn Native Videos - LinkedIn Analytics - Asset Copying - LinkedIn Sales Navigator - Emerging Platforms: Instagram.

Unit IV **12 Hrs**

Search Engine Optimization: Introduction - Search Engine - The Concept of SEO - SEO Phases - Website Audit - Content - Social Media Reach – Maintenance - Local Search SEO - SEO Visual Search - Voice Change will change the SEO Industry - Subdomains vs Subfolders - SEO - Website Navigation - External Links - Pop-ups - Advanced Website Features.

Unit V **11 Hrs**

Mobile Marketing: Introduction - Mobile Advertising - Mobile Marketing Toolkit - Mobile Marketing Features - Mobile Analytics. Digital Analytics: Introduction - Data Collection - Key Metrics - Experience Analysis - Making Web Analytics Actionable - Types of Tracking Code - Competitive Intelligence.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Seema Gupta	Digital Marketing	McGraw Hill Education	2nd Edition, 2018

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Simon Kingsnorth	Digital Marketing Strategy: An Integrated Approach to Online Marketing	Kogan Page	2nd Edition, 2019
2	Dave Chaffey	Digital Marketing	Pearson	7th Edition, 2019
3	Stephanie Diamond	Digital Marketing All-in-One for Dummies	For Dummies	1st Edition, 2019
4	Kevin Hartman	Digital Marketing Analytics: In Theory and In Practice	Ostmen Bennett Bridge publishing Services	2nd Edition, 2020

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Mrs. S. Kavitha

Course Code	Course Title	Category	L	T	P	Credit
CS23A02	M-Commerce	Theory	58	2	-	3

Preamble

This course provides an insight on M-Commerce principles and business models. It also explores the concept of mobile commerce technologies, applications, mobile payment methods, security, and ethics.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamental concept of E- commerce and process of business models	K1
CLO2	Understand the architecture and applications of M-Commerce	K2
CLO3	Illustrate the risks, issues, legal and security aspects in M-Commerce	K3
CLO4	Analyze the infrastructure, fraud prevention and payment methodologies and examine the legal and ethical issues in mobile commerce	K4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	S
CLO2	S	S	M	S	M
CLO3	S	S	S	S	M
CLO4	S	S	S	M	S

S-Strong; M-Medium.

M-Commerce - CS23A02 - (58 Hrs)

Unit I **12 Hrs**

Introduction to E- commerce: Introduction - E-commerce - E-business - Categories of E-commerce applications - Traditional and Electronic commerce - Advantages and disadvantages of E-commerce. Business Models of E-commerce: Introduction - Business models of E-commerce- Business to Consumer (B2C) - Business to Business (B2B) - Difference between B2C and B2B - C2C: Definition - Characteristics and Applications of C2C EC.

Unit II **11 Hrs**

Mobile commerce and WAP: Introduction to Mobile commerce - Application - Advantages of M-commerce - Wireless Application Protocol - WAP Browser - Features of WAP 2.0 - Technologies of M- commerce.

Unit III **12 Hrs**

Mobile commerce Risk, Security and Payment Methods: Introduction - Security and Payment Methods - Mobile Commerce Security - Security Mechanism - Mobile Security - Network Infrastructure and Security- WLAN and Security - WAP and Security - Mobile commerce payment methods - Mobile payment operations.

Unit IV **12 Hrs**

Mobile Money Infrastructure and Fraud Prevention for M- Payment: Introduction - Requirement for authentication infrastructure for M-commerce - Trust relationship - Requirement for Mobile commerce - Password based authentication for mobile users with support for public key technology - M - payment value chain - Life cycle - Operational Issues in M-Commerce payment - Mobile payment systems - General analysis of the payment solutions**.**

Unit V **11 Hrs**

Legal and Ethical Issues: Introduction - Issues related to E- commerce - Legal issues - Taxation and E-commerce - Cyber Laws: Introduction - Cyber laws in India - Salient Provisions of Cyber Law - Contracting and contract Enforcement - IT act 2000.

Text Book

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Dr. U.S. Pandey & Er. Saurabh Shukla	E- Commerce and Mobile Commerce Technologies	S. Chand & Company Pvt. Ltd	2nd Revised Edition, 2014

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication
1	Karabi Bandyopadhyay	Mobile Commerce	Prentice Hall India Learning Private Limited	2013
2	Paul May	Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business	Cambridge University Press	1st Edition, 2001
3	Norman Sadeh	M-Commerce: Technologies, Services, and Business Models	John Wiley & Sons	2003

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies

Course Designer

- Dr. M.Rajeswari

Course Code	Course Title	Category	L	T	P	Credit
CS23CP4	Python Programming Lab	Practical	-	-	75	4

Preamble

This course includes a practice in the use of basic techniques of Python programming and to implement in real time environment. It enriches the knowledge in programming techniques using pattern matching concepts. It enables to understand object-oriented programming concepts.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand python programming structure	K1
CLO2	Classify different functions in python programming	K2
CLO3	Apply files for data processing	K3
CLO4	Illustrate pattern matching and extra action using regular expression	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	M
CLO3	S	S	M	S	S
CLO4	S	S	M	S	S

S- Strong; M-Medium.

Python Programming Lab - CS22CP4 - (75 Hrs)

List of Programs

- Exercises using conditionals and loops.
- Exercises for implementing functions.
- Exercises using list and their built-in functions.
- Exercises by implementing tuples.
- Exercises by implementing dictionary.
- Exercises using apply (), filter (), map () and reduce () functions.
- Exercises by implementing Modules.
- Exercises by implementing classes and instances.
- Exercises by illustrating regular expression.
- Exercises for implementing files concept.
- Exercises using strings and their built-in functions.

- Exercises for implementing database concepts.
- Exercises for pattern recognition using machine learning

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Dr. K. Padmavathi

PSGR Krishnammal College for Women

Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

BACHELOR OF COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2023 – 2026 BATCH
SEMESTER V

Semester	Part	Course Code	Title of Course	Course Type	Instruction hours / week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
V	III	CS23C10	Web Design and Development	CC	5	73	2	3	25	75	100	4
V	III	CS23C11	Computer Graphics	CC	5	73	2	3	25	75	100	4
V	III	CS23C12	Software Engineering	CC	5	73	2	3	25	75	100	4
V	III	CS23E01 CS23E02 CS23E03	Parallel Computing Big Data Analytics Virtualization and Cloud Services	DSE	5	73	2	3	25	75	100	5
V	III	CS23CP5	Web Design and Development Lab	CC	5	75	-	3	15#	35#	50	3
V	III	CS23SBP1	DevOps Tools	SEC	3	41	4	-	100	-	100	3
V	III	CS20AC1 CS20AC2	Multimedia Blockchain Technology	ACC	SS	-	-	3	25	75	100	5*
V	IV	NM21CS1	Cyber Security I	AECC	2	30	-	-	100	-	100	Gr.
V	VI	CS23COM	Comprehensive Examination	GC	-	-	-	-	100	-	100	Gr.
V	IV	CS23INST	Field work / Institutional Training	DSE	-	-	-	-	100	-	100	2
I - V	VI	16BONL1 16BONL2	Online Course Online Course	ACC	-	-	-	-	-	-	-	-

*The credit is applicable to candidates who take up the advance learner course exam- additional credits
#CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

CC	Core Course	ACC	Additional Credit Course
AECC	Ability Enhancement Compulsory Course	SS	Self-Study
CA	Continuous Assessment	GC	General Courses
ESE	End Semester Examination	Gr.	Grade
DSE	Discipline Specific Elective	SEC	Skill Enhancement Course

Course Code	Course Title	Category	L	T	P	Credit
CS23C10	Web Design and Development	Theory	73	2	-	4

Preamble

This course provides the basics of web page design using PHP / MySQL. It focuses on architecture and built-in components for design and development of dynamic websites.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic constructs of PHP Scripting Language and MySQL	K1
CLO2	Understand the web design elements, functions, Advanced array, error handling, files, data connections and MVC architecture	K2
CLO3	Apply web design methods to solve problems	K3
CLO4	Analyze the web page design requirements and design web pages using PHP / MySQL	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	M
CLO3	S	S	M	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

Web Design and Development - CS23C10 - (73 Hrs)

Unit I **14 Hrs**

Introduction: Basics of HTML, CSS, Server - Side Web Scripting - Syntax and Variables - Control and Functions. Passing Information between Pages: GET Arguments - POST Arguments - Formatting Form Variables - String: Strings in PHP - String Functions.

Unit II **15 Hrs**

Arrays and Array Functions: Creating Arrays - Retrieving Values - Multidimensional Arrays - Inspecting Arrays - Deleting from Arrays - Iteration. Advanced Array Functions: Transformations of Arrays- Stacks and Queues. Number Handling: Numerical Types - Mathematical Operators - Simple Mathematical Functions - Randomness - Regular Expressions: Tokenizing and parsing Functions. Handing Exceptions with PHP: Error Handling in PHP.

Unit III **15 Hrs**

Working with the File system: PHP File Permissions - File Reading and Writing Functions - File system and Directory Functions - Network Functions - Date and time Functions - Calendar Conversion Functions. Working with Sessions and Cookies: Sessions work in PHP - Session Functions - Configuration Issues - Cookies - Sending HTTP Headers.

Unit IV **15 Hrs**

Structured Query Language (SQL): Relational Database and SQL-SQL standards - The Workhorses of SQL-Database Design-Privileges and Security. PHP and MYSQL: Connecting to MySQL - Making MySQL Queries - Fetching Data Sets - Multiple Connections - Error Checking - Creating MySQL Databases with PHP - MySQL Functions.

Unit V **14 Hrs**

Understanding the core concepts of Laravel 5 - Setting up the environment - Basic Architecture of Laravel Applications - Laravel Application Life cycle - Artisan command-line interface - MVC and routes - Connecting with a database.

Text Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Steve Suehring Tim Converse and Joyce Park	PHP 6.0 and MySQL Bible	Wiley	2009, 1st Edition
2	Fernando Monteiro	Hands-On Full-Stack Web Development with Angular 6 and Laravel 5	Packt Publisher	2018, 1st Edition

Reference Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Jon Ducket	PHP & MySQL	Wiley	2014, 1st Edition
2	Luke Welling and Laura Thomson	PHP and MySQL Web Development	Pearson Education	2016, 5th Edition
3	Martin Bean	Laravel 5 Essentials	Packt Publishing Limited	2015, 1st Edition

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Dr. K. Sathiyakumari

Course Code	Course Title	Category	L	T	P	Credit
CS23C11	Computer Graphics	Theory	73	2	-	4

Preamble

This course provides the fundamentals of computer graphics and Augmented Reality (AR). It also focuses on 2D & 3D transformations & viewing and applications of AR Technology.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamentals of computer graphics and augmented reality	K1
CLO2	Understand the working principle of display devices, 2D & 3D transformations & viewing and AR technology	K2
CLO3	Apply computer graphic algorithms to solve problems	K3
CLO4	Illustrate the steps to perform 2D & 3D graphic representation in applications	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	S	M	S

S-Strong; M-Medium.

Computer Graphics - CS23C11 - (73 Hrs)

Unit I **14 Hrs**

Ba sic Concepts: **Uses of computer graphics** - Display devices - **Color CRT Monitors** - Direct view storage tube - Flat panel displays - Raster scan systems - Random scan system - Input and Hard copy Devices.

Unit II **15 Hrs**

Line drawing algorithms: DDA Algorithm - Bresenham's Line Drawing Algorithm - Circle Generating Algorithms: Properties of circles - Midpoint circle algorithm. Two dimensional transformations: Basic transformations - Composite transformation of translation - Rotation - Scaling - Other transformations: Reflection - Shear.

Unit III **15 Hrs**

Two-dimensional viewing: Clipping Operations - Point clipping - Line clipping: Cohen Sutherland line clipping - Curve clipping - Text clipping - Exterior clipping. Three dimensional concepts: Three-dimensional display methods - Three dimensional geometric and modeling transformations: Translation, Rotation and Scaling.

Unit IV **15 Hrs**

Augmented Reality: Definition - Components of Augmented Reality - History of Augmented Reality - Augmented Reality - Differences between Augmented Reality and Virtual Reality - Difference between AR and QR Codes - Challenges with AR - Opportunities for Augmented

Reality - Types of Augmented Reality - Augmented Reality Working - Augmented Reality Methods - AR Display Technology - Interaction in AR Applications.

Unit V **14 Hrs**

Value of Augmented Reality: Next User Interface - Uses of Augmented Reality: Sports, Gaming, and Entertainment, Education - Maintenance and Repair - Medicine - Business and Commerce - AR Tools: Unity - Vuforia - Introduction - Big Trends - Technical Trends - Future Concepts for Augmented Reality - AR Contact Lenses.

Text Books

S. No	Author	Title of the Book	Publishers	Year and Edition
1	Donald Hearn, M. Pauline	Computer Graphics	Pearson	2012, 2nd Edition
2	Gregory Kipper, Joseph Rampolla	Augmented Reality	O'Reilley	2012, 1st Edition

Reference Books

S. No	Author	Title of the book	Publisher	Year and Edition
1	Steve Marschner, Peter Shirley	Fundamentals of Computer Graphics	Taylor & Francis Group	2021, 5th Edition
2	Jay David Bolter, Morya Engberg, Blair Maclntyre	Reality Media Augmented & Virtual Reality	The MIT Press, Cambridge	2021, 1st Edition
3	Jonathan Linowes	Augmented Reality with Unity AR Foundations	Packt Publishing	2021, 1st Edition

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Dr. S. Karpagavalli

Course Code	Course Title	Category	L	T	P	Credit
CS23C12	Software Engineering	Theory	73	2	-	4

Preamble

This course provides the fundamentals of software engineering process in software development It also covers software process models, requirement analysis, design, testing and quality assurance.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts of software engineering in software development life cycle	K1
CLO2	Understand common lifecycle processes to plan and deliver an effective Software engineering Process	K2
CLO3	Apply software engineering principles to develop software systems	K3
CLO4	Demonstrate the concepts of software engineering by solving software design-based problems	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	S	M	S

S-Strong; M-Medium.

Software Engineering - CS23C12 - (73 Hrs)

Unit I **14 Hrs**

Software and Software Engineering: Nature of software - Software myths Process Models: Generic process model - Process assessment and improvement - Prescriptive process models- Specialized process models - Unified process - Personal and team process models - Process technology - Product and process.

Unit II **15 Hrs**

Agile Development: Agility - Agility and the cost of change - Agile process - Extreme programming (XP) - Agile process models -Tool set for the agile process. DevOps: Introduction to DevOps - Getting started with DevOps - Continuous Integration and Continuous Delivery - The CI/CD principles - Using a package manager - Using Jenkins.

Unit III **15 Hrs**

Understanding Requirements: Requirement's engineering- Establishing the groundwork - Eliciting requirements - Developing use cases - Building the requirements model - Negotiating requirements - Validating requirements. Requirements modeling: Scenarios, Information and Analysis Classes Requirements analysis - Scenario - based modeling.

Unit IV **15 Hrs**

Design Concepts: Design within the context of software engineering - Design process - Design concepts - Design model Architectural design: Software architecture - Architectural genres - Architectural styles.

Unit V **14 Hrs**

Software Quality Assurance: Background issues - Elements of software quality assurance - SQA tasks, goals and metrics - Formal approaches to SQA - Statistical software quality assurance - Software reliability - The ISO 9000 quality standards - SQA plan. Software Testing Strategies: Strategic Approach to software testing - Verification and validation - Organizing for software testing - Software testing strategy - Criteria for completion of testing. Software Process Improvement: SPI - SPI process - CMMI - People CMM.

Text Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Roger S. Pressman, Bruce R Maxin	Software Engineering - A Practitioner's Approach	Mc-Graw Hill Education	2023, 9th Edition
2	Mikael Krief	Learning DevOps (Unit II)	Packt Publishing Ltd.	2019, 1st Edition

Reference Books

S.No	Author	Title of the book	Publisher	Year and Edition
1	Ian Sommerville	Software Engineering	Pearson Education	2017, 10th Edition
2	Richard Fairley	Software Engineering Concepts	Mc-Graw Hill Education	2024, 9th Edition
3	Rajib Mall	Fundamentals of Software Engineering	Prentice Hall India Learning Private Limited	2014, 4th Edition

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Mrs. J. Gayathri

Course Code	Course Title	Category	L	T	P	Credit
CS23E01	Parallel Computing	Theory	73	2	-	5

Preamble

This course provides knowledge on hardware and the software work, starting from simple systems to complex shared resource architectures and shared memory programming paradigm.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the concepts of parallel computing and architectures	K1
CLO2	Understand the architecture of future multi- and many-core processor systems	K2
CLO3	Apply serial programs and algorithms to solve problems	K3
CLO4	Illustrate the pragmatic approach of parallel computing	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	S	S	M
CLO2	S	M	S	S	M
CLO3	M	M	S	M	M
CLO4	S	S	M	S	S

S- Strong; M-Medium.

Parallel Computing - CS23E01 - (73 Hrs)

Unit I **15 Hrs**

Introduction: Why do we need High speed computing? - How do we increase the speed of computers? - History of parallel computers - Some interesting features of parallel computers. Instruction Level parallel processing: some example commercial processors - multithreaded processors - Proposed future processor architectures.

Unit II **14 Hrs**

Structure of parallel computers: A generalized structure of a parallel computer - Shared memory parallel computers - interconnection networks - Distributed shared memory parallel computers.

Unit III **15 Hrs**

Introduction: Computational demands of modern science - Advent of practical parallel processing - Parallel processing terminology - The sieve of Eratosthenes. PRAM Algorithms: A model of serial computation - The PRAM model of parallel computation. PRAM algorithms: Parallel reduction - merging two sorted lists.

Unit IV **15 Hrs**

Processor Arrays, Multiprocessors and Multicomputer: Processor organizations - Processor arrays - Multiprocessors - multicomputer - Flynn's taxonomy - speedup, scaled speedup and parallelizability.

Unit V **14 Hrs**

Parallel programming languages & algorithms: Parallel language & algorithm design for the array processor - other von Neumann - type languages - C, C++ & parallel C++ - Non-von Neumann - type languages.

Text Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Michael J Quinn	Parallel Computing	Tata Mc-Graw Hill	2008, 2nd Edition
2	V. Rajaraman, C. Siva Ram Murthy	Parallel Computers Architecture and Programming	Prentice Hall of India Pvt. Ltd	2008, 1st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Micheal McCool, Arch D. Robinson, James Reindres	Structured Parallel Programming	Morgan Kaufmann Publishers	2012, 1st Edition
2	Wilkinson Barry, Michael Allen	Parallel and Concurrent Programming	Pearson Education	2012, 1st Edition
3	Peter Pacheco	Introduction to Parallel Programming	Morgan Kaufmann Publishers	2011, 1st Edition

Pedagogy

- Lecture, Group Discussion, Case Studies

Course Designer

- Dr. K. Padmavathi

Course Code	Course Title	Category	L	T	P	Credit
CS23E02	Big Data Analytics	Theory	73	2	-	5

Preamble

The course provides an introduction to big data analytics, tools and techniques. It introduces Hadoop architecture and map reduce programming model. It also provides knowledge on NoSQL databases, querying model and applications in big data.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basics of big data, tools and techniques in big data analytics	K1
CLO2	Understand the programming models, data storage and querying models and data visualization in big data analytics	K2
CLO3	Apply the big data analytics methods and tools for solving real-world problems	K3
CLO4	Analyze the specific business case and apply appropriate data analytic tools and methods	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	S	S
CLO3	S	S	M	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

Big data analytics - CS23E02 - (73 Hrs)

Unit I **15 Hrs**

Overview of Big Data: Defining Big Data - Big Data Types - Big Data Analytics - Industry Examples of Big Data - Big Data and Data Risk - Big Data Technologies - Benefits of Big Data - Basics of Hadoop: Big Data and Hadoop - Hadoop Architecture -Main Components of Hadoop Framework – Analyzing Big Data with Hadoop - Benefits of Distributed Applications - Hadoop Distributed File System - Advantages of Hadoop - Ten Big Hadoop Platforms

Unit II **15 Hrs**

Hadoop Distributed File System: Architecture of APACHE Hadoop HDFS - File Systems - HDFS File Blocks - HDFS File Commands. Map Reduce: Introduction to Map Reduce - Working of Map Reduce - Map operations - Map Reduce Program - Map Reduce User Interfaces.

Unit III **15 Hrs**

NoSQL Databases: NoSQL Data Management - Types of NoSQL Databases - Query Model for Big Data - Benefits of NoSQL. HBase, CASSENDRA and JAQL: Introduction to HBase - Row-oriented and Column-oriented Data Stores - HDFS Vs HBase - HBase Architecture - HBase Data Model -

Understanding HBase Data Model - Introduction to Cassandra - Features - Data Replication - Components - Cassandra Query Language - Data Model - Data models of Cassandra and RDBMS. Introduction to JAQL - JSON - Components of JAQL.

Unit IV **14 Hrs**

HIVE: Introduction to Hive - Data Models - Building Blocks - Data file formats - Hive for Data warehousing - HiveQL - Data Manipulation - Queries - Hive - Built in Functions. PIG: Introduction - Components - PIG Program Execution Modes - Data formats and Models - Pig vs SQL - Pig Vs Map Reduce - Difference between Hive and Pig - Apache Pig history

Unit V **14 Hrs**

Data Visualization Tools: Tableau - Advantages - Creating Visualization - Text Table - Heat Maps - Maps with calculated Colours - Creating Maps - Dashboard. Applications: WALMART: How Big Data is used to Drive Supermarket Performance - NETFLIX: How Netflix Used Big Data to Give Us the Programmes We Want - FACEBOOK: How Facebook Use Big Data to Understand Customers

Text Book

S. No	Author	Title of the Book	Publisher	Year and Edition
1	V.K. Jain	Big Data and Hadoop	Khanna Book Publishing	2017, 1st Edition
2	Chandraish Sinha	Tableau 10 for Beginners	Createspace Independent Pub	2018, 1st Edition
3	Bernard Marr	Big Data in Practice	Wiley Publications	2016, 1st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	G. Sudha Sadasivam and R. Thirumahal	Big Data Analytics	Oxford University Press	2020, 1st Edition
2	Arshdeep Bahga and Vijay Madisetti	Big Data Analytics: A Hands-On Approach	VPT	2018, 1st Edition
3	Paul Zikopoulos and Chris Eaton	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data	Tata McGraw Hill	2011, 1st Edition

Pedagogy

- Lecture, Demonstration, Group Discussion

Course Designer

- Dr. S. Karpagavalli

Course Code	Course Title	Category	L	T	P	Credit
CS23E03	Virtualization and Cloud Services	Theory	73	2	-	5

Preamble

This course provides an insight on virtualization, cloud services and data centers. It also emphasizes on various cloud service providers, cloud deployment models and hypervisors.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamentals of cloud, essentials of virtualization and datacenters	K1
CLO2	Understand the cloud services, service models and virtualization types	K2
CLO3	Apply cloud services and virtualization for effective use of resources	K3
CLO4	Analyze different cloud services, security threats, virtualization and data centers for various business categories	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	S
CLO2	S	S	S	M	S
CLO3	M	S	S	S	S
CLO4	S	M	S	S	S

S-Strong; M-Medium.

Virtualization and Cloud Services - CS23E03 - (73 Hrs)

Unit I **15 Hrs**

Computing Paradigms - Cloud Computing Fundamentals: Motivation for Cloud Computing- Defining Cloud Computing - Principles of Cloud computing- Cloud Ecosystem - Requirements for Cloud Services - Cloud Application - Benefits and Drawbacks. Cloud Computing Architecture and Management: Introduction - Cloud Architecture -Core components and service layers- Anatomy of the Cloud - Managing the Cloud - Migrating Application to Cloud.

Unit II **15 Hrs**

Cloud Deployment Models: Introduction - Private Cloud - Public Cloud - Community Cloud - Hybrid Cloud -Comparative analysis and real-world applications. Cloud Service Models: Introduction - Infrastructure as a Service - Platform as a Service - Software as a Service - Web2.0 and Cloud Computing - Components of Web 3. 0 - Emerging Cloud service models and industry trends.

Unit III **15 Hrs**

Virtualization: Introduction - Approaches to virtualization: Hardwa re, OS, and application-level – Hypervisors: Types and functionalities - multi-core and parallel processing in virtualization- Memory and Storage Technology in virtualized environments. Security in Cloud: Introduction- key

security challenges and mitigation strategies- Platform-Related Security - Audit, compliance, and regulatory considerations.

Unit IV **14 Hrs**

Cloud Service Providers: Introduction - EMC - Google - Sales force - Amazon Web Services: S3 - EBS - EC2 -Dynamo DB - Microsoft - IBM

Unit V **14 Hrs**

Data Centers: Overview, purpose, and classification– Data center goals – Data center facilities - Role of data centers in the enterprise - Role of data centers in the service provider environment - Application architecture models - Cloud-based data center architectures - Essential data center services and operational best practices.

Text Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	K. Chandrasekaran	Essentials of Cloud Computing (Unit I, II, III & IV)	CRC Press	2025, Reprint
2	Mauricio Arregoces, Maurizio Portolani	Data Center Fundamentals (Unit V)	Cisco press	2021, 2st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year and Edition
1	Ray Rafaels	Cloud Computing	Create Space Independent Publishing Platform	2018, 2nd Edition
2	Curtis Franklin Jr. and Brian Chee	Securing the Cloud: Security Strategies for the Ubiquitous Data Center	Auerbach Publications	2019, 1st Edition
3	Dinseh G. Dutt	Cloud Native Data Center Networking: Architecture, Protocols, and Tools	O'Reilly Media	2019, 1st Edition

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designers

- Mrs. S. Kavitha

Course Code	Course Title	Category	L	T	P	Credit
CS23CP5	**Web Design and Development Lab**	**Practical**	**-**	**-**	**75**	**3**

Preamble

This course provides a hands-on training in web page design using PHP / MySQL. It focuses on Architecture and built-in components of PHP / MySQL for design and development of dynamic websites.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the installation of PHP / MySQL	K2
CLO2	Apply PHP / MySQL, MVC architecture in web development	K3
CLO3	Apply the components of PHP / MySQL for web development	K3
CLO4	Demonstrate the steps in building dynamic website using PHP / MySQL	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	M	S
CLO3	S	S	S	S	S
CLO4	S	M	S	S	S

S- Strong; M-Medium.

Web Designing and Development Lab - CS23CP5 - (75 Hrs)

List of Exercises

- Simple web page using html
- Design web page using CSS
- Control Structure & Loops in PHP
- String Functions in PHP
- Array and Function in PHP
- Form handling in PHP
- Advanced array in PHP
- Exception handling in PHP
- Server-Side Validation and Page Redirection in PHP
- Cookies and Sessions in PHP
- File / Image Uploading in PHP
- PHP Data Base Connectivity with MYSQL
- MySQL functions
- Develop a web application using Laravel framework

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Mrs. S. Ponmalar

Course Code	Course Title	Category	L	T	P	Credit
CS23SBP1	DevOps Tools	Practical	-	4	41	2

Preamble

This course is designed to provide the fundamental understanding of DevOps. It enables the analysis, design, deployment and test software applications in an environment.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concept of technologies and methodologies in DevOps	K2
CLO2	Demonstrate Jenkins concepts to build, deploy and test Software applications	K2
CLO3	Implement the drivers responsible for the emergence of DevOps	K3
CLO4	Illustrate the deployment of concepts and practices in IT Service Management and apply DevOps in an enterprise environment	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	S	M	S
CLO3	S	M	S	S	S
CLO4	M	S	M	S	S

S- Strong; M-Medium.

DevOps Tools - CS23SBP1 - (41 Hrs)

List of Programs

- Version control system using GitHub
- Push and Pull methods in GitHub
- Building jobs using Jenkins.
- Configuring email notifications in Jenkins.
- Create a CI pipeline using Jenkins.
- Create a CD pipeline in Jenkins and deploy in Cloud.
- Pulling images in Docker containers.
- Working with Docker Networks.
- Integrate Kubernetes and Docker
- Build automation using Maven.

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designers

- Mrs. S. Ponmalar
- Mrs. J. Gayathri

Course Code	Course Title	Category	L	T	P	Credit
NM21CS1	Cyber Security I	Theory	30	-	-	Grade

Objective

This course introduces fundamental concepts of Cyber Security in the digital era. It provides the knowledge of cybercrimes, cyber laws and also the security of digital devices. It helps to do secure digital transactions and safe usage of social media.

Cyber Security - NM21CS1 - (30 Hrs)

Unit I **6 Hrs**

Principles of Cyber security: Introduction to Cyber security - Defining cyberspace - Architecture of cyberspace - Communication and web technology - Internet infrastructure for data transfer and governance - Regulation of cyberspace - Concept of Cyber security - Issue and challenges of cyber security.

Unit II **6 Hrs**

Cyber Crime: Introduction to Cybercrime - Classification of Cyber-crimes – Cyber-crime against women and children – Financial frauds - Social engineering attacks – Malware - Zero day and zero click attacks.

Unit III **6 Hrs**

Cyber Law: Cyber Criminals modus-operandi – Reporting of cybercrimes – remedial and mitigation measures – Legal perspective of cybercrime– IT Act 2000 and its amendments – Organization dealing with cybercrimes and cyber security in India.

Unit IV **6 Hrs**

Social Media Security: Introduction to social network – Types of social media – social media platform – Hashtag – Viral content – Security issues related to social media. – **Cyber Security tools:** N map – Introduction to Nmap – Nmap scan types- Nmap command list.

Digital Transaction: Introduction to digital payments – Components of digital payments – Modes of digital payments – Banking cards – UPI (Unified Payment Interface) – e-Wallets.

Unit V **6 Hrs**

Digital Devices Security: End point device and Mobile phone security – Password policy – Security patch management – Data backup – Device security policy – Cyber security best practices. Installation and configuration of Computer Anti-Virus.

Case studies: Illustrations of Financial frauds – Digital Signature. Prepare a checklist for secure net banking

*e-Content will be provided

*This course is for all final year students of all streams from 2023-24 year onwards.

Reference books:

1. Raef Meeuwisse, Cybersecurity for Beginners, Lulu Publishing Services,2nd Edition,2017
2. Scott Augenbaum, The Secret to Cybersecurity-A Simple Plan to Protect Your Family and Business from Cybercrime, Forefront Books Publisher,2019
3. Sunit Belapure and Nina God Bole, Cyber security understanding cybercrimes computer forensics and Legal perspectives, Wiley India Pvt Ltd, 2011
4. Christopher Hadnagy, Social Engineering: The Science of Human Hacking, Wiley Publisher, 2nd Edition,2018

5. Pavan Duggal, Artificial Intelligence, Cybercrimes & Cyberlaw,2018
6. Joe Gray, Practical Social Engineering: A Primer for the Ethical Hacker, 2022
7. Henry A. Oliver, Security in the digital age: social media security threats and vulnerabilities,
8. Create Space Independent publishing platform, 2015.

Evaluation Pattern

Quiz	60 Marks
Case Study	20 Marks
Poster	20 Marks
Total	100 Marks

Course Code	Course Title	Category	L	T	P	Credit
CS20AC1	Multimedia	Theory	Self-Study			5

Preamble

This course provides basic concepts in multimedia and devices, systems, tools and techniques. It also focuses on animation, distributing multimedia in networks, art, design and digital cinematography.

Multimedia - CS20AC1

Unit I

Multi Media Fundamentals: History of Multimedia - Multimedia Objects - Multimedia in business and work- Multimedia hardware - Memory & Storage devices - Communication devices.

Unit II

Multimedia Presentation tools- Tool Features - object generation with video sound - image capturing- Authoring tools - card and page-based authoring tools - Digital Audio / Video: Perception of sound- hearing sensitivity - frequency range – sound - wavelength - Speed of sound- Measuring the sound - Noise Signal - Video Signal - Video Format - Video Lights-Types and Functions.

Unit III

Graphics/Image: Image file format-Principles of animation: 2D and 3D animation - Morphing - Kinematics, Tweening - Motion capture - Character animation – Modeling - Special effects and Video Conferencing - Web Streaming - Video Streaming - Internet Telephony.

Unit IV

Multimedia Networking - Applications - streamed stored and audio-making - Protocols for real ti me interactive Applications - Distributing multimedia - Secluding and Policing Mechanisms - Integrated services - Design Consideration for Web pages.

Unit V

Motion Picture: Analogue and Digital camera, lenses-viewing and monitoring - Types of Films - various storage media - Types of lights - video lights - cine lights - reflectors - Digital Video Camera.

Text Book

S.No	Author	Title of The Book	Publishers	Year and Edition
1	Tay Vaughan	Multimedia: Making it Work	Tata Mc-Graw Hill Education	2017, 9th Edition

Reference Books

S.No	Author	Title of The Book	Publishers	Year and Edition
1	Sreeparna Banerjee	Elements of Multimedia	Chapman and Hall/CRC	2018, 1st Edition
2	Prabhat K. Andleigh and Kiran Thakrar	Multimedia Systems Design	Pearson Education	2015, 1st Edition
3	Ze - Nian Li & Mark S Drew	Fundamentals Of Multimedia	Pearson Education	2004, 1st Edition

Course Designer

- Mrs. A. Priyadharshini

Course Code	Course Title	Category	L	T	P	Credit
CS20AC2	Blockchain Technology	Theory	Self-Study			5

Preamble

This course provides conceptual understanding of block chain technology and how it can be used in Industry 4.0 It covers the technological underpinning of block chain operations using Ethereum.

Blockchain Technology - CS20AC2

Unit I

Introduction: Overview of Block chain - History of Blockchain - Peer to Peer Network - Smart Contract - Wallet - Digital Currency - Ledgers - Types of Blockchain - Platform.

Unit II

Consensus Mechanism: Permissioned Blockchain - Permisionless Blockchain - Different Consensus Mechanism - Proof of Work - Proof of Stake - Proof of Activity - Proof of Burn - Proof of Elapsed Time - Proof of Authority - Proof of Importance.

Unit III

Distributed Consensus: Nakamoto consensus - Proof of Work - Proof of Stake - Proof of Burn, Difficulty Level - Sybil Attack - Energy utilization and alternate.

Unit IV

Smart contract and Ethereum: Overview of Ethereum - Writing Smart Contract in Solidity - Remix IDE - Different networks of Ethereum - understanding blocks practically at blockhcain.com - how to compile and deploy smart contract in remix.

Unit V

Understanding Hyper ledger Fabric: Overview of Open-source Hyper ledger project - Hyper ledger Fabric - Architecture - Identities and Policies - Membership and Access Control - Channels- Transaction Validation - Writing smart contract using Hyper ledger Fabric. Enterprise application of Blockchain: Cross border payments - Know Your Customer (KYC).

Text Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Melanie Swan	Blockchain	O'Reilly Media	2015, 1st Edition
2	Imran Bashier	Mastering Blockchain	Packt	2020, 1st Edition
3	Andreas M. Antonopoulos & Gavin Wood	Mastering Ethereum: Building Smart Contracts and DApps	O'Reilly Media	2018, 1st Edition

Reference Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Elad Elrom	The Blockchain Developer	Apress	2019, 1st Edition
2	Daniel Drescher	Blockchain Basics	Apress	2017, 1st Edition
3	Don Tapscott & Alex Tapscott	Blockchain Revolution	Portfolio Penguin	2016, 1st Edition

Course Designer

- Mrs. J. Gayathri

PSGR Krishnammal College for Women

Affiliated to Bharathiar University \ Autonomous \ College of Excellence \ Accredited with A++ Grade \ Ranked 9th in NIRF

BACHELOR OF COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOMES - BASED CURRICULUM FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2023 – 2026 BATCH
SEMESTER VI

Semester	Part	Course Code	Title of Course	Course Type	Instruction hours / week	Contact Hours	Tutorial Hours	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
VI	III	CS23C13	Full-Stack Web Development	CC	5	73	2	3	25	75	100	3
VI	III	CS23C14	Software Testing	CC	5	73	2	3	25	75	100	3
VI	III	CS23E04 CS23E05 CS23E06	Artificial Intelligence and Machine Learning / Internet of Things/ Quantum Computing	DSE	5	73	2	3	25	75	100	3
VI	III	CS23SBP3	UI/UX Design	SEC	3	41	4	-	100	-	100	3
VI	III	CS23CP6	Full-Stack Web Development Lab	CC	5	75	-	3	*15	*35	50	2
VI	III	CS23PROJ	Project and Viva Voce	DSE	7	-	-	-	25	75	100	5
VI	III	#CS20AC3 / CS21AC4	Mobile Application Development / Cryptography and Network Security	ACC	SS	-	-	3	25	75	100	5
I-V	VI	16BONL1 16BONL2	Online Course Online Course	ACC	-	-	-	-	-	-	-	-

*CA conducted for 25 and converted into 15, ESE conducted for 75 and converted into 35

#Credits applicable to candidates who take up Advanced Level Course examination

ESE	End Semester Examination	CC	Core Course
DSE	Discipline Specific Elective	SS	Self-Study
SEC	Skill Enhancement Course	CA	Continuous Assessment
ACC	Additional Credit Course		

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23C13	FULL-STACK WEB DEVELOPMENT	THEORY	73	2	-	3

Preamble

This course provides knowledge on web development using React.js and Angular.js for front-end development and Node.js for server-side backend development. It emphasizes practical, industry-oriented skills to build full stack web applications integrating front-end and back-end technologies.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamentals of React.js, Angular.js and Node.js	K1
CLO2	Understand the architecture and concepts of front-end and back-end integration	K2
CLO3	Apply full-stack development techniques to design and implement web applications	K3
CLO4	Analyze, integrate, and deploy scalable and secure full-stack web applications	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	M	S
CLO2	S	S	S	S	M
CLO3	S	S	M	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

FULL STACK WEB DEVELOPMENT -CS23C13 – 73 HRS

Unit I (15 Hrs)

React.js Fundamentals – Introduction to React.js – ES6+ features – JSX syntax – Project setup – Components: functional and class components – Props and state management – Event handling – Conditional rendering – Lists and keys – Forms: creating and validating forms – React Router: single-page application (SPA) routing and navigation.

Unit II (15 Hrs)

Angular.js Essentials **–** Introduction to Angular.js – Architecture, modules, controllers – Two-way data binding – Expressions and directives (*ngModel, ngFor, ngIf*) – Components, services, and dependency injection – Form controls: template-driven forms and validation – Routing and HTTP API consumption.

Unit III **(15 Hrs)**

Node.js Backend Programming – Introduction to Node.js – Environment setup – Core modules – Asynchronous programming: callbacks, promises, async/await – Express.js framework: REST API creation, middleware, error handling – Database operations with MySQL and MongoDB – Authentication basics and security fundamentals – State management using Redux – Store, actions, reducers, and middleware for managing complex application states in React.js integrated with Node.js APIs.

Unit IV **(14 Hrs)**

Full-Stack Project Integration – Connecting React.js/AngularJS front end with Node.js backend using RESTful APIs – Data transfer using JSON – API consumption – State management – Token-based authentication (JWT) – Error handling patterns – Use cases: e-commerce application (product catalog, shopping cart, checkout flow) – Student portal (authentication and role-based access) – Task management application (collaborative workflows) focussing on Building, running, and debugging real-world projects.

Unit V **(14 Hrs)**

Deployment and Advanced Industry Tools **–** Cloud deployment – Hosting – SSL setup – Domain mapping – Performance optimization – Debugging and profiling – CI/CD basics – Automated testing – Version control – Security best practices – Vulnerability handling – Industry case studies – Production releases.

Text Books

S.No	Author	Title	Publisher	Year and Edition
1	Jonathan Wexler	Get Programming with Node.js	TBA	2025
2	Alex Banks, Eve Porcello	Learning React	O'Reilly	2025
3	Aristeidis Bampakos	Learning Angular	Packt	2025

Reference Books

S.No	Author	Title	Publisher	Year and Edition
1	Mario Casciaro	Node.js Design Patterns	Packt	2025
2	Anthony Accomazzo	Full stack React: The Complete Guide	O'Reilly	2025
3	Muhammad Ahsan Ayaz	Angular Cookbook	Packt	2025

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designers

- Mrs. S. Ponmalar

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23C14	SOFTWARE TESTING	THEORY	73	2	-	3

Preamble

This course provides an insight on different software testing techniques, automation tools and test management. It emphasizes all software testing phases and test automation using selenium.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the software testing basics, automation, and test management	K1
CLO2	Understand the types of software testing and activities in each software testing phase and test automation	K2
CLO3	Apply various software testing methods in writing test cases	K3
CLO4	Analyze and apply software testing methods to verify and validate software	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	M	S	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

SOFTWARE TESTING – CS23C14 – 73 HRS

Unit I (15 Hrs)

Introduction to Testing: The Evolving Profession of Software Engineering - The Role of Process in Software Quality - Testing as a Process. Testing Fundamentals: Introduction - Basic Definitions - Software Testing Principles- Test Goals, Policies, Plans, And Documentation: Testing and Debugging Goals and Policies - Test Planning - Test Plan Components - Test Plan Attachments - Test Design Specifications - Test Case Specifications - Test Procedure Specifications - Locating Test Items - The Test Transmittal Report - Reporting Test Results.

Unit II (15 Hrs)

White-Box Testing: Static Testing - Structural Testing - Challenges in White-Box Testing. Black-Box Testing: Introduction - Need of Black-Box Testing - Black-Box Testing techniques.

Unit III (14 Hrs)

Integration Testing: Introduction - Type of Integration Testing – Integration Testing as a Phase of Testing - Scenario Testing - System and Acceptance Testing: System Testing Overview -

Functional versus Non-functional Testing - Functional System Testing - Non-Functional Testing - Acceptance Testing

Unit IV **(15 Hrs)**

Performance Testing: Factors Governing Performance Testing - Methodology for Performance Testing - Tools for Performance Testing - Process for Performance Testing - Challenges. Regression Testing: Introduction - Types of Regression Testing - Execution of Regression Testing - Best Practices in Regression Testing

Unit V **(14 Hrs)**

Software Test Automation: Test automation -Need and Scope for Automation - Criteria for Selecting a Testing Tool - Test Automation Tools - Introduction to Selenium - Installing Selenium Components - Using Selenium IDE - Managing User Interface Controls - Basics of Java- Creating First Selenium Web Driver Script.

Text Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Ilene Burnstein	Practical Software Testing: A Process-Oriented Approach	Springer	2010
2	Srinivasan Desikan, Gopalaswamy Ramesh	Software Testing Principles and Practices	Pearson Education	2012
3	Navneesh Garg	Test Automation Using Selenium WebDriver with Java	AdactIn Group Pvt Ltd	2014

Reference Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Renu Rajani	Testing Practitioner Handbook	Packt Publishing Limited	2017
2	Naresh Chauhan	Software Testing	Oxford University Press	2016 and 2nd Edn.
3	Adithya Garg, Ashish Mishra	A Practitioner's Guide to Test Automation Using Selenium	Tata McGraw Hill Education	2015

Pedagogy

- Lectures, Group discussions, Demonstrations, Case studies.

Course Designer

- Dr. S. Kavitha

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23E04	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	THEORY	73	2	-	3

Preamble

This course introduces artificial intelligence applications and machine learning techniques – classification, clustering and regression. It gives insight on ensemble learning, deep learning algorithms, natural language processing, Large Language Model (LLM) and agentic AI.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basics of artificial intelligence, machine learning, deep learning and agentic AI	K1
CLO2	Understand the machine learning techniques – classification, clustering, regression, and ensemble learning and model performance evaluation metrics	K2
CLO3	Apply neural network and various deep learning algorithms	K3
CLO4	Analyze Artificial Intelligence applications, LLM and Agentic AI	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	M	S	S	S
CLO3	S	S	S	S	M
CLO4	S	S	S	S	S

S- Strong; M-Medium.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING – CS23E04 – 73 HRS

Unit I (15Hrs)

Definition and History of AI – Turing Test, Dartmouth Conference, AI winters - Applications of AI: Healthcare, Autonomous Vehicles, Natural Language Processing, Robotics, Finance, Education, Smart Cities - AI in daily life: Recommender Systems, Voice Assistants, Predictive Maintenance - Ethical, Legal, and Social Implications of AI.

Unit II (15 Hrs)

Machine learning techniques - Supervised Learning and Unsupervised learning -Classification - Regression - Clustering - Binary classification - Multi class classification - k-Nearest Neighbors (k-NN) –Decision Trees - Support vector machine. Regression - Linear regression - Logistic Regression - Support Vector Regression (SVR) - Clustering - K-Means clustering - Hierarchical clustering

Unit III **(14 Hrs)**

Evaluation Metrics: Accuracy, Precision, Recall, F1-score, Confusion Matrix, ROC-AUC - Bias-Variance -Trade-off and Overfitting. Ensemble Learning: Bagging, Boosting, Random Forests, Stacking. - Introduction to Reinforcement Learning.

Unit IV **(14 Hrs)**

Deep Learning: Introduction to Neural Networks – Perceptron, Activation Functions - Multi-Layer Perceptrons and Backpropagation. Convolutional Neural Networks (CNNs) – Image classification - Recurrent Neural Networks (RNNs) and LSTMs.

Unit V **(15 Hrs)**

Natural Language Processing - Large Language Models (LLMs): Transformer architecture–capabilities and limitations -Prompt Engineering and fine-tuning techniques - Agentic AI with LLMs: Building autonomous AI workflows - Future Directions: Generative AI, Explainable AI, AI Governance.

Text Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach	Pearson	2021 and 4th Edn.
2	Aurélien Géron	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	O'Reilly Media	2023 and 3rd Edn.
3	Ian Goodfellow, Yoshua Bengio, and Aaron Courville	Deep Learning	MIT Press,	2016 and 1ST Edn
4	Yuxi (Hayden) Liu	Transformers for Natural Language Processing	Packt Publishing	2022 and 2nd Edn.

Reference Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Christopher M. Bishop	Pattern Recognition and Machine Learning	Springer	2006 and 1st Edn.
2	Steven Bird, Ewan Klein, and Edward Loper	Natural Language Processing with Python	O'Reilly Media	2009 and 1st Edn.

Pedagogy

- Lectures, Group Discussions, Demonstrations, Case studies

Course Designer

- Dr. S. Karpagavalli

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
CS23E05	INTERNET OF THINGS	THEORY	73	2	-	3

Preamble

This course covers the fundamental concepts, architecture, hardware components, communication protocols, and software frameworks of the Internet of Things (IoT). IoT-based applications across domains such as smart cities, healthcare, and industry. The course also provides insights into IoT based applications and future technologies.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamental concepts of the Internet of Things (IoT) and the key components of the IoT Reference Architecture.	**K1**
CLO2	Understand the basic IoT communication protocols and the fundamentals of Python programming as applied to IoT systems.	**K2**
CLO3	Apply the use of computers and peripherals to build IoT hardware, and engage in industry-academia collaboration to stay updated with recent trends in IoT.	**K3**
CLO4	Develop a small and low-cost IoT system and use IoT concepts in real-life situations.	**K4**

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	**M**	**S**	M
CLO3	S	S	**S**	M	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

INTERNET OF THINGS - CS23E05 -73 HRS

Unit I **(14 Hrs)**

Introduction to IoT: Definition and Characteristics of IoT – IoT History, Evolution, and Applications (Smart Homes, Healthcare, Agriculture, Industry 4.0) – IoT Architecture: Perception, Network, and Application Layers – IoT Ecosystem and Standards – Challenges and Future Trends in IoT.

Unit II **(15 Hrs)**

IoT Hardware and Sensors: IoT Devices and Components (Sensors, Actuators, Microcontrollers, Gateways) – Introduction to Embedded Systems for IoT – Popular IoT Boards: Arduino, Raspberry Pi, ESP32 – Power Management in IoT Devices – Communication Interfaces: UART, SPI, I²C, GPIO.

Unit III **(15 Hrs)**

IoT Networking and Communication Protocols: IoT Communication Models and APIs – Wireless Technologies: Wi-Fi, Bluetooth/BLE, Zigbee, Z-Wave, LoRa, RFID, NFC – IoT Network Layer Protocols: IPv6, 6LoWPAN – Application Layer Protocols: MQTT, CoAP, HTTP/HTTPS – Cloud Platforms for IoT: AWS IoT, Azure IoT Hub, Google Cloud IoT.

Unit IV **(14 Hrs)**

IoT Software and Data Management: IoT Programming Basics (Python/Node.js for IoT) – IoT Middleware and Frameworks – Edge Computing and Fog Computing Concepts – IoT Data Analytics: Data Collection, Cleaning, and Visualization – Security and Privacy in IoT Systems.

Unit V **(15 Hrs)**

IoT Applications and Case Studies: Smart Cities: Intelligent Traffic and Waste Management – Smart Healthcare and Wearables – Industrial IoT (IIoT) and Predictive Maintenance – Agricultural IoT: Precision Farming – Emerging Trends: Digital Twins, AI + IoT (AIoT), and Blockchain in IoT.

Text Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Arshdeep Bahga and Vijay Madisetti	Internet of Things: A Hands-On Approach	Universities Press	2024 and 1st, Edn.
2	Rajkumar Buyya, Amir Vahid Dastjerdi	Internet of Things: Principles and Paradigms	Morgan Kaufmann	2016 and 1st Edn.
3	Pethuru Raj and Anupama C. Raman	The Internet of Things: Enabling Technologies, Platforms, and Use Cases	CRC Press	2017 and 1st Edn.

Reference Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Adrian McEwen and Hakim Cassimally	Designing the Internet of Things	Wiley	2013 and 1st, Edn.
2	Oliver Hersent, David Boswarthick, Omar Elloumi	The Internet of Things: Key Applications and Protocols	Wiley	2012 and 2nd Edn.
3	Manoel Carlos Ramon	Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers –	Apress	2014 and 1st Edn.

Pedagogy

- Lectures, Group Discussions, Demonstrations, Case studies

Course Designer

- Dr. K. Sathiyakumari

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
CS23E06	QUANTUM COMPUTING	THEORY	73	2	-	3

Preamble

The course offers a solid grounding in quantum mechanics, algorithms, error correction, and programming for quantum systems. It provides insights into emerging applications, current hardware platforms, and future directions in quantum technologies.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the fundamental concepts of the Internet of Things (IoT) and the key components of the IoT Reference Architecture.	K1
CLO2	Understand the basic IoT communication protocols and the fundamentals of Python programming as applied to IoT systems.	K2
CLO3	Apply the use of computers and peripherals to build IoT hardware, and engage in industry-academia collaboration to stay updated with recent trends in IoT.	K3
CLO4	Develop a small and low-cost IoT system and use IoT concepts in real-life situations.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	**M**	**S**	M
CLO3	S	**M**	**S**	M	S
CLO4	S	S	S	S	S

S- Strong; M-Medium.

QUANTUM COMPUTING - CS23E06-73 HRS

Unit I (14 Hrs)

Introduction to Quantum Computing: Classical vs. Quantum Computing – Historical Development of Quantum Computing – Qubits and Superposition – Quantum Gates and Circuits – Quantum Parallelism – Applications and Current Status of Quantum Technologies.

Unit II (14 Hrs)

Quantum Mechanics for Computing: Postulates of Quantum Mechanics – Dirac Notation – Tensor Products – Measurement and Probabilities – Quantum Entanglement – Bloch Sphere Representation.

Unit III (15 Hrs)

Quantum Algorithms: Quantum Parallelism and Interference – Deutsch-Jozsa Algorithm – Bernstein-Vazirani Algorithm – Grover's Search Algorithm – Shor's Factoring Algorithm – Quantum Fourier Transform (QFT).

Unit IV **(15 Hrs)**

Quantum Error Correction and Hardware: Sources of Quantum Noise – Quantum Error Correction Codes – Decoherence and Fault-Tolerant Quantum Computation – Quantum Hardware Platforms (Superconducting Qubits, Trapped Ions, Photonics) – NISQ Devices.

Unit V **(15 Hrs)**

Quantum Programming and Applications: Introduction to Quantum Programming Languages (Qiskit, Cirq) – Building Simple Quantum Circuits – Quantum Cryptography and Quantum Key Distribution – Quantum Machine Learning Overview – Future Trends and Challenges in Quantum Computing.

Text Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Michael A. Nielsen and Isaac L. Chuang	Quantum Computation and Quantum Information	Cambridge University Press	2010 and10th Anniversary Edn.
2	Phillip Kaye, Raymond Laflamme, and Michele Mosca	An Introduction to Quantum Computing	Oxford University Press	2007 and 1st Edn.
3	Jack D. Hidary	Quantum Computing: An Applied Approach	Springer	2012 and 2nd Edn.

References Books

S. No	Author	Title of The Book	Publishers	Year and Edition
1	Eleanor G. Rieffel and Wolfgang H. Polak	Quantum Computing: A Gentle Introduction	MIT Press	2014 and 1st, Edn.
2	Chris Bernhardt	Quantum Computing for Everyone	MIT Press	2019 and 1st Edn.

Pedagogy

- Lectures, Group Discussions, Demonstrations, Case studies

Course Designer

- Dr. S. Karpagavalli

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23SBP3	UI/UX DESIGN	PRACTICAL	-	4	41	3

Preamble

The objective of this course is to provide hands-on experience in UI/UX design, covering user-centered design, prototyping, and usability testing. Students will also learn to build responsive, interactive interfaces using industry tools.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the principles of user interface (UI) design and user experience (UX) development	K2
CLO2	Apply wireframing and prototyping techniques using design tools	K3
CLO3	Develop responsive web interfaces with usability and accessibility considerations	K3
CLO4	Demonstrate user testing methods and iterate designs based on feedback	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	M
CLO2	M	S	S	S	S
CLO3	S	M	S	S	S
CLO4	S	S	M	S	S

S- Strong; M-Medium.

UI/UX DEVELOPMENT – CS23SBP3 - 41 HRS

List of Programs

- Design a simple login form UI using wireframing tools (Figma/Adobe XD/Sketch).
- Create a low-fidelity prototype for an e-commerce homepage.
- Develop a responsive navigation menu for a web application.
- Design a mobile app interface for a food delivery service.
- Implement grid-based layouts with HTML & CSS for a dashboard page.
- Create a dark mode and light mode toggle for a website.
- Design and test form validation UI (registration form).
- Develop an interactive prototype with clickable elements in Figma.
- Conduct a usability test on a sample interface and document user feedback.

- Create a final UI/UX project – design and develop a complete user interface for a chosen domain (e.g., education, health, entertainment, or business).

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designer

- Dr. M. Rajeswari

COURSECODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS23CP6	FULL-STACK WEB DEVELOPMENT LAB	PRACTICAL	-	-	75	2

Preamble

This lab provides hands-on training in full-stack web development using React.js, Angular.js, and Node.js. It emphasizes the practical application of front-end and back-end integration, API communication, authentication, and deployment. Students will gain industry-oriented skills by developing and deploying real-world full-stack applications.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the setup and configuration of React.js, Angular.js, and Node.js environments	K2
CLO2	Apply front-end and back-end programming techniques to build functional web applications	K3
CLO3	Integrate RESTful APIs, databases, and authentication mechanisms into full-stack applications	K3
CLO4	Demonstrate deployment, debugging, and version control practices in full-stack projects	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	M
CLO2	S	S	M	S	S
CLO3	S	S	S	S	S
CLO4	S	M	S	S	S

S- Strong; M-Medium.

FULL-STACK WEB DEVELOPMENT LAB – CS23CP6 -75 HRS

List of Exercises

- Creating static web pages with HTML and CSS fundamentals.
- Developing React.js components: functional components, props, and state.
- Implementing event handling and form validation in React.js.
- React Router: building multi-page single-page applications.
- State management in React using Redux (store, actions, reducers, middleware).
- AngularJS app development: controllers, directives, data binding, and forms.
- Building AngularJS services and communication with REST APIs.
- Node.js setup and creating HTTP servers.
- Writing RESTful APIs with Express.js: routing, middleware, and error handling.
- Database CRUD operations with MongoDB/MySQL via Node.js.
- Authentication and session management with JWT in Node.js applications.
- Integrating React.js/AngularJS front-end with Node.js backend APIs.

- Deploying full-stack applications to cloud platforms.
- Debugging and performance profiling of web applications.
- Version control using Git and collaborative workflows.
- Final mini-project: Build and deploy a full-stack web application.

Pedagogy

- Demonstration of working environment / Tools / Software / Program

Course Designers

- Mrs. M. Ponmalar

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
CS20AC3	MOBILE APPLICATION DEVELOPMENT	THEORY	SELF-STUDY			5

Preamble

This course provides insight on mobile application development using Android SDK. It focuses on android platform, layouts, activities, data binding, views and menus available for mobile application development

MOBILE APPLICATION DEVELOPMENT - CS20AC3

Unit I

Introduction to Mobile Applications: Tour of android technologies - Consumer perspectives - Android versions - Developer perspective - Java - XML - Business perspective – Installing software tools - JDK - Java for Windows, Linux, Solaris and Macintosh - SDK Installation - IDE Eclipse environment - Installing and Configuration of Eclipse - AVD creation.

Unit II

Android system Architecture: Android Stack - Linux Kernel - Android Runtime - Dalvik VM - Application Framework - Android emulator - Android applications development - Virtualization - APIs - Android File system - A Basic Android Application - Deployment. Android Activities: The Activity Lifecycle - Lifecycle methods - Creating Activity.

Unit III

Intents - Intent Filters - Activity stack. Android Services: Simple services - Binding and Querying the service - Executing services. Broadcast Receivers: Creating and managing receivers - Receiver intents. Content Providers: Creating and using content providers - Content resolver.

Unit IV

Android UI - Android Layouts - Attributes - Layout styles - Linear - Relative - Table - Frame - Scroll - Android UI Views: Menus - Lists and Notifications - Input Controls: Buttons - Text Fields - Checkboxes - ListView - Spinners - progress bar - Dialog fragment - Image view to display pictures - Using Menus with views.

Unit V

Data Persistence - Saving and Loading user preferences - Accessing and Modifying Preferences - Persisting data to files - Saving to internal storage and external storage - Working with databases: SQLite - coding for SQLite using Android - DB Adapter helper Class - Messaging - Sending SMS - Sending Email - Location based services - Displaying map - getting location data and monitoring location.

Text Books

S.No	Author	Title of the Book	Publisher	Year and Edition
1	Barry Burd	Android Application Development - All-in-one for Dummies (Unit I, II)	Wiley India	2016
2	Jerome(J.F) DiMarzio	Beginning Android programming with Android Studio (Unit III, IV, V)	John Wiley & Sons, Inc	2017

Reference Books

S.No	Author	Title of the Book	Publisher	Year and Edition
1	Ian F. Darwin	Android Cookbook	P O'Reilly Media	2017
2	Lauren Darcey, Shane Conder	Sams Teach Yourself Android Application Development in 24 hours	Pearson Education	2013 and 2nd Edn.

Course Designer

- Mrs. J. Gayathri

COURSE CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
CS21AC4	CRYPTOGRAPHY AND NETWORK SECURITY	THEORY	SELF-STUDY			5

Preamble

This course provides theoretical knowledge on cryptography and network security. It also covers various cryptographic techniques, authentication and security issues in networks.

CRYPTOGRAPHY AND NETWORK SECURITY - CS21AC4

Unit I

Introduction to the Concepts of Security: The need for security - Security Approaches - Principles of Security - Types of Attacks. Cryptographic Techniques: Plaintext and Ciphertext - Substitution Techniques - Transposition Techniques.

Unit II

Encryption and Decryption -Symmetric and Asymmetric Key Cryptography – Steganography Key - Range and Key Size -Possible Types of Attacks. Computer-based Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes - An overview of Symmetric Key Cryptography - DES - Blowfish - AES.

Unit III

Computer-based Asymmetric Key Cryptography: Brief History of Asymmetric Key Cryptography - An overview of Asymmetric Key Cryptography - The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together - Digital Signatures - Knapsack algorithm.

Unit IV

Public Key Infrastructure: Digital Certificates, Private Key Management - The PKIX Model, Public Key Cryptography Standards - XML - PKI and Security.

Unit V

Internet Security Protocols: Basic Concepts - Secure Socket Layer - SHTTP - Secure Electronic Transaction - E-mail Security - Security in GSM - Security in 3G.

Text Books

S.No	Author	Title of the Book	Publisher	Year and Edition
1	AtulKahate	Cryptography and Network Security	McGraw Hill Education	2013 and 3rd Edn.

Reference Books

S.No	Author	Title of the Book	Publisher	Year and Edition
1	William Stallings	Cryptography and Network Security	Pearson Education	2005 and 4th Edn.
2	Neal Krawetz,	Cryptography and Network Security	Cengage Learning	2007
3	Bernard Menezes	Network Security and Cryptography	Cengage Learning	2010

Course Designer

- Dr. S. Kavitha