



**PSGR
Krishnammal College for Women**



DEPARTMENT OF COMPUTER SCIENCE

**CHOICE BASED CREDIT SYSTEM (CBCS)
&
LEARNING OUTCOMES BASED CURRICULUMFRAMEWORK (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 problems 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 communication skills and team work
- 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-time problems and to work independently on software projects as an effective team member
- PSO2** : Design and develop applications in the areas like artificial intelligence and machine learning algorithms, networking, web design, cloud computing, IoT and data analytics



Department of Computer Science
Choice Based Credit System & Learning Outcomes Based Curriculum Framework
Bachelor of Computer Science 2023- 2026 Batch

Semester	Part	Subject Code	Title of Paper	Category	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	Core 1: Programming in C	CC	4	58	2	3	25	75	100	3
I	III	CS23CP1	Programming Lab1: C Programming Lab	CC	3	45	-	3	15	35	50	2
I	III	PP22C02	Core 2: Computational and Algorithmic Thinking for Problem Solving	CC	3	45	-	-	100	-	100	3
I	III	CS23C03	Core 3: Computer Organization and Architecture	CC	4	58	2	3	25	75	100	3
I	III	TH23A03	Allied A1 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	-				
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	CS23C04	Core 4: Java Programming	CC	5	73	2	3	25	75	100	3
II	III	CS23CP2	Programming Lab 2: Java Programming Lab	CC	5	75	-	3	15*	35*	50	3
II	III	CS23C05	Core 5: Data Structures	CC	4	58	2	3	25	75	100	3
II	III	TH23A06	Allied A2 Discrete Mathematics	GE	6	88	2	3	25	75	100	5
II	IV		Online Course	AEC	-	-	-	-	-	-	-	Grade
		NME23A2/ NME23B2	** Advanced Tamil II/ Basic Tamil II	AEC	2	-	-	-	100	-	100	Grade

II	V	23PEPS1	Professional English for Physical Sciences	AEC	2	25	5	-	100	-	100	2
II	VI	NM23GAW	General Awareness	AEC	Self-Study	-	-	OT	100	-	-	Grade
II	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	Core 6: Operating System	CC	4	58	2	3	25	75	100	3
III	III	CS23C07	Core 7: Computer Networks	CC	4	58	2	3	25	75	100	3
III/ IV	III	CS23SCE1 / CS23SBGP	Coursera: Robotic Process Automation / SBS I - Gen - AI	SEC	3	45/44	-/1	-	100	-	100	3
III	III	TH23A13	Allied A3: Optimization Techniques	GE	4	58	2	3	25	75	100	3
III	III	CS23CP3	Programming Lab 3: DBMS Lab	CC	5	75	-	3	15*	35*	50	4
III	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
III	IV	NM22UHR	Universal Human Values and Human Rights #	AECC	-	-	-	-	100	-	100	Gr
I - V	VI	16BONL1 16BONL2	Online Course - I Online Course - II	ACC	-	-	-	-	-	-	-	-
III & IV	IV		Job Oriented Course: Amazon Web services/ Cisco Certified Network Associate/ Microsoft windows server administration/ Microsoft Power BI	-	-	-	-	-	-	-	-	-

#Selfstudy

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

L : Language

AEC : Ability Enhancement Course

E : English

AECC : Ability Enhancement Compulsory Course

CC : Core Course

CA : Continuous Assessment

SEC : Skill Enhancement Course

ESE : End Semester Examination

GE : Generic Elective

Gr : Grade

Mapping with Programme Learning Outcomes

Course 1 - CS23C01

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

Course 2 - CS23CP1

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

Course 3 - PP22C02

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

Course 4 - CS23C03

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

Course 5 - CS23C04

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

Course 6 - CS23CP2

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

Course 7 – CS23C05

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

Course 8 - CS23C06

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

Course 9- CS23C07

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

Course 10 - CS23SBGP

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

Course 11 - CS23CP3

CLOs	PL O1	PL O2	PLO 3	PL O4	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

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: $2 \times 3 = 6$

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

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

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 TANSICHE 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

Course Number	Course Name	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; L-Low

Programming in C - CS23C01

(58 Hrs)

Syllabus

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	8 th Edition, 2019
2	P.Kaliraj, T. Devi	Higher Education for Industry 4.0 and Transformation to Education 5.0	CRC Press - Taylor & Francis Group	1 st Edition, 2021

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Dr. K. Padmavathi

Course Number	Course Name	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; L-Low

C Programming Lab -CS23CP1

(45 Hrs)

List 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 Number	Course Name	Category	L	T	P	Credit
PP22C02	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 that Computing, 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; L- Low

Computational and Algorithmic Thinking for Problem Solving - PP22C02 (45 Hrs)

Syllabus

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 Sort Algorithms- 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 Number	Course Name	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; L- Low

Computer Organization and Architecture - CS23C03

(58 Hrs)

Syllabus

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

11Hrs

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

12Hrs

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	3 rd 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	1 st 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	3 rd Edition, 2019
2	John .L. Hennessy	Computer Architecture - A Quantitative approach	Elsevier	6 th Edition, 2018
3	William Stallings	Computer Organization & Architecture	Pearson Education	11 th Edition, 2022

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

- Mrs. M. Dhivya

Course Number	Course Name	Category	L	T	P	Credit
CS23C04	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; L-Low

Java Programming - CS23C04

(73 Hrs)

Syllabus

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
- Dr. M. Sowmya

Course Number	Course Name	Category	L	T	P	Credit
CS23CP2	Java Programming Lab	Practical	-	-	75	3

Preamble

The lab course is intended to explore object oriented concepts through Java programming language. Make the students to perform data manipulation operations, database connectivity and to analyze the biological sequence database using 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; L-Low

Java Programming and Bio Informatics 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 – LinkedList and ArrayList
- 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

- Dr. M. Sowmya

Course Number	Course Name	Category	L	T	P	Credit
CS23C05	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; L-Low.

Data Structures- CS23C05

(58 Hrs)

Syllabus

Unit I

12 Hrs

Introduction and Overview: Introduction - **Basic Terminology** - Elementary Data Organisation - 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	5 th 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	HarryHariom Choudhary	Data Structures	Create Space Independent Publishing Platform	2014
3	Rajdev Tiwari and Nagesh Sharma	Designand Analysis of Algorithms	Pearson Education	2014

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Dr. J. Viji Gripsy

Course Number	Course Name	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	S	M
CLO4	S	S	S	S	M

S- Strong; M-Medium.

Operating System- CS23C06

(58 Hrs)

Syllabus

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, 10 th Edition
2	Richard Stones, Neil Matthew	Beginning: Linux Programming	Wiley Publisher	2007, 4 th Edition

Reference Books

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

Note

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

Pedagogy

- Lectures, Demonstration, Case studies

Course Designer

- Mrs. M. Dhivya

Course Number	Course Name	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)

Syllabus

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	McGraw Hill	2017, 4 th 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, 3 rd Edition
2	Larry L Peterson, Bruce S Davie	Computer Networks - A systems approach	Elsevier Press	2012, 5 th Edition
3	Andrew S Tanenbaum	Computer Networks	Pearson education	2011, 5 th Edition
4	William Stallings	Data and Computer Communications	Prentice Hall of India Private Limited, NewDelhi	2011, 8 th Edition

Pedagogy

- Lecture, Demonstration, Case Studies

Course Designer

- Mrs. S. Kavitha

Course Number	Course Name	Category	L	T	P	Credit
CS23SCE1	Coursera: Robotic Process Automation	Theory	-	-	-	3

Course Contents

(45Hrs)

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

Course Number	Course Name	Category	L	T	P	Credit
CS23SBGP	SBS I - Gen-AI	Practical	-	1	44	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 -CS23SBGP

(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 Number	Course Name	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	PL O1	PL O2	PLO 3	PL O4	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.