



**PSGR
Krishnammal College for Women**



DEPARTMENT OF DATA SCIENCE

CHOICE BASED CREDIT SYSTEM (CBCS)

&

**LEARNING OUTCOMES BASED CURRICULAR
FRAMEWORK (LOCF)**

B.Sc. DATA SCIENCE

2024-2027 BATCH



Programme Learning Outcomes (PLO's)

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

PLO1: Apply analytical and critical thinking skills to solve complex real-world problems by implementing different tools in the fields of Data Science, Mathematics and Statistics

PLO2: Develop and implement data analysis strategies based on theoretical principles and problem-solving techniques to meet industry standards.

PLO3: Design solutions by applying analytical skills for socio-economic problems with appropriate ethical considerations.

PLO4: Promote life-long learning to meet the demands of changing trends and the workplace.

PLO5: Articulate the principles of Data Science and its impact on innovation and progress within the local or global context.

Programme Specific Outcomes (PSO)

The students at the time of graduation will

PSO1: Apply technical skills attained through laboratory exercises, projects, internships and value-added programmes to develop and implement customized data analysis methodologies in data science.

PSO2: Apply tools and techniques using Statistical, Machine Learning techniques and Decision Support Systems to support business processes and functions.

PSO3: Excel independently and as a collaborative team member or leader, showcasing strong communication and teamwork by applying programming and technical skills to solve multi-disciplinary problems.



Department of Data Science
Choice Based Credit System & Learning Outcomes Based Curricular Framework
Bachelor of Data Science - 2024 -2027 Batch and Onwards
Semester I

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	
I	I	TAM2301A/ HIN2301A/ FRE2301A	Language I – Tamil Paper I/ Hindi Paper I/ French Paper I	L	4	58	2	3	25	75	100	3
	II	ENG2301A	English Paper I	E	4	58	2	3	25	75	100	3
	III	CY24C01	Programming in C	CC	4	58	2	3	25	75	100	3
	III	PP22C02	Computational and Algorithmic Thinking for Problem Solving	CC	3	45	-	-	100	-	100	3
	III	DS24C03	Fundamentals of Data Science	CC	4	58	2	3	25	75	100	3
	III	TH24A08	Mathematics for Data Science	GE	6	88	2	3	25	75	100	5
	III	DS24CP1	Programming in C Lab	CC	3	45	-	3	15	35	50*	2
	Non-Tamil Students											
	I V	NME23A1 / NME23B1	Advanced Tamil I/ Basic Tamil I	AEC	2	28	2	-	100	-	100	2
	Students with Tamil as Language											
IV	NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100		
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	
II	I	TAM2302A/ HIN2302A/ FRE2302A	Tamil Paper II/ Hindi Paper II/ French Paper II	L	4	58	2	3	25	75	100	3
	II	ENG2302A	English Paper II	E	4	58	2	3	25	75	100	3
	III	DS24C04	Python Programming for Data Science	CC	4	58	2	3	25	75	100	3
	III	DS24C05	Operating System	CC	4	58	2	3	25	75	100	3

II	III	DS24CP2	Python Programming Lab	CC	3	45	-	3	15	35	50*	2
	III	DS24CP3	Statistical Analysis Lab	CC	3	45	-	3	15	35	50*	2
	III	TH24A17	Statistics for Data Science	GE	6	88	2	3	25	75	100	5
	IV	NM24UHR	Universal Human Values and Human Rights	AECC	2	30	-	-	100	-	100	2
	IV	NME23A2/ NME23B2	Advanced Tamil II/ Basic Tamil II	AEC	-	-	-	-	100	-	100**	Gr.
	VI	NM23GAW	General Awareness	AEC	SS	-	-	-	100	-	100	Gr.
I-IV	VI	COM15SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	-

L: Language

CA: Continuous Assessment

E: English

ESE: End Semester Examination

CC: Core Course

GE: Generic Elective

AEC: Ability Enhancement Course

ACC-Additional Credit Courses

AECC-Ability Enhancement Compulsory Course

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

****After class hours**

Evaluation Pattern 24-25 Batch onwards

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

UG & PG- 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

UG & PG - 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 : $2 \times 5 = 10$

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

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

Total: 75 marks

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

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, Topic & literature collection	:	5 Marks
II Review	-	Research Design & Data Collection	:	10 Marks
III Review	-	Analysis & Conclusion Preparation of rough draft	:	10 Marks
Total			:	25 Marks

End Semester Examination:

Evaluation of the project :25 Marks

Viva Voce :50 Marks

Total : 75 Marks

Part IV

Introduction to Entrepreneurship / Value Education / Environmental Studies / Design Thinking

Quiz	:	50 marks
Assignment	:	25marks
Project / Case study	:	25 marks
Total	:	: 100 Marks

Cyber Security I

Quiz	:	60 Marks
Case Study	:	20 Marks
Poster	:	20 Marks

Mapping Course Learning Outcomes with Programme Learning Outcomes

CY24C01 PROGRAMMING IN C

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

PP22C02 COMPUTATIONAL AND ALGORITHMIC THINKING FOR PROBLEM SOLVING

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

DS24C03 FUNDAMENTALS OF DATA SCIENCE

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

DS24CP1 PROGRAMMING IN C LAB

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

DS24C04 PYTHON PROGRAMMING FOR DATA SCIENCE

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

DS24C05 OPERATING SYSTEM

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

DS24CP2 PYTHON PROGRAMMING LAB

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

DS24CP3 STATISTICAL ANALYSIS LAB

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

SEMESTER I

Course Number	Course Name	Category	L	T	P	Credit
CY24C01	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	S
CLO2	S	S	M	S	M
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium

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 - **Impact of Industry 4.0 on Society, Business, Government and People - Introduction to 5.0.**

Text Books

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

Reference Books

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

Pedagogy

- Lectures, Group discussions, Demonstrations

Course Designer

Dr. Sabitha Banu A

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 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 behavior 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

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: Flow algorithm 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 Books

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

Pedagogy

Lectures, Simulation exercises, Demonstration, PPT, Case Study

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
DS24C03	FUNDAMENTALS OF DATA SCIENCE	Theory	58	2	-	3

Preamble

The course introduces learners with a solid foundation in essential concepts and techniques in Data Science. Students will have the knowledge and skills to effectively analyze data, handle heterogeneous datasets through preprocessing and visualization methods, and utilize common data science tools to address real-world challenges.

Prerequisite

- NIL

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Remembering the concepts of Data, information, and Database.	K1
CLO2	Understanding the basic concepts of Data Science, databases, data preparation and methods.	K2
CLO3	Applying the analysis concepts in SQL, visualization tools, and Python.	K3
CLO4	Analyzing the Methodology of Data Science	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

Syllabus

Unit I

(11 Hrs)

Introduction: Data, information, and Knowledge-Data Science: the art of data exploration-Data Science tasks-Data Science objectives- **Applications of Data Science**. Importance of Data Science: Need for Data Science - Data Science Process – Business Intelligence and Data Science – Prerequisites for a Data Scientist – **Tools and Skills required**.

Unit II

(12 Hrs)

Data, sources, and generation: Introduction-Data attributes-**Data-storage formats**-Data sources-Data generation. Databases for Data Science: Structured Query Language (SQL): Basic Statistics, Data Munging, Filtering, Joins, Aggregation, **No-SQL**: Document Databases, Wide-column Databases and

Graphical Databases.

Unit III

(12 Hrs)

Data Preparation: Data cleaning-Data reduction-Data transformation-Data normalization-Data integration

Basics Concepts:

Machine Learning Paradigm - Evaluating a classifier: Evaluation steps-Handling unbalanced classes-Model generalization-Evaluation metrics: **confusion matrix**-accuracy-precision and recall-F-measure.

Unit IV

(12 Hrs)

Data Science Methodology: Big Data analysis: Introduction-Characteristics of Big Data-Types of Big Data-Big Data analysis problems – techniques - Big Data analytics platforms-MapReduce architecture. Examples of Data Analytics – Data Analytics Lifecycle: Data Discovery, Data Preparation, Model Planning, Model Building, Communicate Results.

Unit V

(11 Hrs)

Data Visualizing using Tableau: Introduction-Dimensions and Measures, Descriptive statistics-Basic Charts-Dashboard design & principles-**Special chart types**

Data Science in Practice: Need of Data Science in the real world-**Hands-on Data Science with Python**-Necessary Python libraries-loading the dataset-**Dataset preprocessing**-Feature selection and normalization.

Text Books:

S. No	Author	Title of the Book	Publisher	Year of Publication / Edition
1	Jugal K. Kalitha, Dhruba K. Bhattacharyaa, Swarup Roy	Fundamentals of Data Science: Theory and Practice	Academic Press	2023, 1 st Edition
2	Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare	Fundamentals of Data Science	CRC Press	2021, 1 st Edition

Reference Books:

S. No	Author	Title of the Book	Publisher	Year of Publication / Edition
1	Joel Grus	Data Science from Scratch: First Principles with Python	O'Reilly Publications	2019, 2 nd Edition
2	Lillian Pierson	Data Science for Dummies	Wiley	2021, 3 rd Edition

Pedagogy

- Chalk and talk PPT, Discussion, Assignment, Demo, Quiz

Course Designer

Dr. S. Poongodi

Course Number	Course Name	Category	L	T	P	Credit
DS24CP1	Programming in C Lab	PRACTICAL	-	-	45	2

Preamble

This course offers practical training in C Programming, enhances the skill set through hands-on experience. By completing the course, learners will gain the ability to craft logical solutions for various problems. The course involved in compiling, linking, and debugging code, as well as tackling more intricate programming tasks.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Outline the logic using flowchart for a given problem and develop Programs using conditional and looping statements.	K1
CLO2	Differentiate built-in functions and apply user defined functions to solve problems	K2
CLO3	Construct programs with features of Arrays, Structures and Pointers.	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	S	S	S	M
CLO2	S	S	S	S	S
CLO3	S	S	S	S	M
CLO4	S	S	S	M	S

S- Strong, M-Medium

Programs List

- Exercise using different data types
- Exercise using operators
- Exercise to implement control structures
- Exercise using loop statements
- Exercise to implement arrays
- Exercise using built-in functions
- Exercise to generate user-defined function

- Exercise using structures
- Exercise using pointers
- Exercise to work with files

Pedagogy

- Demonstration of working environment / Tools / Software/Program

Course Designer

Dr. M. Sasikala

SEMESTER II

Course Code	Course Name	Category	L	T	P	Credit
DS24C04	PYTHON PROGRAMMING FOR DATA SCIENCE	Theory	58	2	-	3

Preamble

This course comprehensively introduces Python programming and its applications in data analysis, covering fundamental programming concepts, data manipulation techniques, and visualization tools.

Pre-requisite

- Programming Fundamentals
- Problem Solving Silks

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall Python programming basics, including syntax, data types, operators, and control structures.	K1
CLO2	Understand Python's concepts of functions, strings, lists, tuples, sets, and dictionaries.	K2
CLO3	Apply Python programming concepts to work with data structures such as strings, lists, tuples, sets, and dictionaries to solve computational problems.	K3
CLO4	Analyse and utilize advanced Python libraries, including NumPy, Pandas, and Matplotlib, for efficient data manipulation and visualization.	K4

Mapping with Programme Learning Outcomes

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

S- Strong, M-Medium

Syllabus

UNIT I

(11 Hrs.)

Introduction: History, Executing Python programs, Commenting in Python, Basics of Python Programming: Character Set, Tokens, data Types, Variables, Print, Input and Eval Function, Formatting number and Strings. **Operators and Expressions:** Arithmetic Operators, Operator Precedence and Associativity, Bitwise Operators, Boolean Operators.

UNIT II

(11 Hrs.)

Decision Statements: Conditional (if), Alternative (if-else), Chained Conditional (if-elif-else). **Loop Control Structures:** While, For, Break, Continue, Range Function. Functions: Introduction, Inbuilt Functions, User-Defined functions, passing Parameters, Return Values, Recursion.

UNIT III

(12 Hrs.)

Strings: Basic Inbuilt Python Functions for String, Index Operator, Immutability, **String Methods and Operations.** Lists: Creating Lists, Accessing Lists, List Slicing, List Comprehension. Sets: Creating Sets, Set Operations

UNIT IV

(12 Hrs.)

Tuples: Creating Tuples, Inbuilt Functions for Tuples, Operations on Tuples. Dictionaries: Need, Basics of Dictionaries, Creation, Adding and Replacing Values, Operations and Methods, **Nested Dictionaries.** Introduction to NumPy: NumPy Standard Data Types, Basics of NumPy Arrays, **Aggregations.**

UNIT V

(12 Hrs.)

Data Manipulation with Pandas: Introduction to Pandas, **Installation and Usage,** Data Indexing and Selection, Operating on Data, Handling Missing Data. Visualization with Matplotlib: Introduction to Matplotlib, Simple Line Plots, **Simple Scatter Plots,** Histogram

Text Books

S. No	Author	Title of the Book	Publisher	Year of Publication and Edition
1	Ashok N. Kamthane, Amit Ashok Kamthane	Programming and Problem Solving with Python	McGraw-Hill	2018, 2 nd Edition
2	Jake VanderPlas	Python Data Science Handbook - Essential Tools for Working with Data	O'Reilly	2017, 1 st Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication and Edition
1	Allen B. Downey	Think Python: How to Think like a Computer Scientist	O'Reilly Publishers	2016, 2 nd Edition
2	Wesley J Chun	Core Python Applications Programming	Prentice Hall	2012, 3 rd Edition

Pedagogy

Lectures, Demonstrations, Case studies.

Course Designers

1. Dr. S. Poongodi
2. Dr. M. Sasikala

Course Code	Course Name	Category	L	T	P	Credit
DS24C05	OPERATING SYSTEM	Theory	58	2	-	3

Preamble

This course introduces the fundamental structure of operating systems, focusing on essential concepts such as process management, synchronization, and CPU scheduling. It examines the core components of an operating system and provides an overview of file system interfaces and implementations.

Prerequisite

- Basic knowledge of Computer Architecture
- Programming Fundamentals

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the various elements and principles of Operating systems	K1
CLO2	Understand the concepts of process, thread, CPU scheduling, synchronization tools and memory management	K2
CLO3	Apply page replacement policies, deadlock avoidance and detection algorithms and file concepts & organization for dynamic memory management	K3
CLO4	Analyse various CPU scheduling algorithms and different methods for communication between processors	K4

Mapping with Programme Learning Outcomes

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

S- Strong; M-Medium

SYLLABUS

Unit I

(12 Hrs.)

Overview: OS's Role in Computer Systems, Computer System Organization and Architecture,

Operating-System Operations, Resource Management, **Security and Protection, Virtualization, Distributed Systems.** Operating Systems Structures: Operating System Services, System calls, Systems Services, Linkers and Loaders.

Unit II (12 Hrs.)

Processes: Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication. Threads and Concurrency: **Multicore Programing, Multithreading Models.** CPU Scheduling: Basic Concepts - CPU Scheduler, Preemptive and Nonpreemptive Scheduling and Dispatcher, Scheduling Criteria, Scheduling Algorithms - FIFO, SJF and RR

Unit III (12 Hrs.)

Synchronization Tools: Critical Section Problem, Peterson’s Solution, Mutex Locks, Semaphores. Deadlocks: System Model, **Deadlock Characterization, Methods for Handling Deadlocks,** Unraveling the Garuda-Naga knot - Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit IV (11 Hrs.)

Main Memory: Contiguous Memory Allocation, Paging, Structure of Page Table, **Swapping.** Virtual Memory – Akasha effect: Demand Paging, Page Replacement algorithms, FIFO, Optimal Page and LRU, **Page-Buffering Algorithms, Applications and Page Replacement.**

Unit V (11 Hrs.)

File System Interface: File Concept, Access Methods, Directory Structure, **protection,** Memory-Mapped Files. File System Internals: File Systems, Partitions and Mounting, File Sharing, **Virtual File Systems, Remote File Systems.**

Text Books

S. No	Author	Title of the Book	Publisher	Year of Publication and Edition
1	Abraham Silberschatz, Greg Gagne, Peter B. Galvin	Operating System Concepts	Wiley Publisher	2023, Global Edition

Reference Books

S. No	Author	Title of the Book	Publisher	Year of Publication and Edition
1	Andrew S. Tanenbaum, Herbert Bos	Modern Operating Systems	Pearson Educations	2023, 5 th Edition
2	William Stallings	Operating Systems: Internals and Design Principles	Pearson Educations	2017, 9 th Edition

Pedagogy

Lectures, Demonstrations, Case studies.

Course Designers

1. Dr. M. Sasikala
2. Dr. S. Poongodi

Course Code	Course Name	Category	L	T	P	Credit
DS24CP2	PYTHON PROGRAMMING LAB	Practical	-	-	45	2

Preamble

This Course emphasizes Python programming fundamentals integrated with problem-solving skills. Key areas covered include Basics of Python syntax and programming constructs, Data structures like lists, tuples, dictionaries, and sets, Libraries like NumPy, Pandas, and Matplotlib.

Course Learning Outcome

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic Python syntax, data types, variables, and control structures like if-statements and loops.	K1
CLO2	Understand arithmetic operations, logical operators, and precedence rules to solve real-world problems using Python.	K2
CLO3	Apply data structures such as lists, tuples, dictionaries, and sets in Python to organize and process data.	K3
CLO4	Analyze Python libraries like NumPy, Pandas, and Matplotlib to manipulate data and create visualizations for analysis.	K4

Mapping with Programme Learning Outcomes

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

S- Strong, M-Medium

Syllabus

- Program to understand and implement the concepts of Data Types, Variables, Operators, and Operator Precedence.
- Program to understand and develop Decision-making statements and Control structures.
- Program to create and invoke Built-in & User-defined functions and perform String Operations.

- Program to explore and perform operations on Data structures such as lists, tuples, dictionaries, and sets.
- Program to understand and implement basic operations using NumPy, Pandas, and Matplotlib.

Pedagogy

Demonstration of working environment / Tools / Software/Program

Course Designers

1. Dr. S. Poongodi
2. Dr. M. Sasikala

Course Code	Course Name	Category	L	T	P	Credit
DS24CP3	STATISTICAL ANALYSIS LAB	Practical	-	-	45	2

Preamble

This course provides practical experience in using PSPP to apply statistical techniques. Students will learn to analyze data, create visualizations, and interpret results. They will work with concepts such as frequency distributions, central tendency, regression analysis, and probability. The course helps students develop the skills to analyze real-world data and make data-driven decisions.

Prerequisite

- Basic Knowledge of Statistics

Course Learning Outcome

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall and describe key statistical concepts such as frequency distribution, measures of central tendency, variance, correlation, and regression.	K1
CLO2	Understand the principles of statistical techniques and their significance in data analysis.	K2
CLO3	Apply various statistical methods and techniques, including frequency distribution, regression analysis, and probability calculations.	K3
CLO4	Analyze data sets using statistical tools to identify patterns and relationships.	K4

Mapping with Programme Learning Outcomes

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

S- Strong, M-Medium

Syllabus

- Program to find the Frequency Distribution of given data.
- Program to plot Graphs and Charts for data visualization.
- Program to calculate Measures of Central Tendency (Mean, Median, Mode).
- Program to compute Standard Deviation and Variance for a dataset.
- Program to analyze and compute Correlation between two datasets.
- Program to perform Simple Linear Regression on a given dataset.
- Program to calculate the Probability of events in a dataset.
- Program to simulate and analyze Theoretical Distributions.

Pedagogy

Demonstration of working environment / Tools

Course Designers

1. Dr. S. Poongodi
2. Dr. M. Deepa