

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

Nationally Accredited with 'A+' Grade by NAAC

TIRUCHIRAPPALLI

PG DEPARTMENT OF INFORMATION TECHNOLOGY



B.Sc. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

SYLLABUS

2025 -2026 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

PG DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

The department of Information Technology envisions to create technically competent, skilled intellectual IT professionals, efficient problem solvers, innovators and entrepreneurs to meet the current challenges of the modern computing industry.

MISSION

- To provide quality education and elevate the students towards higher educational Programs
- To encourage and guide the students to improve their competency skills in information technology market
- To equip the students to cater the industrial demands through providing advance training

Cauvery College for Women (Autonomous)

B.Sc Artificial Intelligence and Machine Learning

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (CBCS –LOCF)

(For the Candidates admitted from the Academic year 2025-2026 and onwards)

PSO NO	Programme Specific Outcomes Students of B.Sc. Artificial Intelligence and Machine Learning will be able to	POs Addressed
PSO1	Analyze problems, identify key requirements, and define clear specifications to develop effective solutions in par with the expected quality standards for Artificial Intelligence and Machine Learning professional.	PO1
PSO2	Utilize technical skills gained from lab exercises, projects, internships, and value-added programs to tackle complex and interdisciplinary challenges.	PO4
PSO3	Design, Analyze, Interpret and execute AI problems and draw actionable conclusions for strategic decision-making.	PO2
PSO4	Develop ground-breaking ideas in artificial intelligence and machine learning domain to implement real world applications	PO4
PSO5	Adapt to modern platforms to enhance employability, foster entrepreneurship, and pursue higher education opportunities effectively	PO3

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total		
							Hrs	Marks				
								Int.	Ext			
I	I	Language Course - I (LC)	தமிழ் இலக்கிய வரலாறு - I	25ULT1	6	3	3	25	75	100		
			Hindi Ka Samanya Gyan aur Nibandh	23ULH1								
			Poetry, Grammar and History of Sanskrit Literature	23ULS1								
			Foundation Course: Paper I- French – I	23ULF1								
	II	English Language Course- I(ELC)	General English - I	23UE1	6	3	3	25	75	100		
	III	Core Course – I (CC)	Programming in C	25UAM1CC1	5	5	3	25	75	100		
				Core Practical - I (CP)	Programming in C(P)	25UAM1CC1P	3	3	3	40	60	100
				First Allied Course-I (AC)	Linear Algebra and Calculus	25UAM1AC1	4	3	3	25	75	100
				First Allied Course-II (AC)	Probability and Statistics	25UAM1AC2	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-I (AECC)	UGC Jeevan Kaushal- Universal Human Values	25UGVE	2	2		100		100		
Total					30	22				700		
II	I	Language Course-II (LC)	பொதுத் தமிழ் - II	25ULT2	6	3	3	25	75	100		
			Hindi Literature & Grammar – II	22ULH2								
			Prose, Grammar and History of Sanskrit literature	23ULS2								
			Basic French – II	22ULF2								
	II	English Language Course- II(ELC)	General English- II	23UE2	6	3	3	25	75	100		
	III	Core Course – II (CC)	Programming in Python	25UAM2CC2	4	5	3	25	75	100		
				Core Practical - II (CP)	Programming in Python (P)	25UAM2CC2P	2	2	3	40	60	100
				Core Course-III(CC)	Fundamentals of Data Structures	25UAM2CC3	4	3	3	25	75	100
				First Allied Course-III (AC)	Optimization Techniques	25UAM2AC3	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-II(AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100		
				Ability Enhancement Compulsory Course – III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100
		Extra Credit Course	SWAYAM		As per UGC Recommendation							
	Total					30	22				700	

Semester I	Internal Mark: 25		External Mark: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
25UAM1CC1	PROGRAMMING IN C	CORE COURSE – I (CC)	5	5

Course Objectives

- To familiarize the students with the understanding of code organization
- To improve the programming skills
- Learning the basic programming constructs.

Course Outcomes and Cognitive Level Mapping

CO Number	Course Outcome	Cognitive Level
CO1	Outline the fundamental concepts of C programming languages, and its features	K1
CO2	Demonstrate the programming methodology.	K2
CO3	Identify suitable programming constructs for problem solving.	K3
CO4	Select the appropriate data representation, control structures, functions and concepts based on the problem requirement.	K4
CO5	Evaluate the program performance by fixing the errors.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	2	1	2	2	2	3	2
CO2	3	2	3	2	2	3	3	2	3	2
CO3	3	3	3	2	2	3	3	2	3	3
CO4	3	2	3	2	3	2	2	2	3	3
CO5	3	3	3	2	3	3	3	2	2	3

“1” – Slight (Low) Correlation “2” – Moderate (Medium) Correlation
“3” – Substantial (High) Correlation “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	Overview of C: History of C- Importance of C- Basic Structure of C Programs- Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Decision Making and Branching: Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement. Decision Making and Looping: While, Do-While, For, Jumps in loops.Arrays - Character Arrays and Strings.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	User Defined Functions: Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions-Recursion	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Structures and Unions: Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures Pointers: Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Pointers and Structures-	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	File Management in C- Dynamic Memory Allocation- Allocating a Block of Memory- Allocating a Multiple Blocks of Memory-Releasing the used space-Altering the Block of Memory-The Preprocessor-Macro substitution-Bit Level Programming	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	<p>Self Study for Enrichment (Not included for End Semester Examinations)</p> <p>Algorithm- Flowchart- Develop algorithms for real time scenario- Simple expressions- Conversion programs- swapping numbers (with and without using temporary variable).</p> <p>Programs for checking eligibility-Triangle formation-Sum of series-Array manipulations (Sorting, searching, insert, delete and merging)-String handling programs - Employee pay bill preparation, Student mark list using Files.</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
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Textbooks

1. E. Balaguruswamy, (2010), —Programming in ANSI C, Fifth Edition, Tata McGraw Hill Publications.

References

1. Ashok N. Kamthane, Amit Ashok Kamthane (2015). Programming in C, 3rd Edition, Pearson India Education Services Pvt. Ltd.
2. Byron Gottfried, (2010), —Programming with C, Schaums Outline Series, Tata McGraw Hill Publications

Web References

1. <https://www.learn-c.org/>
2. <https://www.cprogramming.com/>
3. <https://www.tutorialspoint.com/cprogramming/index.html>
4. <http://www.programiz.com/c-programming>
5. <http://www.programmingsimplified.com/c-program-examples>

Pedagogy

Chalk and Talk, PPT, Discussion, Assignment, Demo, Quiz and Seminar.

Course Designer

1. Dr. S.Suguna Devi, Associate Professor, Department of Information Technology.

Semester I	Internal Mark: 40		External Mark: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
25UAM1CC1P	Programming in C (P)	CORE COURSE- I (CP)	3	3

Course Objectives

- The Course aims to provide exposure to problem-solving through C programming
- It aims to train the student to the basic concepts of the C -Programming language
- Apply different concepts of C language to solve the problem

Course Outcomes and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Demonstrate the understanding of syntax and semantics of C programs.	K1
CO2	Identify the problem and solve using C programming techniques.	K2
CO3	Identify suitable programming constructs for problem solving.	K3
CO4	Analyze various concepts of C language to solve the problem in an efficient way.	K4
CO5	Develop a C program for a given problem and test for its correctness.	K5

Mapping with Programme Outcomes

COs\ POs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	2	2	3	1	2	3
CO2	3	2	3	2	3	3	2	2	2	3
CO3	3	2	2	2	2	3	3	2	3	2
CO4	3	3	2	3	2	3	3	2	3	3
CO5	3	3	3	2	3	3	3	3	2	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“-” indicates there is no correlation.

Syllabus

1. Programs using Input/ Output functions
2. Programs on conditional structures
3. Programs using Looping structures
4. Programs using Arrays
5. String Manipulations
6. Programs using Functions
7. Recursive Functions
8. Implement Files by using Structures and Pointers
9. Implement a program using various Dynamic memory allocation constructs
10. Program to implement various Bitwise operators.

Text Book

1. E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.

Reference Books

1. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998.
3. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021

Web References

1. <https://www.tutorialspoint.com/cprogramming>
2. <https://www.javatpoint.com/c-programming-language-tutorial>
3. <https://www.w3schools.in/category/c-tutorial>

Course Designer

Dr. S.Suguna Devi, Associate Professor, Department of Information Technology

FIRST ALLIED COURSE – I (AC)
LINEAR ALGEBRA AND CALCULUS
(2025 - 2026 Onwards)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
25UAM1AC1	LINEAR ALGEBRA AND CALCULUS	ALLIED	4	3

Course Objective.

- **Analyze** the concepts of Matrix, Vectors and their applications.
- **Familiarize** with the functions of several variables.
- **Explore** the ideas of Infinite series.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Knowledge Level
CO1	On the successful completion of the course, students will be able to Acquire knowledge in recent developments in various branches of Mathematics.	K1, K2
CO2	Apply the concept to model the problems mathematically.	K3
CO3	Analyze data quantitatively and create the ability to access and communicate mathematical information.	K4
CO4	Classify the solutions of mathematical problem using different techniques.	K5
CO5	Develop a strong base in theoretical and applied Mathematics.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	2	2	3	2
CO2	2	2	2	3	2	2	2	3	3	3
CO3	2	3	3	2	3	2	3	2	2	2
CO4	2	2	3	3	2	3	3	3	2	2
CO5	2	3	2	3	3	2	2	2	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –
“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p>Matrices: Matrices – Matrices Operations – Related Matrices – Rank of a Matrix – Consistency of linear system of equations – Eigen values and Eigen vectors – Properties of Eigen values – Cayley-Hamilton Theorem (proof not needed) – Reduction of quadratic form to canonical form – Nature of Quadratic form – Statement and problems only.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	<p>Infinite Series: Series – General Properties of Series – Series of Positive Terms – Comparison Test – Integral Test – Comparison of ratios – D’Alembert’s ratio test – Cauchy’s root test – Alternating series – Series of positive and negative terms – Statement and problems only.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<p>Functions of Several Variables: Partial derivative – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s theorems for functions of two variables – Applications: Maxima and minima of functions of two variables – Simple problems only.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	<p>Vector Differential Calculus: Scalar and vector point functions – Del applied to scalar point functions – Gradient – Del applied to vector point functions – Physical interpretation of divergence – Del applied twice to point functions– Problems only.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	<p>Vector Integral Calculus: Line integral – Surfaces – Green’s theorem in the plane – Stoke’s theorem – Volume integral – Gauss Divergence theorem – Irrotational and Solenoidal fields – Statement and simple problems only.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	<p>Self -Study for Enrichment: (Not included for End Semester Examination) Reduction to Diagonal form– Further tests of Convergence – Geometrical Interpretation – Del applied to product of point functions – Green’s theorem</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

Text Book

Grewal.B.S., (2014), *Higher Engineering Mathematics, 43rd Edition*, Khanna Publishers, New Delhi.

Chapters and Sections

UNIT-I	Chapter 2: Sections 2.4 to 2.7, 2.10, 2.13 to 2.15, 2.17 to 2.18
UNIT-II	Chapter 9: Sections 9.3 to 9.9, 9.11 to 9.13
UNIT-III	Chapter 5: Sections 5.2,5.4 to 5.7, 5.9
UNIT-IV	Chapter 8: Sections 8.4 to 8.8
UNIT-V	Chapter 8: Sections 8.11 to 8.16,8.18

Reference Books

1. Kenneth Hoffman (2022). Linear Algebra, Phi Learning private limited, New Delhi.
2. Prasun Kumar Nayak (2016). *Linear Algebra Concepts and Applications*, Books and Allied (P) Ltd, Kolkata.
3. Manicavachagom Pillay, T.K. Natarajan, T (2019). *Calculus, Volume I*, S. Viswanathan Pvt Limited.

Web References

1. <https://www.youtube.com/watch?v=4IQxrK9nnd4>
2. <https://youtu.be/Kb8RjeJzD-4>
3. <https://youtu.be/NKzZW1FSZls>
4. https://youtu.be/d_vpRjwR02U
5. https://youtu.be/yO_M888Mnyk

Pedagogy

Chalk and Talk, Power point presentation, Group Discussion, Seminar, Assignment and Quiz.

Course Designer

1. Dr. V. Geetha
2. Dr. P. Sudha

FIRST ALLIED COURSE – II (AC)
PROBABILITY AND STATISTICS
(2025-2026 Onwards)

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs /Week	CREDITS
25UAM1AC2	PROBABILITY AND STATISTICS	ALLIED	4	3

Course Objective

- **Define** the notion of probability, random variables and theoretical distributions.
- **Explore** the fundamental concepts of two-dimensional random variables, sampling tests.
- **Apply** the idea of design of experiments and statistical quality control in various fields.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Define probability, random variables, theoretical distributions, two-dimensional random variables, sampling tests, Design of experiments and Statistical quality control.	K1
CO2	Explain the basic concepts of probability, random variables, theoretical distributions, two-dimensional random variables, sampling tests, Design of experiments and Statistical quality control.	K2
CO3	Apply the various concepts of probability, random variables, theoretical distributions, two-dimensional random variables, sampling tests, Design of experiments and Statistical quality control for solving the problems.	K3
CO4	Solve the problems using probability, random variables, theoretical distributions, two-dimensional random variables, sampling tests, Design of experiments and Statistical quality control.	K3
CO5	Examine the given data and interpret the results.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	2	3	3	3
CO2	3	3	3	3	3	2	3	3	2	3
CO3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	2	3	3	3

“1” – Slight (Low) Correlation → “2” – Moderate (Medium) Correlation →
 “3” – Substantial (High) Correlation → “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	Probability and Random variables Probability - The axioms of probability - Conditional probability – Baye’s theorem – Random variables - The Binomial Distribution - The Mean and the Variance of a Probability Distribution - Continuous Random Variables – The Normal Distribution. (Definitions, Statement of the Theorems and problems only).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	Two-dimensional Random Variables. Joint Distributions: Discrete and Continuous – Moment Generating Functions – The Method of Least Squares – Correlation (omit Correlation and caution and Inference about the Correlation coefficient). (Problems only).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	Testing of Hypothesis Tests of Significance for Large Samples – Sampling of Attributes – Sampling of Variables – Applications of chi-square Distribution: Goodness of fit – Test of Independence of Attributes - Contingency Tables – Applications of t-Distribution: t-test for Single Mean – t-test of Difference of Means – Applications of F-Distribution: F-test for Equality of Two Population Variances. (Problems only).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	Design of experiments Completely Randomized Designs – Randomized-Block Designs – The graphic Presentation of 2^2 and 2^3 experiments.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	Statistical Quality Control Quality Control - Control Charts for Measurements- Control Charts for Attributes - Tolerance Limits.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	Self Study for Enrichment: (Not included for End Semester Examinations) Poisson Approximation to the Binomial Distribution – Critical Region and Level of Significance - Multiple Regressions – 2^n Factorial Experiments – Experimental Designs for Quality.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Richard A.Johnson, Irwin Miller and John Freund. (2017). *Miller & Freund’s Probability and Statistics for Engineers (Fifth Impression)*. Pearson India Education Services Pvt.Ltd.

2. Gupta.S.C and Kapoor.V.K. (2013). *Fundamentals of Mathematical Statistics (11th Edition)*. Sultan Chand & Sons Educational Publishers, New Delhi.

Chapters and Sections

UNIT-I	Chapter 3: Sections 3,4,6,7 [1] Chapter 4: Sections 1,2,4 [1] Chapter 5: Sections 1 & 2 [1]
UNIT-II	Chapter 5: Sections 10 & 11 [1] Chapter 11: Sections 1 & 6 [1]
UNIT-III	Chapter 14: Sections 14.6 – 14.8 [2] Chapter 15: Sections 15.6 (15.6.2 & 15.6.3) [2] Chapter 16: Sections 16.3 (16.3.1 & 16.3.2), 16.6.1 [2]
UNIT- IV	Chapter 12: Sections 2 & 3 [1] Chapter 13: Section 4 [1]
UNIT- V	Chapter 15: Sections 4,5,6,7 [1]

Reference Books

1. Milton J.S. and Arnold J.C. (2007). *Introduction to Probability and Statistics(3rd Edition)*, Tata McGraw Hill.
2. Gupta. S. P. (2017). *Statistical Methods (45th Edition)*. Sultan Chand & Sons, New Delhi.
3. Bhishma Rao.G.S.S. (2011). *Probability and Statistics*. Scitech Publications (India) Pvt. Ltd..

Web References

1. <https://youtu.be/c18FKHUDZv8>
2. <https://youtu.be/ZoaUu6iRE64>
3. <https://youtu.be/71oNiqPoKD8>
4. <https://youtu.be/xTpHD5WLu0A>
5. <https://tinyurl.com/yb57hh5e>
6. <https://tinyurl.com/h3nbyj35>
7. <https://rb.gy/muaxp>

Pedagogy

Power Point Presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designer

1. Dr. S. Vidhya
2. Dr. L. Mahalakshmi

Semester II	Internal Mark: 25		External Mark: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
25UAM2CC2	Programming in Python	Core Course – II	4	5

Course Objectives

- To understand and implement Python programs
- To inculcate hands-on experience in developing Python programs
- To perform data analytics using dataset in Python

Course Outcomes and Cognitive Level Mapping

CO Number	Course Outcome On the successful completion of the course, students will be able to	Cognitive Level
CO1	To define the basics of Python	K1
CO2	To explain the data types, Arrays, Regular expressions and Functions in Python	K2
CO3	To interpret the usage of Operators, Decision making, Control statements and File handling in Python	K3
CO4	To analyze the importance of Exception Handling in Python	K4
CO5	To evaluate the usage of modules and packages in Python	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	1	2	2	1
CO2	3	3	2	3	3	2	3	2	2	2
CO3	3	2	3	2	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3

“1” – Slight (Low) Correlation
“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation
“–” indicates there is no correlation

SYLLABUS

UNIT	CONTENTS	HOURS	COs	COGNITIVE LEVEL
I	Introduction to Python: Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multi-Line Statements - Multiple Statement Group (Suite) - Quotes in Python - Input, Output and Import Functions - Operators. Data Types and Operations: Numbers – Strings – List – Tuple – Set – Dictionary – Data type conversion.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Flow Control: Decision Making – Loops – Nested Loops – Types of Loops. Functions: Function Definition – Function Calling - Function Arguments - Recursive Functions - Function with more than one return value.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Modules and Packages: Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - The dir() function - The reload() function - Packages in Python - Date and Time Modules. File Handling- Directories in Python.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Exception Handling: Built-in Exceptions-Handling Exceptions - Exception with Arguments - Raising Exception - User-defined Exception - Assertions in Python. Regular Expressions: The match() function - The search() function - Search and Replace - Regular Expression Modifiers: Option Flags-Regular Expression Patterns Character Classes-Special Character Classes - Repetition Cases - findall() method - compile() method.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	GUI Programming: Introduction – Tkinter -Widgets – Layout Managers	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self Study for Enrichment: (Not included for End Semester Examination) Object-Oriented Programming: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes- Destructors in Python – Encapsulation - Data Hiding – Inheritance - Method Overriding- Polymorphism	–	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

TEXT BOOKS

1. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Book Publishing Co, 2016.
2. Dr. R. Nageswara Rao, "Core Python Programming", 2018, Dreamtech Press

REFERENCE BOOKS

1. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016

WEB REFERENCES

1. <https://www.youtube.com/watch?v=rfscVS0vtbw>
2. <https://www.youtube.com/watch?v=jcQnTwjttXM>
3. <https://www.youtube.com/watch?v=DmHSwTiD5Tk>
4. <https://www.youtube.com/watch?v=-uNayxaQoU>

PEDAGOGY

Chalk and Talk, Power Point Presentation, Discussion, Assignment, Demo, Quiz and Seminar.

COURSE DESIGNER

Dr.S.Suguna Devi, Associate Professor, Department of Information Technology

Semester II	Internal Mark: 40		External Mark: 60	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
25UAM2CC2P	Programming in Python (P)	Core Practical - II (CP)	2	2

Course Objectives

- Write simple programs using control structures, functions and strings
- Develop programs using tuples, lists, sets and dictionary
- Write simple programs using Constructors, Method overloading and inheritance
- Develop programs using files and regular expressions
- Write simple programs using packages and exception handling

Course Outcomes and Cognitive Level Mapping

CO Number	COURSE STATEMENT	Knowledge Level
CO1	Develop simple programs in Python using data types and variables	K1
CO2	Demonstrate the concepts of Arrays, Functions and Strings	K2
CO3	Make use of Regular Expressions, GUI	K3
CO4	Analyze the usage of Files and its manipulations	K4
CO5	Evaluate the dataset in creating data frames and data visualization	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	1	2	2	1
CO2	3	3	2	3	3	2	3	2	2	2
CO3	3	2	3	2	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	2	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) Correlation

“–” indicates there is no correlation

LAB EXERCISES

1. Simple programs in Python
2. Data types and Operations
3. Array Manipulations
4. Programs using Functions
5. Handling Strings
6. Programs using Lists, Tuples and Dictionaries
7. Executing Regular Expressions in Python
8. GUI programs
9. File Handling
10. Load a dataset and perform the following:
 - Display first few records of the DataFrame
 - Finding Summary of the DataFrame
 - Slicing and Indexing of DataFrame
 - Creating New Columns, Grouping and Aggregating
 - Re-naming columns, Applying operations to Multiple Columns
 - Filtering Records based on Condition
 - Handling missing values
 - Exploration of Data using Visualization

WEB REFERENCES

1. <https://www.geeksforgeeks.org/linux-unix/shell-script-to-perform-operations-on-a-file/>
2. <https://dokumen.pub/open-source-web-development-with-lamp-using-linux-apache-mysql-perl-and-php-020177061x-9780201770612.html>
3. <https://www.sourcecodester.com/srms-makumbusho>

PEDAGOGY

Chalk and Talk, Power Point Presentation, Discussion, Assignment, Demo, Quiz and Seminar.

COURSE DESIGNER

Dr.S.Suguna Devi, Associate Professor, Department of Information Technology

Semester II	Internal Mark: 25		External Mark: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
25UAM2CC3	FUNDAMENTALS OF DATA STRUCTURES	CORE COURSE - III	4	3

Course Objectives

- Understand the fundamental concepts various data structures and the different ways of organizing them
- To acquaint the student with the basics of the various data structures
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes and Cognitive Level Mapping

CO Number	Course Outcome On the successful completion of the course, students will be able to	Cognitive Level
CO1	Define and describe the basic concepts, terminology, and types of data structures.	K1
CO2	Illustrate and explain the operations of linear and non-linear data structures.	K2
CO3	Develop and implement programs using linked lists and their variations to manage dynamic data.	K3
CO4	Analyze tree and graph structures using appropriate traversal and representation techniques.	K4
CO5	Evaluate and design efficient algorithms for applications involving data structures.	K5

Mapping of CO with PO and PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	1	2	2	2	3	3	3
CO2	3	2	3	1	2	3	3	2	3	2
CO3	3	3	3	2	2	3	3	2	2	3
CO4	3	2	3	2	3	2	3	3	3	2
CO5	3	3	2	3	2	3	3	2	2	3

“1” – Slight (Low) Correlation “2” – Moderate (Medium) Correlation
 “3” – Substantial (High) Correlation “-” indicates there is no correlation

SYLLABUS

UNIT	CONTENTS	HOURS	COs	COGNITIVE LEVEL
I	Introduction and Overview: Definitions - Concept of Data Structures- Overview of Data Structures Implementation of Data Structures. Arrays: Definition –Terminology - One-dimensional Array - Multidimensional Arrays.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Stacks and Queues: Fundamentals – Evaluation of Expressions- Multiple Stacks and Queues. Elementary Data Structures: Priority Queues.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Linked Lists: Singly linked lists - Linked Stacks and Queues - The Storage Pool - Polynomial Addition - Doubly Linked Lists.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Trees: Basic Terminology – Binary Trees – Binary Tree Representations – Binary Tree Traversal – Threaded Binary Trees.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Graphs: Terminology and Representations – Traversals, Connected Components and Spanning Trees – Single Source All Destination.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	SELF STUDY: Applications of Trees – All pair shortest paths – Transitive Closure - Topological Sort – Critical Paths.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

TEXT BOOKS

1. Debasis Samanta (2018). Classic Data Structures, Second Edition, PHI Learning Private Limited, New Delhi. (Unit I)
2. Ellis Horowitz, Sartaj Sahni, (2010). Fundamentals of Data Structure, Galgotia Publications. (Unit II, III, & IV, V)
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar, (2009). Computer Algorithms, Universities Press. (Unit II)

REFERENCE BOOKS

1. Alfred V. Aho, John E. Hopcroft Jeffrey D. Ullman (2006). Data Structures and Algorithms, Pearson Education.
2. Seymour Lipschutz (2011). Data Structures with C, McGraw Hill Education, New York.

WEB REFERENCES

1. <https://lpuguidecom.files.wordpress.com/2017/04/fundamentals-of-data-structuresellis-horowitz-sartaj-sahni.pdf>
2. <https://www.slideshare.net/canaokar/fundamentals-of-computer-algorithms-byhorowitz-sahni-rajsekaran>
3. <https://nptel.ac.in/courses/106102064>

PEDAGOGY

Chalk and Talk, PPT, Discussion, Assignment, Demo, Quiz and Seminar.

COURSE DESIGNER

Dr. A. BHUVANESWARI, Associate Professor, Department of Information Technology

FIRST ALLIED COURSE – III (AC)
OPTIMIZATION TECHNIQUES
(2025 - 2026 and Onwards)

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
25UAM2AC3	OPTIMIZATION TECHNIQUES	ALLIED	4	3

Course Objectives

- **Understand** the various features of Optimization Techniques.
- **Analyze** the optimum solutions using Operations Research.
- **Explore** the concepts of Operations Research in real life problems.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Define the various techniques of Operations Research.	K1
CO2	Illustrate the various notions in the respective streams.	K2
CO3	Identify the different terminologies of Operations Research	K3
CO4	Analyze the solutions of mathematical problems using specific techniques.	K4
CO5	Simplify the optimum solutions of a mathematical problem.	K4

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	2	3	3	3	2	3
CO2	3	3	3	2	3	3	3	3	3	2
CO3	3	3	2	3	2	3	2	3	2	2
CO4	3	3	2	3	2	3	3	2	3	2
CO5	3	3	3	2	3	3	3	3	2	2

“1” – Slight (Low) Correlation –

“2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation –

“-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p>Linear Programming Problem - Mathematical Formulation Introduction - Linear programming Problem - Mathematical Formulation of the problem - Illustrations on Mathematical Formulation of LPPs. (Simple problems only)</p> <p>Linear Programming Problem - Graphical Solution and Extension Introduction - Graphical Solution Method - Some Exceptional Cases - General Linear Programming Problem - Canonical and Standard Forms of LPP.</p> <p>Linear Programming Problem - Simplex Method The Computational Procedure: The Simplex Algorithm. (Simple problems only).</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p>Transportation problem Finding an Initial Basic Feasible Solution - Test for Optimality - Degeneracy in Transportation Problem - Transportation Algorithm (MODI method) – Some Exceptional Cases. (Simple problems only).</p> <p>Assignment Problem Introduction - Mathematical Formulation of the Problem- Solution Methods of Assignment Problem- Special Cases in Assignment Problems. (Simple problems only).</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p>Sequencing Problem Introduction - Problem of Sequencing - Basic Terms used in Sequencing - Processing n Jobs through Two Machines - Processing n Jobs through k Machines.</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p>Games and Strategies Introduction - Two-Person Zero-Sum Games – Some Basic Terms – The Maximin-Minimax Principle – Games without Saddle Points – Mixed Strategies – Graphical Solution of $2 \times n$ and $m \times 2$ Games. (Problems Only).</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	<p>Network Scheduling by PERT/CPM Introduction - Network: Basic Components - Logical Sequencing - Rules of Network Construction - Concurrent Activities - Critical</p>	12	CO1, CO2, CO3, CO4,	K1, K2, K3, K4

	Path Analysis - Probability Considerations in PERT.		CO5	
VI	<p>Self-Study for Enrichment (Not included for End Semester Examination)</p> <p>An Overview of Operations Research - Fundamental Properties of Solutions of Simplex Method – The Travelling Salesman Problem – Processing 2 Jobs through k Machines – Dominance Property – Distinction between PERT and CPM.</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Kanti Swarup, P.K. Gupta, Manmohan. (2014) Sixteenth Edition. *Operations Research*, Sultan Chand & Sons, New Delhi.

Chapters and Sections

- UNIT - I Chapter 2: Sections 2:1 – 2:4
Chapter 3: Sections 3:1 – 3:5
Chapter 4: Section 4:3
- UNIT - II Chapter 10: Sections 10:9, 10:10, 10:12, 10:13, 10:15
Chapter 11: Sections 11:1 – 11:4
- UNIT - III Chapter 12: Sections 12:1 – 12:5
- UNIT - IV Chapter 17: Sections 17:1 – 17:6
- UNIT-V Chapter 25: Sections 25:1 – 25:7

Reference Books

1. Hamdy A.Taha (2017), *Operations Research An Introduction*, Pearson India Education Services PVT Ltd.
2. Premkumar Gupta, Hira D.S.(2004), *Operations Research*, S.Chand & Company Ltd, New Delhi.
3. Chandrasekhara Rao.K, Shanti Lata Mishra. (2008), *Operations Research*, Narosa Publishing House PVT Ltd, New Delhi.

Web References

1. <https://www.britannica.com/topic/operations-research>
2. <https://byjus.com/maths/linear-programming/>
3. <https://www.gatexplore.com/transportation-problem-study-notes/>
4. <https://youtu.be/rowWM-MijXU>
5. <https://youtu.be/TQvxWaOnrqI>
6. https://youtu.be/RTX-ik_8i-k
7. <https://youtu.be/s5KZw1EpBEo>

Pedagogy

Power Point Presentation, Group discussion, Seminar, Assignment.

Course Designer

Dr. S. Vidhya