

## SEMESTER-I

**Thanthai Hans Roever College (Autonomous), Elambalur, Perambalur**  
**Bachelor of Computer Applications**



### B.C.A



**Choice Based Credit System – Learning Outcome Based**  
**Curriculum Framework (CBCS – LOCF)**

(For the candidate admitted from the academic year 2025 -2026)

Semester	Part	Course Code	Title of the Course	Int.Hrs / Week	Credits	EndSem Exam Hrs	Max. Marks		
							CIA	ESE	Total
<b>I</b>	I	25UT1/H1	Tamil - I	6	3	3	25	75	100
	II	25UE2	English - I	6	3	3	25	75	100
	III	25UCA1CC1	Python Programming and Data Visualization	6	5	3	25	75	100
		25UCA1CPI	Python Programming and Data Visualization Lab	5	4	3	40	60	100
		25UMA1AC1	Mathematical for Computing	5	4	3	25	75	100
	IV	25UVE	Value Education	2	2	3	25	75	100
			Value Added Course*	--	2*	3	50	50	100*
<b>Total</b>				<b>30</b>	<b>21</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>600</b>

Course Code	Credits	Title of the Course	CC / AC / DE	Category			m.	Max. Marks			
			SE / GS / EVS	Theo.	Tutorial	Lab.		Exam	CIA	ESE	Total.
			VE / VAC	Hrs.	Hrs.	Hrs.					
I	25UT1	3									
		பொதுத்தமிழ்- தமிழ்இலக்கியவரலாறு-I					3 Hrs.	25	75	100	

**Pre-Requisite:** தமிழ்ப் பாடத்தின் அடிப்படை நூல்கள்.ஆசிரியர் வரலாறு.இலக்கணம் ஆகியவற்றை அறிந்திருக்க வேண்டும்

**Course Objectives:**The purpose of learning this course is:

- 1.முதலாம் ஆண்டு பட்டவகுப்பு மாணவர்களுக்குத் தமிழ்மொழி இலக்கியங்களை அறிமுகம் செய்தல்
- 2.தமிழ் இலக்கியப்போக்குகளையும் இலக்கணங்களையும் மாணவர் அறியுமாறு செய்து அவர்களின் படைப்பாற்றலை தூண்டுதல்
- 3.தமிழ்இலக்கியம் சார்ந்த போட்டித்தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்
- 4.பழந்தமிழ் இலக்கிய நயங்களை உணர்த்துதல்
- 5.இலக்கிய ஆளுமைகளை அறிந்துகொள்ளுதல்

**Course Outcomes:**

- 001: சங்க இலக்கியத்தில் காண்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்துகொள்வர்.
- 002: அறஇலக்கியம் மற்றும் தமிழ்க்காப்பியங்களின் வழி வாழ்வியல் சிந்தனைகளைப் பெறுவர் .
- 003: பக்தி இலக்கியங்களை கற்பதன் மூலம் பக்திநெறியினையும் பகுத்தறிவு இலக்கியங்களை கற்பதன் வழி நல்லிணக்கத்தையும் தெரிந்துபின்பற்றுவர்.
- 004: மொழியறிவோடு சிந்தனைத்திறனைப் பெறுவர்
- 005: மொழிபெயர்ச்சிக்கு தேவையான இலக்கணங்களை கற்பர்

**Unit-I** தமிழ்இலக்கியஇலக்கணவரலாறுஅறிமுகம்

15 Hrs.

## I.இலக்கணம்

அ.தொல்காப்பியம்,இறையனார்களவியல்உரை,நம்பியகப்பொருள்,புறப்பொருள் வெண்பாமலை, நன்னூல்,தண்டியலங்காரம்,யாப்பருங்கலக்காரிகைநூல்கள்

ஆ.மொழிப்பயிற்சி ஒற்றுப்பிழை தவிர்த்தல்

வல்லினம் மிகும் இடங்கள்,வல்லினம் மிகா இடங்கள்

ஈ.ரொற்று வரும் இடங்கள் ,ஒரு,ஓர்வரும்இடங்கள்

அது, அஃதுவரும்இடங்கள் ,தான்தாம்வரும்இடங்கள்

பயிற்சி: வல்லினம்மிகும்இடங்கள்,மிகாஇடங்கள்

தவறாக வரும்வகையில் ஒருபத்திகொடுத்து ஒற்றுப்பிழைதிருத்தி எழுதசெய்தல்

2.சங்கஇலக்கியம்

எட்டுத்தொகை,பத்துப்பாட்டு

3.அறஇலக்கியம் -பதினெண்கீழ்க்கணக்குநூல்கள்

4.காப்பியஇலக்கியம்-

ஐம்பெரும்காப்பியங்கள்,ஐஞ்சிறுகாப்பியங்கள்,சமயகாப்பியங்கள்

5.பக்திஇலக்கியம்(பன்னிருதிருமுறைகள்நாலாயிரதிவ்யபிரபந்தம் )

6.பகுத்தறிவுஇலக்கியம்

(சித்தர்இலக்கியங்கள்)புலவர்குழந்தையின்ராவணகாவியம்

Unit-II சங்கஇலக்கியம்

15 Hrs.

எட்டுத்தொகை

நற்றிணை முதல்பாடல் -நின்றசொல்லர்

குறுந்தொகை மூன்றாம்பாடல்-நிலத்தினும்பெரிது

ஐங்குறுநூறு நெல்பல பொழிக பொன்பெரிது சிறக்க (முதல்பாடல்)-வேட்கைபத்து

கலித்தொகை -51 சுடர்தொடிகுகேளாய் -குறிஞ்சிக்கலி

புறநானூறு-தெண்கடல்வளாகம்பொதுமையின்றி,நாடாகொன்றோ- 187

பத்துப்பாட்டு

1. முல்லைப்பாட்டுமுழுவதும்

Unit-III

15 Hrs.

1.திருக்குறள் -அறன்வலியுறுத்தல்அதிகாரம்

2.நாலடியார்பாடல்-(குஞ்சியழகும்)

3.நான்மணிக்கடிகை -நிலத்துக்கு அணி என்ப

4.பழமொழி நானூறு-தம்நடைநோக்கார்

5.இனியவை நாற்பது-இளமை மூப்பு என்று

<b>Unit-IV</b>	காப்பியஇலக்கியம்	5Hrs.
	<ol style="list-style-type: none"> <li>1. சிலப்பதிகாரம்-வழக்குரைக்காதை</li> <li>2. பெரியபுராணம்-பூசலார் நாயனார் புராணம்</li> <li>3. சீறாபுராணம்-மானுக்குப்பிணைநின்ற படலம்</li> <li>4. இயேசுகாவியம்-ஊதாரிப்பிள்ளை</li> </ol>	

<b>Unit-V</b>	பக்திஇலக்கியமும் பகுத்தறிவு இலக்கியமும்	15 Hrs.
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**Text Book(s):**

- 1.மு.வரதராசன்,தமிழ் இலக்கிய வரலாறு,சாகித்ய அகாடமி,புதுதில்லி
- 2.மது.ச.விமலானந்தன்,தமிழ் இலக்கிய வரலாறு,மீனாட்சி புத்தக நிலையம்
- 3.தமிழண்ணல் இலக்கிய வரலாறு
- 4.தமிழ் இலக்கிய வரலாறு முனைவர் சிற்பி பாலசுப்ரமணியம்,நீல.பத்மநாபன்
- 5.தமிழ் இலக்கிய வரலாறு-முனைவர் ப,ச யேசுதாசன்

**Reference Book(s):**

1. தமிழ் இலக்கிய வரலாறு-ஸ்ரீ.குமார்
2. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு-பாக்கியமேரி
3. தமிழ் பயிற்றும் முறை.பேராசிரியர் ந.சுப்புரெட்டியார்,மணிவாசகர் பதிப்பகம்
4. தமிழ் இலக்கிய வரலாறு சு.ஆனந்தன்
5. தமிழ் இலக்கிய களஞ்சியம் -தே.வி.ராஜேந்திரன்

**Web Resources:**

- 1.Tamil Heritage Foundation- [www.tamilheritage.org](http://www.tamilheritage.org)
- 2.Tamil virtual University Library- [www.tamilvu.org/library](http://www.tamilvu.org/library)
- 3.<http://www.chennaiLibrary.com/>
4. <http://www.sirugathaikal.com/>
5. <http://www.noolagam.com/>

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Sem.	Course Code	Credits	Title of the Course	LANGUAGE	Category			Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
I	25UE1	3	<b>GENERALENGLISH–I- Language through Literature and Communication Skills</b>		5	1		3 Hrs.	25	75	100

**Pre-Requisite:**

**Course Objectives:** The purpose of learning this course is:

1. To enable learners to acquire the linguistic competence necessarily required in various life situations.
2. To assist them in developing correct reading habits, silently, extensively and intensively
3. To understand spoken English in various contexts (conversations, lectures, news and media).

**Course Outcomes:**

CO1: On completion of the course, the student will be able to

Acquire self-awareness and positive thinking required in various life situations.

CO2: Acquire the attribute of empathy to improve communicative skills.

CO3: Obtain creative and critical thinking abilities.

CO4: Learn basic grammar for enrich the command of using English language.

CO5: Development and integrate the use of four language skills i.e., listening, speaking, reading and writing.

**Unit-I**

**SELF-AWARENESS & POSITIVE THINKING**

15 Hrs.

**Life Story**

1.1 Chapter 1 from Malala Yousafzai, I am Malala

1.2 An Autobiography or The Story of My Experiments with Truth (Chapters 1, 2 & 3)- M.K. Gandhi

**Poem**

1.3 Where the Mind is Without Fear – Gitanjali 35 – Rabindranath Tagore

1.4 Love Cycle – Chinua Achebe

**Unit-II**

**EMPATHY**

15 Hrs.

**Poem**

1.1 Nine Gold Medals – David Roth

1.2 Alice Fell or poverty – William Wordsworth

**Short Story**

1.3 The School for Sympathy – E.V. Lucas

1.4 Barn Burning – William Faulkner

**Unit-III**

**CRITICAL & CREATIVE THINKING**

15 Hrs.

**Poem**

3.1 The Things That Haven't Been Done Before – Edgar Guest

3.2 Stopping by the Woods on a Snowy Evening – Robert Frost

**Readers Theatre**

3.3 The Magic Brocade – A Tale of China

3.4 Stories on Stage – Aaron Shepard (Three Sideway Stories from Wayside School" by Louis Sachar)

<b>Unit-IV</b>	<b>Part of Speech</b>				15 Hrs.
	4.1 Articles	4.2 Noun	4.3 Pronoun	4.4 Verb	
	4.5 Adverb	4.6 Adjective	4.7 Preposition		
<b>Unit-V</b>	<b>Paragraph and Essay Writing</b>				15 Hrs.
	5.1 Descriptive	5.2 Expository	5.3 Persuasive	5.4 Narrative	
	<b>Reading Comprehension</b>				

Text Book(s):

1. Sachar, Louise "Three Sideway Stories from Wayside School", 2nd edition, Bloomsbury Children's Books, 2021, ISBN-978-1526622075
2. Yousafzai Malala, "I am Malala", Reprint, Little Brown & Co Publisher, 2016, ISBN-978-0316327916
3. M.K. Gandhi, "The Story of My Experiments with Truth", Far-sight Publisher, 2019, ISBN-978-8189297527

Reference Book(s):

1. Rabindranath Tagore, "Gitanjali 35" from Gitanjali (Song Offerings): A Collection of Prose Translations Made by the Author from the Original Bengali. MacMillan, 1913 ISBN-9789382616344
2. Krishnasamy, N., "Modern English: A Book of Grammar, Usage and Composition Macmillan", 1975, ISBN-10:0333905563
3. Shepard Aaron, "Stories on Stage", Shepard Publications, 2017, ISBN-10: 1620355221
4. Nesfield, J.C., "English Grammar Composition and Usage", Macmillan, 2019, ISBN-13: 9780333933787

Web Resources:

1. The Sparrow by Paul Laurence Dunbar <https://poets.org/poem/sparrow-0>
2. A Nation's Strength by Emerson <https://poets.org/poem/nations-strength>
3. [https://www.academia.edu/19855273/Manual\\_of\\_English\\_grammar\\_and\\_composition](https://www.academia.edu/19855273/Manual_of_English_grammar_and_composition)

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Sem.	Course Code	Credits	Title of the Course	CC	Category			Sem. Exam	Max. Marks		
					Lect. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
I	25UCA1CC1	5	Python Programming and Data Visualization		5	1	-	3 Hrs.	25	75	100

**Pre-Requisite:** Basic knowledge of computers, logic, and mathematics is required

**Course Objectives:** The purpose of learning this course is:

1. To understand the core features and syntax of the Python programming language.
2. To develop logical thinking through control structures, functions, and recursion in Python.
3. To apply object-oriented programming concepts for structuring Python applications.
4. To learn file handling, module creation, and exception management in real-time coding.
5. To visualize data using Python libraries and connect Python applications with databases.

**Course Outcomes:**

CO1: Understand and write Python programs using variables, operators, data types, and I/O operations

CO2: Apply decision-making, loops, and user-defined functions including lambda and recursion to solve problems.

CO3: Create and manage modules, handle files and directories, and organize code using packages.

CO4: Implement object-oriented concepts such as classes, inheritance, and polymorphism with error handling.

CO5: Develop simple data visualization applications using libraries like Matplotlib and Pandas and perform basic database operations from Python.

### Unit-I Introduction to Python, Data Types and Operations

12 Hrs.

**Introduction to Python :** Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multiline 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.

### Unit-II Flow Control, Functions

12 Hrs.

**Flow Control:** Decision Making – Loops – Nested Loops – Control Statements – Types of Loops. **Functions:** Function Definition – Function Calling – Function Arguments - Anonymous Functions (Lambda Functions) – Recursive Functions - Function with more than one return value.

### Unit-III Modules and Packages, File Handling

12 Hrs.

**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:** Opening a File - Closing a file - Writing to a File - Reading from a File – File Methods - Renaming a File - Deleting a File - Directories in Python.

### Unit-IV Object Oriented Programming, Exception Handling

12 Hrs

**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. **Exception Handling:** Built-in Exceptions - Handling Exceptions - Exception with Arguments - Raising an Exception - User-defined Exception

### Unit-V Database Programming Data Visualization,

12 Hrs

**Database Programming:** Connecting to a Database-Creating Tables - INSERT Operation - UPDATE Operation - DELETE Operation - READ Operation - Transaction Control - Disconnecting from a Database - Exception Handling in Databases. **Data Visualization** – Elements of Visualization: Various Visualization Tools and Techniques – Selection of Chart Types – Introduction to Matplotlib – Plotting Line, Bar, Pie, Histogram, Scatter, Box, and Area Charts – Customizing Charts: Labels, Legends, Colors – Subplots and Annotations – Using Pandas for Plotting – DataFrame Plotting Functions

**Text Book(s):**

3. Introduction to Computing & Problem Solving Through Python, Jeeva Jose and Sojan P. Lal, Khanna Publishers, 2021, ISBN-13: 978-9382609810
4. Python Data Visualization Essentials Guide, Kalilur Rahman, BPB Publications (First Edition, July 2021)
5. Core Python Programming – Wesley J. Chun (Prentice Hall, 2006)
6. Hands-On Data Visualization: Interactive Storytelling from Spreadsheets to Code – Jack Dougherty & Ilya Ilyankou (O’Reilly, 2021)
7. Matplotlib Cookbook – Srinivasa Rao Poladi (Packt)
8. Allen B Downey. “Think Python: How to Think like a Computer Scientist”, Green Tea Press, version 2.0.17

**Reference Book(s):**

1. Problem solving and Python programming by Ashok Namdev Kamthane & Amit Ashok Kamthane Tata McGraw Hill Publications, 2nd Edition, 2022, ISBN 9390113024
2. Allen B Downey. “Think Python: How to Think like a Computer Scientist”, Green Tea Press, version 2.0.17
3. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2”, Network Theory Ltd., 2021
4. Data Analysis and Visualization Using Python – Dr. Ossama Embarak (Springer, 2022)
5. Python for Data Analysis (3rd Edition) – Wes McKinney (O’Reilly, 2023)

**Web Resources:**

1. <https://www.geeksforgeeks.org/functions-in-python/>
2. [https://www.tutorialspoint.com/python/python\\_database\\_access.htm](https://www.tutorialspoint.com/python/python_database_access.htm)
3. <https://realpython.com/python-mysql/>
4. <https://www.freecodecamp.org/news/python-sql-how-to-use-sql-databases-with-python/>
5. [https://www.tutorialspoint.com/python/python\\_files\\_io.htm](https://www.tutorialspoint.com/python/python_files_io.htm)
6. <https://machinelearningmastery.com/data-visualization-in-python-with-matplotlib-seaborn-and-bokeh/>
7. <https://www.geeksforgeeks.org/data-visualization-python/>
8. <https://www.justintodata.com/python-data-visualization-libraries/>
9. <https://realpython.com/learning-paths/data-visualization-python/>
10. <https://towardsdatascience.com/python-data-visualization-beyond-the-basics-50def26dd6d2>

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HoD

Sem.	Course Code	Credits	Title of the Course	AC/CC/DE/ ES / GS / NME/ PF / PW / VAC/ VE / SE / WK	Category			Sem. Exam	Max. Marks		
					Lect. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
I	25UCA1CP1	4	Python Programming and Data Visualization Lab		-	-	5	3 Hrs.	40	60	100

**Pre-Requisite:**

**Course Objectives:** The purpose of learning this course is:

- 1.To introduce the foundational syntax, operators, and control structures in Python programming.
- 2.To enable students to apply decision-making and iterative constructs in solving mathematical and logical problems.
- 3.To develop the ability to use user-defined functions and modular programming for code reusability and structure.
- 4.To provide practice in manipulating and analyzing strings, numbers, and user inputs effectively.
- 5.To introduce students to data visualization techniques using libraries like Matplotlib for basic data representation.

**Course Outcomes:**

- CO1: Students will be able to perform arithmetic, relational, and logical operations on user-provided inputs using Python.
- CO2: Students will implement control structures and functions to solve real-world problems like factorials, temperature conversion, and palindrome checks.
- CO3: Students will demonstrate the ability to write reusable functions for tasks such as number system conversions and Fibonacci series generation.
- CO4: Students will analyze and process strings and numeric input to compute patterns, such as digit counts, average marks, and text features.
- CO5: Students will be able to create visual representations of data using basic plotting techniques with Matplotlib.

**List of Practical**

**30Hrs**

1. Write a Python program to calculate the sum, product, division, multiplication, and modular division of two numbers entered by the user.
2. a. Write a Python program to check if a given number is even or odd.  
b. Write a Python program to convert temperature in Celsius to Fahrenheit.
3. a. Write a Python program to calculate the factorial of a given number.  
b. Write a Python program to find the area of a triangle given its base and height.
4. a. Write a Python Program to find the simple interest.  
b. Write a python program to swap two numbers using all 3 approaches.
5. Write a program to find the sum of n natural numbers.
6. Write a python program to find the best of two test average marks out of three test's marks accepted from the user
7. Develop a Python program to check whether a given number is palindrome or not and also count the number of occurrences of each digit in the input number.
8. Defined as a function F as  $F_n = F_{n-1} + F_{n-2}$ . Write a Python program which accepts a value for N (where  $N > 0$ ) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed.
9. Develop a python program to convert binary to decimal, octal to hexadecimal using functions.
10. Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters
11. Write a Python program to find the string similarity between two given strings
12. Write a Python program to demonstrate how to draw a Bar Plot using Matplotlib.

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Checked by  
Mr.S.Natarajan

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Sem.	Course Code	Credits	Title of the Course	AC/ AP / CC / CP / DE / EVS/ GS / NME /SE / VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
I	25UMA1AC1	4	<b>Mathematical Computing</b>	AC	5			3 Hrs.	25	75	100

**Pre-Requisite:**

**Course Objectives:** The purpose of learning this course is:

1. Introduce the fundamental concepts of set theory, relations, and functions, and their applications in mathematics and computer science.
2. Develop logical reasoning skills through the study of **propositional logic, logical equivalence, and mathematical induction.**
3. Familiarize students with the basic concepts and operations of **matrices**, solutions of linear systems
4. Introduce **graph theory**, covering various types of graphs, trees, and applications such as spanning trees and shortest paths.
5. Teach the fundamental principles of **finite probability**, including conditional probability, independence, Bayes' theorem, and expected value

**Course Outcomes:**

CO1: Demonstrate understanding of set theory, relations, and functions, and apply them to solve related mathematical problems.

CO2: Apply principles of logic, truth tables, and mathematical induction to construct valid arguments and proofs.

CO3: Perform matrix operations, compute determinants and inverses.

CO4: Understand and apply key concepts in graph theory including Euler and Hamiltonian graphs, spanning trees, and graph traversal algorithms.

CO5: Apply probability rules and techniques to evaluate probabilities, use Bayes' theorem, and compute expected values in finite sample spaces.

**Unit - I Mathematical Logic** 12 Hrs.

Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

**Unit - II Set theory** 12 Hrs.

Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties.

**Unit - III Matrices** 12 Hrs.

Singular matrices – Inverse of a non-singular matrix using adjoint method - Rank of a Matrix – Characteristic equation – Cayley Hamilton's Theorem (proof not needed)– Simple applications only

**Unit - IV Solutions of Simultaneous Linear Algebraic Equations** 12 Hrs.

Gauss Elimination Method– Gauss Jordan Method - Gauss Jacobi - Gauss Seidel Method.

**Unit - V Graph Theory** 12 Hrs.

Introduction - Representing Graphs - Operations on graphs, Directed Graphs - Graph Isomorphism, Paths – Cycles - Euler Graph - Hamilton Graph - Planar Graphs.

**Trees (Basic Concepts Only):** Introduction, Applications of Trees, Spanning Trees, Minimum Spanning Trees

**Text Books:**

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education. (Unit – I & II)
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.(Unit – I & II)
3. T.K. Manickavasagam Pillai & Others, Algebra, VolII, S.V Publications, Pvt.Ltd 2011.(Unit III)
4. S.S.Sastry, “Introductory Methods of Numerical Analysis”, PHI Learning Pvt.Ltd, New Delhi 2010.(Unit – IV)
5. Narsingh Deo, “Graph Theory with Applications to Engineering and Computer Science”. (Unit – V)

**Reference Books:**

1. J.P. Tremblay and R. Manohar Discrete Mathematical Structures with Applications to Computer Science”, Mc Graw Hill Education, 2015
1. Elements of Discrete Mathematics- C. L L IU
2. Discrete Mathematics- a) Semyour Lipschutz, Marc Lipson b) Vinay Kumar.
3. R.S.N. Pillai and Bagavathi, Practical statistics, Second Edition, 2013

**Web Resources:**

1. [https://vemu.org/uploads/lecture\\_notes/17\\_02\\_2023\\_252595088.pdf](https://vemu.org/uploads/lecture_notes/17_02_2023_252595088.pdf)
2. <https://users.encs.concordia.ca/~doedel/courses/comp-232/slides.pdf>
3. [https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads/5/\\_\\_\\_UG\\_B.Sc.\\_Information%20Technology\\_129%2051%20Discrete%20Mathematics\\_BSc-IT\\_Sem%20V\\_8236.pdf](https://mis.alagappauniversity.ac.in/siteAdmin/dde-admin/uploads/5/___UG_B.Sc._Information%20Technology_129%2051%20Discrete%20Mathematics_BSc-IT_Sem%20V_8236.pdf)
4. <https://www2.cs.uh.edu/~arjun/courses/ds/DiscMaths4CompSc.pdf>

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## SEMESTER-II

**Thanthai Hans Roever College (Autonomous), Elambalur, Perambalur**  
**Bachelor of Computer Applications**



## B.C.A



**Choice Based Credit System – Learning Outcome Based**  
**Curriculum Framework (CBCS – LOCF)**

(For the candidate admitted from the academic year 2025 -2026)

Semester	Part	Course Code	Title of the Course	Int.Hrs / Week	Credits	EndSem Exam Hrs	Max. Marks		
							CIA	ESE	Total
<b>II</b>	I	25UT2/H2	Tamil - II	6	3	3	25	75	100
	II	25UE2	English - II	6	3	3	25	75	100
	III	25UCA2CC2	Object Oriented Programming with C++	5	5	3	25	75	100
		25UCA2CP2	Object Oriented Programming with C++ Lab	3	3	3	40	60	100
		25UMA2AC2	Statistical Computing	4	3	3	25	75	100
		25UMA2ACP1	Statistical Computing Lab	2	2	3	40	60	100
	IV	25UCA2NME1	Data Analytics with Excel	2	2	3	25	75	100
		25UES	Environmental Studies	2	2	3	25	75	100
			Value Added Course*	--	2*	3	50	50	100*
<b>Total</b>				<b>30</b>	<b>23</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>800</b>

Sem.	Course Code	Credits	Title of the Course		Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	25UE2	3	<b>GENERALENGLISH-II</b> <b>Language through Literature and Communication Skills</b>	LANGUAGE	5	1		3 Hrs.	25	75	100

**Pre-Requisite:**

**Course Objectives:** The purpose of learning this course is:

1. To achieve a high level of proficiency in all four language skills
2. To make students realize the importance of resilience
3. To enable them to imbibe problem solving skills and To enable them to use tenses appropriately

**Course Outcomes:** On completion of the course, the student will be able to

1. Learn to introduce themselves and talk about everyday activities confidently
2. Be able to write short paragraphs on people, places and events
3. Identify the purpose of using various tenses and effectively employ them in speaking and writing
4. Gain knowledge to write subjective and objective descriptions
5. Identify and use their skills effectively informal contexts.

<b>Unit-I</b>	RESILIENCE <b>Poem</b> 1.1 Don't Quit–Edgar A. Guest 1.2 Still Here–Langston Hughes <b>Short Story</b> 1.3 Engine Trouble – R.K. Narayan 1.4 Rip Van Winkle – Washington Irving	15 Hrs.
<b>Unit-II</b>	DECISION MAKING <b>Short Story</b> 3.1 The Scribe– Kristin Hunter 3.2 The Lady or the Tiger-Frank Stockton <b>Poem</b> 3.3 The Road not Taken–Robert Frost 3.4 Snake– D. H. Lawrence	15 Hrs.
<b>Unit-III</b>	PROBLEM SOLVING <b>Prose life Story</b> 1.1 How I taught My Grandmother to Read– SudhaMurthy <b>Autobiography</b> 3.3 How frog Went to Heaven – A Tale of Angola 3.4 Wings of Fire(Chapters1, 2, 3) by A.P.J Abdul Kalam	15 Hrs.

<b>Unit-IV</b>	TENSES	15 Hrs.
	4.1 Present    4.2Past    4.3 Future    4.4 Concord	
<b>Unit-V</b>	English in the Workplace	15 Hrs.
	5.1 E-mail–Invitation, Enquiry, Seeking, Clarification	
	5.2 Circular                      5.3 Memo                      5.4Minutes of the Meeting	

Text Book(s):

1. Kumar, Ramendra, “*Stories of Resilience*”, Blue Rose Publications, 2020.ISBN 9789389888362.
2. Louise Dempsey, “The Reading Book: A Complete Guide to Teaching Reading” S & L. Publishing, 2019
3. Richa Sharma, “Descriptive English”, Arihant Publications(India)Ltd.,2019, ISBN-9385980777
4. Raymond Murphy, “Essential English Grammar”, 4<sup>th</sup> edition, Cambridge University Press, 2018,ISBN-978-8175960299

Reference Book(s):

- 1.Hewings Martin, “Advanced English Grammar”, Cambridge University Press, 2013, ISBN-978-0-521-731454
2. MoulaShaikh, “Communicative Skills: Practical Approach”, 2011

Web Resources:

1. Langston Hughes.StillHere<https://poetryace.com/im-still-here>
2. R. K. Narayan. Engine Trouble <http://www.sbioaschooltrichy.org/work/Work/images/new/8e.pdf>
3. Washington Irving. Rip Van Winkle <https://www.gutenberg.org/files/60976/60976-h/60976-h.htm>
4. FrankStockton. The Lady or the Tiger <https://www.gutenberg.org/ebooks/396>

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Sem.	Course Code	Credits	Title of the Course	CC	Category			m. Exam	Max. Marks		
					Lect. Hrs.	Tutoria Hrs.	Lab. Hrs.		CIA	ESE	Total.
11	25UCA2CC2	5	Object Oriented Programming with C++		4	1		3 Hrs.	25	75	100

**Pre-Requisite:**

**Course Objectives:** The purpose of learning this course is:

1. To understand the concepts of Object Oriented Programming Language.
2. To distinguish between procedural programming and object oriented programming.
3. To define the concept of data hiding, localization and modularity using classes.
4. To demonstrate the use of virtual functions to implement polymorphism.
5. To Handle Exception Handling Mechanism.

**Course Outcomes:**

CO1: Understand the features, in C++, supporting object oriented programming.

CO2: Understand the concepts of arrays, functions, encapsulation, class and object, constructor and destructor in object- oriented programming

CO3: Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, operator overloading, inheritance and polymorphism

CO4: Understand advanced features of C++ specifically stream I/O and files.

CO5 : Understand advanced features of C++ templates and Exception handling

**Unit-I Object-Oriented Programming, Expression and Control Structures:** 10 Hrs.

**Object-Oriented Programming:** Principles – Benefits of OOP – Application of OOP – Tokens, **Expression and Control Structures:** Tokens – Keywords – Identifiers and Constants – Data types – Constants – Variables – Operators – Manipulators – Expressions – Control Structure.

**Unit-II Functions, Classes and Objects, Constructors and Destructors:** 10 Hrs.

**Functions:** function Prototyping – Call by Reference – Return by Reference – Inline Functions – Default Arguments – const Arguments – Function Overloading – Friend and Virtual Functions. **Classes and Objects :** Class – Member Functions – Arrays with in a Class – Memory Allocation for Objects – Static data members – Static member functions – Arrays of Objects – Objects as Function Arguments – Friendly Functions – Returning Objects – const Member Functions – Pointers to Members. **Constructors and Destructors:** Constructors - Parameterized constructors - Multiple constructors in a class - Constructor with default arguments - Dynamic initialization of Objects - Copy constructor - Dynamic Constructor - Destructors.

**Unit-III Operator Overloading and Type Conversions, Inheritance, Virtual Functions and Polymorphism:** 10 Hrs.

**Operator Overloading and Type Conversions:** Rules for overloading operators – Overloading Unary Operators – Overloading Binary Operators. **Inheritance:** Extending Classes – Derived Classes – Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance – Virtual Base Classes – Abstract Classes, Pointers, **Virtual Functions and Polymorphism:** Pointers – Pointers to Objects –this Pointer – Pointers to Derived Classes – Virtual Functions – Pure Virtual Functions.

**Unit-IV Managing I/O Operations, Working with Files** 10 Hrs.

**Managing I/O Operations:** C++ Streams – C++ Stream Classes – Unformatted I/O and Formatted I/O Operations – Managing Output with Manipulators, **Working with Files:** Classes for File Stream Operations – Opening and Closing a File – Detecting end-of-file – File Pointers and Their Manipulators – Sequential I/O Operations – Updating a File – Error Handling during File Operations – Command Line Arguments

**Unit-V Templates, Exception Handling:** 10 Hrs.

**Templates:** Class Templates – Class Templates with Multiple Parameters – Function Templates – Function Templates with Multiple Parameters – Overloading of Template Functions – Member Function Templates – Non-Type Template Arguments, **Exception Handling:** Basics - Exception Handling Mechanism – Throwing Mechanism – Catching Mechanism – Rethrowing an Exception – Specifying Exceptions.

Text Book(s):

Object Oriented Programming With C++, E. Balagurusamy, McGraw Hill Education Private Limited, 8<sup>th</sup> Edition, 2020.

- **Unit - I Chapter-** (1,2,3)
- **Unit - II Chapter-** (4,5,6)
- **Unit - III Chapter-** (7,8,9)
- **Unit - IV Chapter-** (10,11)
- **Unit - V Chapter-** (12,13)

Reference Book(s):

1. C++ The Complete Reference, Herbert Schildt, 5<sup>th</sup> Edition , 2012.
2. Ashok N Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”, Pearson Education 2003.
3. Maria Litvin& Gray Litvin, “C++ for you”, Vikas publication 2002.
4. Object-Oriented Programming Using C++ by Alok Kumar Jagadev , Amiya Kumar Rath , SatchidanandaDehuri , PHI Learning, 2017

Web Resources:

1. C++ The Complete Reference, Herbert Schildt, 5<sup>th</sup> Edition , 2012.
2. Ashok N Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”, Pearson Education 2003.
3. Maria Litvin& Gray Litvin, “C++ for you”, Vikas publication 2002.
4. Object-Oriented Programming Using C++ by Alok Kumar Jagadev , Amiya Kumar Rath , SatchidanandaDehuri , PHI Learning, 2017

Prepared by

S.Natarajan

Checked by

P.Ramanathan

HoD

Sem.	Course Code	Credits	Title of the Course	AC/CC/DE/ ES / GS / NME/ PF / PW / VAC/ VE / SE / WK	Category			Sem. Exam	Max. Marks		
					Lect. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	25UCA2CP2	3	Object Oriented Programming with C++ Lab			3	3 Hrs.	40	60	100	

**Pre-Requisite:**

**Course Objectives:** The purpose of learning this course is:

1. Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
2. Understand dynamic memory management techniques using pointers, constructors, destructors, etc
3. Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
4. Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
5. Demonstrate the use of various OOPs concepts with the help of programs

**Course Outcomes:**

CO1: Remember the program structure of C with its syntax and semantics(PO1,PO6)

CO2: Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)(PO2)

CO3: Apply the programming principles learnt in real-time problems(PO4,PO7)

CO4: Analyze the various methods of solving a problem and choose the best method(PO6)

CO5: Code, debug and test the programs with appropriate test cases(PO7,PO8)

**List of Practical**

30Hrs

- 1) Program to perform arithmetic, relational, logical, and bitwise operations.
- 2) Program to calculate factorial, check prime number, and Fibonacci series using control structures.
- 3) Program using function overloading and inline functions.
- 4) Program to demonstrate parameterized constructors and copy constructors.
- 5) Program to overload unary and binary operators.
- 6) Program to implement single and multilevel inheritance.
- 7) Program to read contents from a file and display it.
- 8) Program to demonstrate use of file pointers and detecting end-of-file.
- 9) Program using function templates with multiple parameters.
- 10) Program demonstrating basic exception handling using try, throw, and catch.

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Sem.	CourseCode	Credits	Title oftheCourse	AC/ AP / CC /CP / DE /EVS/GS/NME/ SE / VE/VAC	Category			Sem. Exam	Max.Marks		
					Theo. Hrs.	Tutor ial Hrs.	Lab · Hrs.		CIA	ESE	Total.
I	25UMA2AC2	3	StatisticalComputing	AC	4			3 Hrs.	25	75	100

**Pre-Requisite:**

**CourseObjectives:**Thepurposeoflearningthiscourseis:

1. Enablestudentstoclassify,tabulate,andrepresentdatausingdiagramsandgraphs.
2. Familiarizestudentswithmeasuresofcentraltendencyandtheirapplications.
3. Introducemeasuresofdispersionandtheirroleindataanalysis.
4. Explaintheconceptsofcorrelationandregressionwithreal-lifeapplications.
5. Developanalyticalandinterpretativeskillstounderstandandapplystatisticaltools.

**CourseOutcomes:**

CO1:Understandthebasicconceptsofstatistics,typesofvariables,andsourceofdataandpresentdata effectively through classification, tabulation, and graphical tools.

CO2:Calculateandinterpretvariousmeasuresofcentraltendency.

CO3:Computeandcomparedifferentmeasuresofdispersionsuchasrange,standarddeviation,etc.

CO4: Analyze the relationship between two variables using correlation techniques.

CO5:Applyregressionmethodstopredictvaluesandunderstandthetrendindata.

**Unit-I DescriptiveStatistics**

9Hrs.

Definitionof Statistics-ImportanceandScopeofStatistics-Limitationsof Statistics-Frequency Distribution

- ContinuousFrequencyDistribution-GraphicRepresentationofaFrequencyDistribution–Histogram- Frequency Polygon.

**Unit-II Measuresofcentraltendency**

9Hrs.

Arithmetic Mean - Properties of Arithmetic Mean- Merits and Demerits of Arithmetic Mean-GeometricMean - Meritsand DemeritsofGeometric Mean-HarmonicMean-Meritsand DemeritsofHarmonic Mean

- Median-MeritsandDemeritsofMedian-Mode–MeritsandDemeritsofMode

**Unit-III Measures of dispersion**

9Hrs.

Range-QuartileDeviation-MeanDeviation-StandardDeviation-CoefficientofVariation-Meritsand Demerits

**Unit-IV Correlation**

9Hrs.

Introduction–Meaning–ScatterDiagram–KarlPearson’scoefficientofcorrelation –Correlationcoefficient for a Bivariate frequency distribution – Probable error of correlation coefficient - Rank correlation.

**Unit - V Regression**

9Hrs.

Introduction–Linearregression–Curvilinearregression–Regressioncurves.

**TextBooks:**

1. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Edition: 2002, Sultan Chand & Sons publications, New Delhi. (ISBN 81-7014-791-3)

UNIT – I	Chapter – 1 & 2	Sections 1.2 to 1.4 & 2.1 to 2.2
UNIT – II	Chapter – 2	Sections 2.3 to 2.9
UNIT – III	Chapter – 3	Sections 3.3 to 3.8
UNIT – IV	Chapter – 10	Sections 10.1 to 10.6
UNIT – V	Chapter – 10	Sections 10.7 (10.7.1 to 10.7.5)

**ReferenceBooks:**

1. S.P. Gupta, Statistical Methods, Revised Edition 2001.
2. R.S.N. Pillai and Bagavathi, Practical Statistics, Second Edition, 2013.
3. T. Veerarajan, Probability, Statistics and Random processes, 3rd Edition: 2012, Tata McGraw Hill Education Private Limited, New Delhi.
4. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, New Delhi 2010

**Web Resources:**

1. <https://byjus.com/maths/statistics/>
2. [https://www.msuniv.ac.in/images/distance%20education/learning%20materials/ug%20pg/ug//bsc\\_statistics/I%20Year%20-%20DJS1B%20-%20Descriptive%20Statistics.pdf](https://www.msuniv.ac.in/images/distance%20education/learning%20materials/ug%20pg/ug//bsc_statistics/I%20Year%20-%20DJS1B%20-%20Descriptive%20Statistics.pdf)
3. <https://www.youtube.com/watch?v=nmlwSQJmX2M>
4. <https://www.teachmint.com/tfile/studymaterial/class-2nd/statisticalmethods/stat-231-full-printed-notespdf/137a97d0-48c1-4613-b674-d785e52a6e95>
5. <https://mu.ac.in/wp-content/uploads/2021/06/USIT204-Numerical-and-Statistical-methods.pdf>

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Sem.	Coursecode	Credits	TitleoftheCourse	Category			Sem. Exam	Max.Marks			
				AC/ CP / SE/VE / VAC	AP / GS/ NME/ /DE	CC /DE		Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.	CIA
II	25UMA2AP1	2	StatisticalComputingLab	AC			2	3Hrs.	40	60	100

**Pre-Requisite:**

**CourseObjectives:** Thepurposeoflearningthiscourseis:

1. Understandthefundamentalsostatisticalconceptssuchascentralendency,dispersion,correlation,anddata visualization
2. DevelopproficiencyinRprogrammingfordataanalysistasks
3. Applygraphicalandnumericaltechniquestosummarize,analyze,andinterpret data.
4. Evaluatetherelationshipbetweendatasetsusingstatisticaltools
5. Enhanceproblem-solvingskillsthroughhands-onscriptingandplottingexercises

**CourseOutcomes:**

CO1:ApplyRfunctionstocomputemean,median,mode,range,andstandard deviation. CO2: Generate bar charts, pie charts, and histograms to visualize datasets

CO3:Analyzerelationshipsbetweenvariablesusingcovarianceandcorrelation

CO4:Interpretthedistributionandvariabilityofdatausingvisualandnumeric methods

CO5: Develop and test R scripts independently for solving statistical problems

**DevelopaprogramusingtheRProgram**

15Hrs

1. WriteanRprogramtodisplaythemarksof5subjectsusingbarhorizontalbarchart.
2. Givenasetofmarksin4subjects,writeanRscripttorepresentthemasapiechartandadd appropriate Labels and a title.
3. Create an R script to draw a histogramwith labelled axes, custombreaks, and coloured barsfor test scores
4. WriteanRprogramtocalculatethemeanofthefollowingmarks:45,56,78,88,and92
5. WriteanRprogramtofindthemedianofthedataset: 56,68,72,74,and 80.
6. WriteanRprogramtofindthemodeofthevalues:2,4,4,6,7, 4,and 8.
7. WriteanRprogramtofindtherangeof 45,55,60,75,and 90.
8. WriteanRprogramtocomputethestandarddeviationof10,15,20,25,and30.
9. WriteanRprogramtocalculatethecovariancebetween $X=c(1,2,3,4,5)$ and $Y=c(2,4,6,8,10)$ . WriteanRprogramtocalculatethecorrelationcoefficientbetween $x=c(1,2,3,4,5)$ and $y=c(5,4,3,2,1)$ .

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Sem.	Course Code	Credits	Title of the Course	CC / AC/ DE SE / GS / EVS VE / VAC	Category			Sem. Exam	Max. Marks		
					Theo. Hrs.	Tutorial Hrs.	Lab. Hrs.		CIA	ESE	Total.
II	20UCA2NME1	2	Data Analytics with Excel	SE	2	-	-	3 Hrs.	25	75	100

**Pre-Requisite:** Basic computer skills with knowledge of Mathematical Operation

**Course Objectives:** The purpose of learning this course is:

1. Know about Excel worksheet
2. Know how to format spreadsheet.
3. Learn different functions of Excel.
4. Know about advance concepts of MS-Excel
5. Know how to write a macro in MS-Excel

**Course Outcomes: Students can able to**

CO1: Know Excel worksheet, spreadsheet and Excel window and formatting of cell.

CO2: Know spreadsheet tools such as splitting, freezing, copying, pasting etc.

CO3: Know standard mathematical, financial, information functions of Excel, Draw diagrams and graphs using Excel

CO4: Draw summary statistics using Excel

CO5: Know how to sort, filter in MS-Excel and Know lookup, referencing and logical function

**Unit-I Introduction to MS-Excel:**

2 Hrs

**Introduction to MS-Excel:** About Excel and Microsoft, Excel spreadsheet, excel window, title bar, menu bar, standard tool bar, formula bar, workbook and sheets - Selecting rows and columns, inserting / deleting rows and columns, cell, cell address, cell formatting, conditional formatting, hiding/unhiding of columns and rows, use of paste and paste special

**Unit-II Spreadsheet tools:**

2Hrs

**Spreadsheet tools:** moving between spreadsheets, inserting, deleting, renaming spreadsheets, splitting the screen, freezing pane, copying and pasting data between spreadsheets, protecting worksheets - Range, entering information into a range, auto fill functionality using range.

**Unit-III Elementary Statistics using MS-Excel Formula functions:**

2 Hrs.

**Elementary Statistics using MS-Excel Formula functions:** financial functions, date and time functions, information functions, concatenate function, find function, text functions ceiling, floor, round functions, trigonometric functions, elementary Mathematical functions - creating different charts, formatting chart objects - creating pivot tables, properties of pivot tables

**Unit-IV Elementary Statistical functions:**

2Hrs.

**Elementary Statistical functions:** finding arithmetic (average), geometric (geomean), harmonic means (harmean), median (median), mode (mode), partition values (percentile.exc, quartile.exc), coefficients of skewness (skew), kurtosis (kurt).

**Unit-V Advance concepts of MS-Excel:**

2 Hrs.

**A dvance concepts of MS-Excel:** Sorting, filtering, lookup and reference functions, logical functions- Writing macro - advanced statistical functions like count, countif, countblank, maxifs, minifs, frequency, averageif, averageifs, confidence.norm, intercept.

**Text Book(s):**

1. Naveen Mishra, "Excel with Microsoft Excel: Comprehensive & Easy Guide to Learn Advanced MS Excel", ISBN-13978-9389024159
2. Ian Lamont, "Excel Basics In 30 Minutes: The beginner's guide to Microsoft Excel", 2020
3. M L Humphrey, "Excel for Beginners Hardcover", 2019
4. Szasz, "Data Analytics Essentials You Always Wanted To Know", 2022, vibrant, ISBN-13 978-1636511184
5. Ken Bluttman, "Microsoft Excel Formulas & Functions for Dummies", Wiley, ISBN13- 978-9390466733.

**Reference Book(s):**

1. Ritu Arora, "Mastering Advanced Excel", ISBN-13978-9355518651
2. Rick Sterling, "The New Microsoft Office 365 Bible", 2020
3. Alan Murray, "Advanced Excel Formulas: Unleashing Brilliance with Excel Formulas", ISBN- 978-1484271247
4. Jonathan Schwabish, "Data Visualization in Excel: A Guide for Beginners, Intermediates, and Woks", 2023
5. Naveen Mishra, "Excel with Microsoft Excel: Comprehensive & Easy Guide to Learn Advanced MS Excel", ISBN-9 78-9389024159

**Web Resources:**

1. [www.w3schools.com](http://www.w3schools.com)
2. [www.geeksforgeeks.com](http://www.geeksforgeeks.com)
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