RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Rathinam Tech Zone, Eachanari, Coimbatore – 641021.

DEPARTMENT OF INFORMATION TECHNOLOGY

Syllabus for

B.Sc. Computer Technology

(I and II Semester)

2024 – 2025 Batch onwards

Vision and Mission of the Institution

Vision

To emerge as a world-renowned Institution that is integrated with industry to impart Knowledge, Skills, Research Culture and Values in youngsters who can accelerate the overall development of India

Mission

To provide quality education at affordable cost, build academic and research excellence, maintain eco-friendly and robust infrastructure, and to create a team of well qualified faculty who can build global competency and employability among the youth of India

Motto

Transform the youth into National Asset

Vision and Mission of the Department

Vision

To establish a department with global recognition deeply intertwined with the technology sector, facilitating the exchange of knowledge and skills, cultivating a culture of research, and imbuing aspiring computer scientists with values, thereby empowering them to spearhead India's comprehensive technological progress.

Mission

To empower students, nurturing academic and research excellence, while equipping them to utilize technology as a catalyst for innovation, enhancing global competitiveness and employability across diverse fields.

Motto

Industry – Ready Education

Program Educational Objectives (PEO)

PEO1	:	Be successful in top graduate schools and in professional positions within academic & research institutions and industries, and in entrepreneurial and consultancy ventures.
PEO2	:	Contribute their Information Technology expertise effectively as members of technologicalTeams.
PEO3	:	Demonstrate lifelong learning and engagement through continued professional development, and participation and leadership in professional societies and organizations.
PEO4	:	Conduct themselves in a responsible, professional, and ethical manner.
PEO5	:	Emerge as a globally competent and universally employable professional who accelerates the overall development of India.

Mapping of Institute's Mission to PEO

Institute's Mission	PEO's
To provide quality education at affordable cost, build academic and research excellence maintain eco-friendly and robust infrastructure, and	PEO1, PEO2
To create a team of well qualified faculty who can build global competency and employability among the youth of India.	PEO2, PEO5

Mapping of Department Mission to PEO

Department Mission	PEO's
To empower students and cultivate academic and research brilliance	PE01, PE02
Provide them to leverage Technology as a tool for innovation	PEO3
Fostering global competitiveness and employability in diverse field	PE04, PE05
To empower students and cultivate academic and research brilliance	PE01, PE02

Program Outcomes (PO):

PO1 (DisciplinaryKnowledge)	:	Demonstrate knowledge competency in required disciplines in University level courses appropriate to the study program.
PO2 (Problem Analysis)	:	Apply appropriate knowledge and adopt suitable skills to identify, formulate, analyze and solve complex problems in real life situations and reach substantiated conclusions.
PO3 (Investigation)	:	Conduct investigation of complex problems by following scientific approach to knowledge development that include appropriate experiments, analysis, evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; interpretation of data, formulation of coherent arguments and synthesis of information (assumptions, hypothesis or implications) in order to reach valid conclusions.
PO4 (Design of Solutions)	:	Design solutions for complex, open-ended real-life problems and to design systems, components or processes that meet specific needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
PO5 (Modern ToolUsage)	:	Create, select, apply, adapt, and extend appropriate techniques, resources, and modern tools to a range of activities, from simple to complex, with an understanding of the associated limitations.

PO6 (Individualand Team Work)	:	Work effectively and respectfully as a member and leader in teams, facilitate cooperative or coordinated effort, act together as a group or a team in the interests of a common cause and work efficiently, preferably in a multi- disciplinary setting. Possess knowledge of the values and beliefs of multiple cultures and a global perspective. Task mapping, setting direction, building a team, formulating an inspiring vision, motivating and inspiring team members who can help achieve the vision, and guide people to the right destination.
PO7 (Communication)	:	Express complex concepts within the profession and with society at large. Such ability includes listening, speaking, reading and writing, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
PO8 (Professionalism)	:	Understand the professional roles and responsibilities in society, especially theprimary role of protection of the public and the public interest.
PO9 (Environment and Sustainability)	:	Analyze social and environmental aspects of the activities. Such ability includes an understanding of the interactions that has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction ofsuch interactions; and the concepts of sustainable design and development and environmental stewardship.
PO10 (Moral and Ethical Awareness)	:	Embrace moral/ ethical values; formulate a position/ argument about an ethical issue from multiple perspectives and apply professional ethics, accountability and equity.
PO11 (Economics and Project Management)	:	Appropriately incorporate economics and business practices including project, risk, and change management into the practice of the system and to understand their limitations.
PO12 (Life- long Learning)	:	Identify and address their own educational needs in a changing World in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Program Specific Outcomes (PSO):

PSO1	:	Exhibit proficiency in crafting accessible and user-friendly applications and systems tailored to diverse communities
PSO2	:	Comprehend cutting edge technologies, tools, and methodologies used in the tech development process and navigate the dynamically evolving technological terrain.
PSO3	:	Acquire the skills to envision, design, and implement innovative technological solutions, anticipating future trends and develop into a successful tech entrepreneur.

Correlation between the PO/PSO and the PEOs

Program Outcomes		PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
PO 1	:	3	1	3	2	3
PO 2	:	3	2	3	1	3
PO 3	:	1	2	3	3	2
PO 4	:	3	1	3	3	3
PO 5	:	3	3	2	3	1
PO 6	:	2	3	3	2	1
PO 7	:	2	3	1	2	3
PO 8	:	3	2	1	3	1
PO 9	:	2	2	3	2	2
PO 10	:	1	3	1	3	3
PO 11	:	3	2	2	2	1
PO 12	:	3	1	2	2	3
PSO 1	:	2	3	1	1	2
PSO 2	:	3	2	2	3	1
PSO 3	:	2	3	3	3	3
PSO 4	:	3	2	2	2	3
PSO 5	:	3	2	2	3	2

3 – Strong correlation; 2-moderate correlation; 1-Less correlation; Blank-no correlation

Components considered for Course Delivery is listed below:

a. Class room Lecture
b. Laboratory class and demo
c. Assignments
d. Mini Project
e. Project
f. Online Course
g. External Participation
h. Seminar
i. Internship

Mapping of POs with Course Delivery:

Program Outcome	Course Delivery								
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
PO1	2	3	1	1	2	1	3	3	1
PO2	3	2	2	3	3	3	1	2	3
PO3	3	3	1	3	1	1	1	2	2
PO4	2	3	2	3	3	1	1	3	1
PO5	3	2	1	2	1	3	3	3	3
PO6	2	3	3	2	3	1	2	3	3
PO7	2	3	1	3	1	1	2	3	2
PO8	2	2	1	2	3	3	2	3	2
PO9	1	1	2	3	3	3	2	3	3
PO10	2	3	2	3	2	2	2	2	2
PO11	1	1	2	2	2	3	3	2	3
PO12	1	2	3	2	2	2	3	2	3
PSO1	2	3	1	3	2	3	1	3	3
PSO2	3	2	2	3	3	2	2	3	2
PSO3	2	3	3	2	2	3	3	2	3
PSO4	3	2	2	1	3	2	2	1	2

3 – Strong correlation; 2-moderate correlation; 1-Less correlation; Blank-no correlation

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

B.SC. COMPUTER TECHNOLOGY DEGREE PROGRAMME

B. Sc (CT) Curriculum Structure - Regulation – 2024

(For students admitted from 2024-2025 and onwards)

S.No.	Sem	Part	Sub Type	Course Code	Course Name	Credit	Hours	INT	EXT	Total
1	1	1	L1		Language - I	3	5	50	50	100
2	1	2	L2		English - I	3	5	50	50	100
3	1	3	Core		Core Course – I **Theory** Problem Solving Techniques using C	4	5	50	50	100
4	1	3	Core		Core Course – II **Theory / Practical** Programming Lab in C	4	4	50	50	100
5	1	3	Allied		Allied-I Mathematics for Computer Science	4	5	50	50	100
6	1	4	SEC		Skill Enhancement Courses – I Database Management system/ Practical – Database Management system Lab	4	4	50	50	100
7	1	4	AEC		Ability Enhancement Course-I Environmental Studies **or** Universal Human Values & Professional Ethics	2	2	50	0	50
						24	**30**	**350**	**300**	**650**
1	2	1	L1		Language - II	3	5	50	50	100
2	2	2	L2		English - II	3	5	50	50	100
3	2	3	Core		Core Course – III **Theory** Java Programming	4	5	50	50	100
4	2	3	Core		Core Course – IV Theory / **Practical** Java Programming Lab	4	4	50	50	100
5	2	3	Elective		Elective - I Entrepreneurship Development	4	4	50	50	100
6	2	3	Allied		Allied-II Discrete Mathematics	4	5	50	50	100
7	2	4	AEC		Ability Enhancement Course II Design Thinking	2	2	50	0	50
8	2	5	Ext		Extension Activity - I (NASA)	1	0	25	0	25
						25	**30**	**375**	**300**	**675**
1	3	1	L1		Language - III	3	4	50	50	100
2	3	2	L2		English - III	3	4	50	50	100
3	3	3	Core		Core Course – V **Theory** Software Engineering	4	6	50	50	100
4	3	3	Core		Core Course – VI **Theory** / Practical Software	4	4	50	50	100

					Engineering Lab					
5	3	3	Allied		Allied-III Numerical Methods	4	5	50	50	100
6	3	4	SEC		Skill Enhancement Courses – II Scripting Language	4	5	50	50	100
7	3	4	AEC		Ability Enhancement Course III Soft Skill-1	2	2	50	0	50
8	3	3	ITR		Internship / Industrial Training (Summer vacation at the end of II semester activity)	2	0	50	0	50
9	3	5	Ext		Extension Activity - II **(NASA)**	1	0	25	0	25
						27	**30**	**425**	**300**	**725**
1	4	1	L1		Language - IV	3	4	50	50	100
2	4	2	L2		English - IV	3	4	50	50	100
3	4	3	Core		Core Course – VII PHP and MySQL	4	6	50	50	100
4	4	3	Core		Core Course – VIII Theory / **Practical** PHP and MySQL Lab	4	4	50	50	100
5	4	3	Allied		Allied-IV Statistics and Probability	4	5	50	50	100
8	4	3	Elective		Elective - II Data Structures	4	5	50	50	100
7	4	4	AEC		Ability Enhancement Course IV Soft Skill-2	2	2	50	0	50
8	4	5	Ext		Extension Activity - III **(NASA)**	1	0	25	0	25
						25	**30**	**375**	**300**	**675**
1	5	3	Core		Core Course – IX Theory Python Programming	4	6	50	50	100
2	5	3	Core		Core Course – X **Theory** / Practical Python Programming Lab	4	6	50	50	100
3	5	3	Elective		Elective - III Optimization Techniques	4	6	50	50	100
	5	3	PRJ		Project	0	6	0	0	0
4	5	4	SEC		Skill Enhancement Courses – Vue JS	4	6	50	50	100
5	5	3	ITR		Internship / Industrial Training - (Summer vacation at the end of IV semester activity)	2	0	50	0	50
6	5	5	Ext		Extension Activity - IV (**NASA**)	1	0	25	0	25
						19	**30**	**275**	**200**	**475**
1	6	3	Core		Core Course – XI Theory Machine Learning	4	6	50	50	100
2	6	3	Core		Core Course – XII Theory /	4	4	50	50	100

					Practical Machine Learning Lab					
3	6	3	Elective		Elective – IV i) Cryptocurrency And Blockchain Technology	4	6	50	50	100
4	6	3	PRJ		Core Project	8	8	100	100	200
5	6	4	SEC		Skill Enhancement Courses – IV Practical / Training Database Management Systems using MongoDB	4	6	50	50	100
						24	**30**	**300**	**300**	**600**
					Total credit	**144**	**180**	**2100**	**1700**	**3800**

Additional Credits										
S.No.	**Sem**	**Part**	**Sub Type**	**Sub Code**	**Subject**	**Credit**	**Hours**	**INT**	**EXT**	**Total**
1	2	6	VAC		VAC - Microsoft Coe Course	2	2	50	0	50
2	3	6	VAC		Inter Department Course	2	2	50	0	50
3	4	6	IDC		VAC - Microsoft Coe Course	2	2	50	0	50
4	5	6	VAC		VAC - Microsoft Coe Course	2	2	50	0	50

Parts	**Sem I**	**Sem II**	**Sem III**	**Sem IV**	**Sem V**	**Sem VI**	**Total Credits**
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	12	16	15	16	15	20	94
Part IV	6	2	6	4	4	4	24
Part V	-	1	1	1	1		4
Total	**20**	**20**	**28**	**25**	**20**	**24**	**146**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
22BGE11T	Part I Tamil	**3**	**6**	**1**	**0**	**Theory**

Introduction:
பகுதி முதல் பாடமாக அமையும், தமிழ்ப்பாடம் கவிதைகள், இலக்கணம், இலக்கியவரலாறு ஆகியவைகள் கொண்டு அமைந்து உள்ளது. ஐந்து அலகுகளாக பகுக்கப்பட்டுள்ளது.

Course Outcome:

CO1	:	பாரதியார், பாரதிதாசன், சிற்பி, சுரதா ஆகிய கவிதைகளின் விளக்கத்தை மாணவர்கள் அறிந்து கொள்ளுவதால், தன்னம்பிக்கையை வெளிக்கொணரும் வகையில் உள்ளது.
CO2	:	பெண் கவிஞர்களின் படைப்பு கவிதையை அறிவதன் மூலம் வாழ்வியல் செய்திகளையும், யதார்த்த நிலையும் அறிய உதவுகிறது.
CO3	:	எண்ணங்களே ஏணிப்படிகள் -வாழ்வில் வெற்றி பெற வேண்டுமானால் எண்ணங்களை வளர்ந்துக் கொள்ள வேண்டும். சிந்தனையில் மூழ்கினர்ல் தெளிவு கிடைக்கும் என்ற கருத்துக்களை அறியும் வகையில் அமைந்துள்ளது.
CO4	:	படைப்புத்திறனை வெளிப்படும் விதமாகவும், இலக்கணத்தை அறிய பயனுள்ளதாக அமைகிறது.
CO5	:	இலக்கியவரலாறு பற்றியச் செய்திகளைக் கொண்டு அதன் வளர்ச்சி நிலையை அறிவும் வகையில் உள்ளது

Unit I : **[12 periods]**
பாரதியார் - பெண் விடுதலை, பாரதிதாசன் - வீரத் தமிழன், சிற்பி – நிலவுப்பூ, சுரதா - நாடு ஆகியவற்றின் விளக்கம் தருதல்

Unit II: **[12 periods]**
தாமரை - தொலைந்துபோனேன், அ. வெண்ணிலா - நீரிலலையும் முகம் மாலதி மைத்ரி - கன்னியாகுமரி, க்ருஷாங்கினி - புன்னை மரம் ஆகிய பெண் கவிதைகளின் செய்திகளை அறிவதால் வாழ்வியல் சூழலையும், யாதர்த்த நிலையையும் விளக்குதல்.

Unit III: **[12 periods]**
எண்ணங்களே ஏணிப்படிகள் - தெளிவான இலக்கு - ஆற்றல் நதி பெருகட்டும் - அறிவை விரிவு படுத்துக்கள் - முன்னேற்றப் படிகள் - வெற்றிச் சிகரம்- எப்பொழுதும் வெற்றி ஆகியவைகள் வாழ்வின் முன்னேற்றதுக்கான செய்திகள் அறியப்பயன்படும்.

Unit IV: **[12 periods]**
பெயர் சொல், வினைச்சொல், இடைச்சொல், உரிச்சொல், எச்சம் - இலக்கணத்திற்கு விளக்கம் அளித்தல் - படைப்பிலக்கியப் பயிற்சி, கவிதை எழுதல் வானொலித் தமிழ், தொலைக்காட்சித் தமிழ், பயன்பாட்டுத்தமிழ், இலக்கண நோக்கில் பயிற்றுவித்தல் எழுதுதல் கவிதை + வானொலி பேச்சுத்திறன் வளர்த்தல். ஆகியவைகள் கொண்டு திறன் வளர்க்க உதவுதல்.

Unit V: **[12 periods]**
இலக்கியவரலாறு பற்றியச் செய்திகள் மற்றும் புதுக்கவிதைகளின் தோற்றங்கள், வளர்ச்சிகள் அறிவும்
வகையில் உள்ளது. ஹைக்கூ, குக்கூ, சென்ட்ரியூ, கஜல். ஆகியவற்றுக்கு விளக்கம் தருதல்.

Text books:
1. பாரதியார் கவிதைகள், 2. பாரதிதாசன் கவிதைகள், 3. சுரதா கவிதைகள், 4. சிற்பி கவிதைகள்
5. அ. வெண்ணிலா

Reference Books:
1 இலக்கியவரலாறு பாக்கியமேரி, 2. இலக்கண நூல், 3. மு.வ. தமிழ் இலக்கிய வரலாறு

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
23BGE12E	English for Communication-1	4	0	0	4	Theory

Introduction:

To encourage students to inculcate and use effective communication skills in their day-to-day life. To develop the LSRW skills to enhance the culture and thoughts through language **Course Outcome:**

CO1	:	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking, and Writing
CO2	:	Understand the total content and underlying meaning in the context
CO3	:	Form the habit of reading for pleasure and for information
CO4	:	Comprehend material other than the prescribed text
CO5	:	Develop the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.

Unit I : **[12 periods]**

A Patch of Land –Subramanian Bharathi, JRD-Harish Bhat, The Faltering Pendulum- Bhabani Bhattacharya Listening for General and Specific Information, Vocabulary: Synonyms, Antonyms, Word Formation

Unit II: **[12 periods]**

The Sparrow-Paul Lawrence Dunbar, Us and Them-David Sedaris (From Dress your Family in Corduroy and Denium), How I taught my grandmother to read-Sudha Murthy, Appropriate use of /articles and Parts of Speech, Listening to Giving Instructions/Directions

Unit III: **[12 periods]**

A Nation's Strength- Ralph Waldo Emerson, Uncle Podger Hangs a Picture-Jerome K.Jerome Self-Introduction, Greeting, Introducing Others, Error Detection

Unit IV: **[12 periods]**

Love Cycle, The Gold Frame-R.K Laxman, Communication and its types, Close Reading

Unit V: **[12 periods]**

Translation, Dialogue Writing, Free Writing, Sentence Types

Text books:

1. Steel Hawk and other stories by Bhattacharya, Bhabani, New Delhi Sahitya Akademi, 1967
2. How I Taught my Grandmother to Read and Other Stories, Murthy, Sudha, Penguin Books, India, 2004

Reference Books:

1. English in use - A textbook for College Students (English ,Paperback, - T.Vijay Kumar, K Durga Bhavani, YL Srinivas
2. Practical English Usage - 4th Edition By Michael Swan
3. The Art of Civilized Conversation: A Guide to Expressing Yourself with Style and Grace -Margaret Shepherd, Penny Carter, (Illustrator), Sharon Hogan, 2005.

Course Outcomes	**Program Outcomes**											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	3	3	3	3	3	3	3	2	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2	3	2
CO3	3	3	3	2	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2	3	2
CO5	3	2	3	3	3	3	3	2	2	3	3	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - I – Problem Solving Using C	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

This subject covers the C Programming Course. Throughout this course, students will learn the fundamental and advanced concepts of C programming, enabling them to write efficient and reliable programs for various applications.

Course Outcome:

CO1	:	Understand basic C programming concepts and create simple programs confidently.
CO2	:	Use decision-making and looping tools to solve different problems in programming.
CO3	:	Use advanced methods to make decisions and organize data effectively in programs.
CO4	:	Manage input/output operations and files smoothly in programs.
CO5	:	Organize code effectively using functions and pointers to make programs run better.

Unit I : Introduction to C Programming and Basic Constructs [12 periods]

Getting Started with C - The C Character Set - Constants, Variables, and Keywords - Form of a C Program - Compilation and Execution - The First C Program - C Instructions - Types of Instructions - Type Declaration Instruction - Arithmetic Instruction - Control Instructions - Types of Operators.

Unit II: Decision Making and Looping Constructs [12 periods]

Decision Control Instruction: - The if Statement - The if-else Statement - Nested if-else - Use of Logical Operators - The Conditional Operators - **Loop Control Instruction**: - Loops and the while Loop - The for Loop - The do-while Loop - Break and Continue Statements

Unit III: Advanced Decision Making and Data Structures [12 periods]

Case Control Instruction - Decisions using switch - Comparison of switch and if-else Ladder - The goto Keyword - Data Types Revisited - The C Pre-processor - Arrays and Multidimensional Arrays - Strings and String Functions - Structures and Array of Structures- Console I/O Functions

Unit IV: Functions, Modular Programming, and Pointers [12 periods]

Functions - Introduction to Functions - Passing Values between Functions - Scope Rule of Functions - Using Library Functions - Return Type of Function – Pointers - Call by Value and Call by Reference - Introduction to Pointers - Pointer Notation - Pointers and Arrays - Pointers to Functions - Recursion

Unit V: Input / Output Operations and Structures in C [12 periods]

Data Organization - File Operations: Opening a File - Reading from a File - Closing the File - Counting Characters – A File-Copy Program - Writing to a File - File Opening Modes - Text Files and Binary Files - Issues in Input / Output - Operations on Bits

Text books:

1. Yash Avant Kanetkar, “Let us C , Fourteenth Edition, BPB Publication, 2017.
2. E.Balagurusamy, “Programming in ANSI C”, Seventh Edition McGraw Hill, 2017

Reference Books:

1. Byron S Gottfried, “Programming with C”, Fourth Edition, McGraw-Hill, 2018
2. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw-Hill, 2021

Course Outcomes	**Program Outcomes**											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	3	1	3	1	1	1	1	3
CO2	1	3	2	1	1	3	3	1	1	1	1	1
CO3	1	3	3	3	1	2	1	3	3	1	3	1
CO4	1	2	3	3	1	1	1	3	2	3	2	1
CO5	1	2	3	3	1	3	1	3	2	3	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core Practical - I – Programming In C Lab	**4**	**-**	**-**	**6**	**Core Practical**

Introduction:

This subject, C Programming Lab, will equip you with the foundational knowledge to excel in programming with C. Students will learn to effectively utilize basic constructs, implement arrays, manipulate strings, work with pointers, and understand structures and file processing techniques.

Course Outcome:

CO1	:	Understand and apply C programming constructs effectively.
CO2	:	Develop programs in C using basic constructs proficiently.
CO3	:	Implement arrays in C programs for various applications.
CO4	:	Utilize strings, pointers, and functions proficiently in C applications.
CO5	:	Implement structures and file processing techniques effectively in C applications.

1. Create a program that calculates the area of a circle given its radius.
2. Implement a program that determines whether a given year is a leap year or not.
3. Display whether the entered number is an Armstrong number or not
4. Create a program that compares three numbers and prints the largest one.
5. Write a program to print the Fibonacci series up to a certain number of terms using a while loop.
6. Write a program that takes an integer input n and prints a triangle pattern with n rows, where each row contains one more asterisk(*) than the previous row.
7. Write a program to find the sum of elements in a one-dimensional array.
8. Implement a program to count the number of vowels in a given string.
9. Create a program to reverse a given string.
10. Write a function that receives marks received by a student in 3 subjects and returns the average and percentage of these marks. Call this function from main( ) and print the results in main( ).
11. Write a program to swap two numbers using pointers.
12. Write a program to calculate the factorial of a number using a recursive function.
13. Write a program to store and display information about students using structures.
14. Write a program to read data from a file and display it on the screen.
15. Write a program to copy contents of one file to another. While doing so replace all lowercase characters to their equivalent uppercase characters.

Text books:

1. Yashavant Kanetkar , “Let us C” , Fourteenth Edition, BPB Publication, 2017.
2. E.Balagurusamy, “Programming in ANSI C”, Seventh Edition McGraw Hill, 2017

Reference Books :

1. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw-Hill, 2021
2. Byron S Gottfried, “Programming with C”, Fourth Edition, McGraw-Hill, 2018

Course Outcomes	**Program Outcomes**											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	1	2	1	1	1	1	1	1
CO2	1	3	1	1	1	3	1	1	1	1	1	1
CO3	1	1	2	3	3	1	1	1	1	1	2	1
CO4	1	1	1	3	3	1	1	3	1	1	2	1
CO5	1	1	1	3	3	1	1	3	1	1	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Mathematics for Computer Science	**4**	**6**	**0**	**0**	**Allied**

Introduction:

This paper focuses on the Mathematical logic, Relations& Functions, Formal languages and Graph Theories

Course Outcome:

CO1	:	To demonstrate a working knowledge of set notation and elementary set theory with its corresponding set operations and also Venn diagram.
CO2	:	To apply the fundamental concepts of Mathematical Logic and Tautologies.
CO3	:	To apply and understand the fundamental concepts of Relations and Functions.
CO4	:	To demonstrate different traversal methods for graphs.
CO5	:	To demonstrate different methods for trees and its properties.

Unit I : **[12 periods]**

Set theory - Introduction-Basic Definition-Types of sets-Operations on sets-Venn-Euler diagrams-Laws of set theory-Power sets and products-Inclusion and exclusion principle.

Unit II: **[12 periods]**

Mathematical logic - Introduction to propositional logic-Basic logical operations-Tautologies-Contradiction - Predicates and Quantification.

Unit III: **[12 periods]**

Relations-Binary Relations-Set operation on relations-Types of Relations-Partial order relation-Equivalence relation-Composition of relations-Functions-Types of functions-Invertible functions-Composition of functions

Unit IV: **[12 periods]**

Graph theory - Basic terminology-Paths, cycle and connectivity-sub graphs-Types of graphs-Representation of graphs in computer memory.

Unit V: **[12 periods]**

Trees-Properties of Trees- Binary trees- traversing Binary trees – Computer Representation of general trees.

Text books:

1. Discrete Mathematics for Computer Science by Gary Haggard,JohnSchlipf and Sue Whitesides
2. Discrete Mathematics by J.K.Sharma second edition – 2005. Macmillan India Ltd.

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Database Management System	4	5	-	-	**Core Theory**

Course Introduction

This course enables the student skills and knowledge to tackle complex database challenges, optimize database performance, and design efficient database solutions using advanced DBMS and SQL techniques.

Course Outcomes	On completion of this course, students will
CO 1:	To provide a basic introduction about DBMS. To Understand the DBMS.
CO 2:	To Provide an overview of ER Diagrams and the Relational model. To Understand key constraints in DBMS.
CO 3:	Understand the various Normalization and implementations.
CO 4:	Explain DB applications, embedded SQL and overview of storage and indexing.
CO 5:	Understand the concept of ACID properties and Physical Database and Tuning.

Unit I:	**Overview of Database Systems**	**[12 Periods]**

Introduction - Overview of Database Management - What is Database System - History of DBMS - Managing Structured Data - File Systems vs. DBMS - Basics of DBMS – DBMS Architecture -Overview of Relational Model - Database languages – Queries - Transaction Management - Structure & Design of a DBMS - Object Relational and semi-structured DB - Users & Administrators- Client/Server Architecture - Case Study.

Unit II:	**Database Design Models**	**[12 Periods]**

The Relational Model - Relational Calculus - Introduction to Database Design - ER Diagrams – Entities, Attributes and Relationships. Design with ER Model - Conceptual Design for Large Enterprises - UML - Case Study.

Relational Model: The Relational Model Integrity Constraints - Key Constraints – Primary Key Constraints - Foreign Key Constraints - General Constraints - Relational Algebra- Selection and Projection- Set Operation - Relational Calculus - Tuple Relational Calculus- Domain Relational Calculus - Case Study.

Unit III:	**Schema Refinement and Normal Forms**	**[12 Periods]**

DB Design - Normal forms and Atomic Domain- Functional Dependencies and Decomposition - Database Design Process

SQL: SQL queries – Union – Intersect - and Except - Nested Queries – Aggregate Queries- Null values- Joins – Views - Stored Procedures - User defined Functions – Triggers – Transactions - Case Study

Unit IV:	**DB Application Development**	**[12 Periods]**

DB Access from applications – embedded SQL, Cursors, and Dynamic SQL. Introduction to JDBC & SQL/J - Stored Procedures.

Overview of Storage and Indexing: Data on external storage - File Organizations and Indexing - Index Data Structures - Comparison of File Organizations - Indexes and Performance Tuning.

Overview of Query Evaluation: System Catalog - Operator Evaluation - Algorithms for relational operations. Introduction to Query Optimization – Alternative Plans - Case Study.

Unit V:	**Transaction Management**	**[12 Periods]**

Introduction to Transaction - ACID Properties Serializability- Transactions and Schedules - Concurrent Execution of Transactions - Lock-based concurrency control - Transaction support in SQL commit - rollback – save point - Introduction to Crash Recovery.

Physical Database Design and Tuning: Introduction to Physical Database design - Index Selection - Clustering. Overview of Database Tuning - Choices in tuning queries and Views - Case Study

Text Books:

1. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke 3rd Edition, McGraw Hill 2003.
2. Database System Concepts, AbrahamSilberschatz, Henry F.Korth and S.Sudarshan, 5th Edition, McGraw Hill 2006.

Reference Books:

1. Fundamentals of Database Systems, Elmasri and Navathe, 5thEdition, Addison- Wesley, 2007.
2. An Introduction to Database Systems, C.J. Date, A. Kannan, S. Swamynatham, 8th Edition, Pearson education, 2006.

Web Resources:

1. https://www.javatpoint.com/dbms-tutorial
2. https://www.appdynamics.com/topics/database-management-systems

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	2	1	1	1	2	1	1	1
CO2	3	3	3	1	1	3	2	1	2	1	1	1
CO3	3	3	3	1	2	2	1	3	2	1	3	1
CO4	2	1	3	2	1	3	2	3	1	2	2	2
CO5	3	1	3	1	2	2	2	3	2	2	2	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Database Management System Lab	**4**	**0**	**0**	**5**	**Practical**

List of Practical Programs:

1. Practical Based on Data Manipulation.
   • Adding data with Insert, • Modify data with Update, • Deleting records with Delete
2. Practical Based on Implementing the Constraints.
   • NULL and NOT NULL, • Primary Key and Foreign Key Constraint • Unique, Check and Default Constraint
3. Practical for Retrieving Data Using following clauses.
   • Simple select clause, • Accessing specific data with Where, Ordered By, Distinct and Group By
4. Practical Based on Aggregate Functions.
   • AVG, • COUNT, • MAX, • MIN, • SUM, • CUBE
5. Practical Based on implementing all String functions.
6. Practical Based on implementing Date and Time Functions.
7. Practical Based on implementing use of union, intersection, set difference.
8. Implement Nested Queries & JOIN operation.
9. Practical Based on performing different operations on a view.
10. Practical Based on implementing use of triggers, cursors & procedures.

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	2	2	3	1	2	3	2	1	2	1	1	1
CO3	3	3	2	1	1	2	1	3	2	1	2	1
CO4	1	1	3	3	1	2	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course - Foundations of Full Stack Web Development	**2**	**3**	**-**	**0**	**Theory & Practical**

Introduction:

To become knowledgeable about the most recent web development technologies. Idea for creating two tier and three tier architectural web applications. Design and Analyse real time web applications. Constructing suitable client and server-side applications. To learn core concept of both front end and back end programming.

Course Outcome:

CO1	:	Develop a fully functioning website and deploy on a web server.
CO2	:	Gain Knowledge about the front end and back end Tools.
CO3	:	Find and use code packages based on their documentation to produce working results in a project.
CO4	:	Create web pages that function using external data.
CO5	:	Implementation of web application employing efficient database access.

Unit I: **[5 hours]**

Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI Version control - Git &Github HTML, CSS

Unit II: **[5 hours]**

Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format

Unit III: **[5 hours]**

REACT JS: Introduction to React React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication

Unit IV: **[5 hours]**

Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application usingMaven

Unit V: **[5 hours]**

Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud.

Text Book:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett ProfessionalJavaScript for Web Developers Book by Nicholas C. Zakas
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-byStep Guide to CreatingDynamic Websites by Robin Nixon
3. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BYAZAT MARDAN

Reference Books:

1. Full-Stack JavaScript Development by Eric Bush
   Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil

Przeorski , Maciej Czarnecki

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
21T	Part I Tamil	**3**	**6**	**1**	**0**	**Theory**

Introduction:

இரண்டாம் பருவப் பாடத்திட்டம் அற இலக்கியம், சிற்றிலக்கியம், சிறுகதைகள், இலக்கணம், இலக்கிய வரலாறு ஆகியவைகள் கொண்டு உருவாகியுள்ளது.

Course Outcome:

CO1	:	ஆறஇலக்கியத்தில் -நீதிநெறி கருத்துக்களை அறிந்து கொள்ளுவதால், வாழ்க்கையில் பண்புகளை பின்பற்றவும், அறெறிவோடு வாழவும் கருத்துக்கள் உள்ளடங்கி இருப்பதால் பயனுள்ளதாக அமையும்.
CO2	:	சிற்றிலக்கியத்தின் செய்திகளான அறம், விருந்தோம்பல் போன்றவற்றை மாணவர்கள் தெளிவாக அறிந்துகொள்ளுவது, அன்பின் மேன்மை, பண்பு ஆகியவைகளும் அறிந்து கொள்ள முடிகிறது.
CO3	:	அணி இலக்கணம் அறிவதால் இலக்கணத்தின் சிறப்பபையும் முக்கியக்கியத்துவத்தையும் அறியலாம்.
CO4	:	சிறுகதைகளில் உள்ள கதைகளில் உள்ள மையக்கருத்துகளைத் தெரிந்து கொள்ளுவது சமுதாயச் சிந்தனையையும், விழிப்புணர்வும் உருவாக்க உதவுகிறது.
CO5	:	தன்னம்பிக்கை கட்டுரை- தன்னம்பிக்கையே வெற்றி – சிந்தனைகளை தூண்டி செயலாக்கும் நுட்பங்களை அறிந்தல், தானாக வளர்வதற்கான வழிகாட்டி, வெற்றிக்கு வழிகாட்டுவதாக அமைகிறது.

அலகு I : [12 **பாட வகுப்புகள்**]

அற இலக்கியம் : திருக்குறள், அன்புடைமை, அறிவுடைமை, நாலடியார், பழமொழி நானூறு-ஆகியவைகள் நீதியின் கருத்துக்களைக் கொண்டு பாடமாக உள்ளது.

அலகு II : [12 **பாட வகுப்புகள்**]

சிற்றிலக்கியம்: நந்திக்கலம்பகம், சிற்றிலக்கிய உறுப்புகள்- குற்றலாக் குறவஞ்சி – மலைவளம், கலிங்கத்துப்பரணி, காடு பாடியது, அழகர் கிள்ளை விடு தூது, கலிங்கத்துப்பரணி– கோயில் பாடியது, கிள்ளை வயடட தூது ஆகிய சிற்றிலக்கியங்களின் கருத்துக்களைத் தெளிவாக எடுத்துரைத்தல்.

அலகு III: [12 **பாட வகுப்புகள்**]

ஆணி இலக்கம் - சிலேடை அணி, பரியாய அணி, விபாவனை அணி, அதிசய அணி, இலக்கணம் - விளக்கத்துடன் கற்பிக்கப்படும்.

அலகு IV: [12 **பாட வகுப்புகள்**]

சிறுகதைகள் : தேர்ந்தெடுக்கப்பட்ட 4-சிறுகதைகள் - மாணவர்களின் தனித்திறனை வளர்க்கும் பொருட்டு எடுக்கப்படும். சமுதாய செய்திகள் மற்றும் சமுதாய நோக்குப் பற்றி விளக்கம் தருதல்.

அலகு V : [12 **பாட வகுப்புகள்**]

தன்னம்பிக்கை கட்டுரைகள் - தன்னம்பிக்கையே – முன்னேற்றச் சிந்தனைகள்திட்டமிடுதல்- தன்னம்பிக்கை தரும் வெற்றிகள்- வளமூட்டும் வார்த்தைகள்- திறமை தீபம் - ஏற்றுகள்- செயலினில் புதுமை செய்வோம் மாணவர்களுக்கு தன்னம்பிக்கை வளர்க்க உதவும்.

பாடநூல்கள்:

1.பதினெண்கீழ்க்கணக்கு நூல்கள்**, 2.** நந்திக்கலம்பகம்**, 3.** குற்றலாக்குறவஞ்சி**,**
4. கலிங்கத்துப்பரணி

பார்வை நூல்கள் :

1. ஜெயகாந்தன் சிறுகதை, 2. புதுமைப்பித்தன் சிறுகதை, 3. சூடாமணி – சிறுகதை, 4. எஸ். ராமகிருஷ்ணன்- சிறுகதை , 5. மு.வ. -தமிழ் இலக்கிய வரலாறு , 6. டாக்டர் கே.கே பிள்ளை – தமிழக வரலாறு மக்களும் பண்பாடும், 7. பேரா.முனைவர் பாக்யமேரி - இலக்கணம் இலக்கிய வரலாறு மொழித்திறன்.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
22E	**General English**					

Introduction: To encourage students to inculcate and use effective communication skills in their day-to-day life. To develop the LSRW skills to enhance the culture and thoughts through language

Course Outcome:

CO1	:	Learn to introduce themselves and talk about everyday activities confidently
CO2	:	Be able to write short paragraphs on people, places, and events
CO3	:	Identify the purpose of using various tenses and effectively employ them in speaking and writing
CO4	:	Gain knowledge to write subjective and objective descriptions
CO5	:	Identify and use their skills effectively in formal contexts.

12 Hours

Unit I:

1.1 Very Indian Poem in Indian English -Nissim Ezekiel - 1.2 If you Are Wrong Admit it-Dale Carnegie - 1.3 Reading for General and Specific Information (Charts, tables schedules, graphs, etc.) - 1.4 Homonyms, Homophones, Homographs

12 Hours

Unit II:

2.1 Still I Rise- Maya Angelou - 2.2 Kindly Adjust Please- Shashi Tharoor - 2.3 Verbs and Tenses
2.4 Subject Verb Agreement

12 Hours

Unit III:

3.1 Alchemist-Paulo Coelho

12 Hours

Unit IV:

4.1 The Flower- Tennyson - 4.2 The Spoon-Fed Age. W.R. Inge - 4.3 Paragraph Writing - 4.4 Error detection

12 Hours

Unit V:

5.1 On Killing a Tree- Gieve Patel - 5.2 Taking and Note Making - 5.3 Reading news and weather reports
5.4 Precis Writing.

Text books:

1. The Alchemist - Paulo Coelho Harper - 2005

Reference Books:

1 Advanced English Grammar. Martin Hewings. Cambridge University Press, 2000
2. Descriptive English. SP Bakshi, Richa Sharma • 2019, Arihant Publications (India) Ltd.
3. The Reading Book: A Complete Guide to Teaching Reading. Sheena Cameron, Louise Dempsey, S & L. Publishing, 2019.
4. Skimming and Scanning Techniques, Barbara Sherman, Liberty University Press, 2014
5 Brilliant Speed Reading: Whatever you need to read, however ...Phil Chambers

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core – Java Programming	**4**	**4**	**-**	**-**	**Core Theory**

Introduction:

This course presents a conceptual and practical introduction to imperative and object-oriented programming, exemplified by Java.

Course Outcome:

CO1	:	Define the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
CO2	:	Identify the situations of Program Control Statements, Introducing Classes, Objects and Methods of their usages.
CO3	:	Identify String Handling, Arrays, classes, objects, members of a class and the relationships among them needed for a specific problem.
CO4	:	OOP concepts like inheritance, Interface & package in real time situations.
CO5	:	Develop Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access applet, multithreading) K3

Unit I : Java Programming Fundamentals: [12 periods]

The Java Language, the Key Attributes of Object-Oriented Programming, the Java Development Kit, a First Simple Program, Handling Syntax Errors, the Java Keywords, Identifies in Java, the Java Class Libraries Introducing. Data Types and Operators: Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions.

Unit II: Program Control Statements: [12 periods]

Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops. Introducing Classes, Objects and Methods: Class Fundamentals -Objects - Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, constructor types, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.

Unit III: More Data Types and Operators: [12 periods]

Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The Bitwise operators. String Handling: String Fundamentals, The String Constructors, Three String-Related Language Features, String Buffer and String Builder. A Closer Look at Methods and Classes: Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Var args: Variable-Length Arguments.

Unit IV: Inheritance: [12 periods]

Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final keyword. Interfaces: Fundamentals, Creating, Implementing, References, Implementing Multiple Interfaces, Constants, Interface extended, Nested Interfaces. Packages: Fundamentals, Packages and Member Access, Importing Packages, Static Import. Exception Handling: Hierarchy, Fundamentals, Uncaught Exception, Multiple catch clauses, tryblocks, throwing an Exception, finally, throws, Java's Built-in Exceptions.

Unit V: Multithreaded Programming: **[12 periods]**

Multithreaded Programming: fundamentals, thread creation types, Multiple Threads, Thread Priorities, Synchronization, using Synchronization Methods. Enumerations, Auto boxing and Annotations: Enumerations, Java Enumeration are class types, Auto boxing, Annotations (metadata) Generics: Generics Fundamentals Bounded Types, Methods, Constructors, Some Generic Restrictions. Applets: basics - Skeleton, life cycle of applet – applet methods - Passing parameters to Applets.

Text books:

3. Herbert Schildt, Java The Complete Reference, 11th Edition, Copyright © 2019 by McGraw-Hill Education (Publisher).

Reference Books :

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806.
2. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
3. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
4. Anita Seth and B L Juneja, JAVA One step Ahead, Oxford University Press, 2017.

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	3	3	1	1	1	1	1
CO2	2	3	1	1	1	1	2	1
CO3	1	1	1	1	1	1	1	3
CO4	2	3	2	1	1	1	1	1
CO5	1	3	3	3	1	3	1	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Practical – Java Programming lab	**2**	**0**	**0**	**4**	**Practical**

Introduction:

This subject, C Programming Lab, will equip you with the foundational knowledge to excel in programming with C. Students will learn to effectively utilize basic constructs, implement arrays, manipulate strings, work with pointers, and understand structures and file processing techniques.

Course Outcome:

CO1	:	Execute JAVA programs based on simple constructs like arrays, loops, decision statements, functions etc
CO2	:	Incorporate object-oriented concepts like classes, objects, inheritance, polymorphism resembling real time situation.
CO3	:	Demonstrate the use of packages and interfaces
CO4	:	Develop OOP programs containing User created Exception handling & Threading.
CO5	:	Familiarize with Java development Environment such as Eclipse, NetBeans etc. Suggestive list of programs.

1. To find the sum of any number of integers entered as command line arguments
2. To learn use of single dimensional array by defining the array dynamically.
3. To check if a number is prime or not, by taking the number as input from the keyboard
4. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
5. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().
6. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
7. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
8. Write a program to demonstrate the concept of boxing and un-boxing.
9. Create a multi-file program where in one file a string message is taken as input from the user
10. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
11. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages

Write a program DivideByZero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.

13. Write a program to demonstrate priorities among multiple threads.
14. Write a program to generate a window without an applet window using main() function.

Course Outcomes	**Program Outcomes**							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	3	3	1	1	1	1	1
CO2	2	3	1	1	1	1	2	1
CO3	1	1	1	1	1	1	1	3
CO4	2	3	2	1	1	1	1	1
CO5	1	3	3	3	1	3	1	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective I - Entrepreneurial Development	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

To build the necessary competencies and creativity and prepare them to undertake entrepreneurship as a desirable and feasible career option.

Course Outcome:

CO1	:	To know about the role of the entrepreneur in India and around and the globe, understand the benefits and drawbacks of entrepreneurship and students has to avoid them; entrepreneurial failure.
CO2	:	CO2 : The course aims to develop student's ability to create, lead and coordinate projects within the textile and fashion sector. It also intends to provide tools and methods in order to make use of entrepreneurial thinking to develop a business project.
CO3	:	CO3 : Students will be able to define, identify and/or apply the principles of new venture financing, growth financing, and growth financing for existing businesses.
CO4	:	CO4 : To understand process of women entrepreneur and how faced their problems
CO5	:	CO5 : To understand difference between Micro, small and medium Enterprise

Unit I : **[12 periods]**

Entrepreneur – importance- qualities, nature types – difference between entrepreneur and entrepreneurship and economic development – its importance – role of entrepreneurship – entrepreneurial environment.

Unit II: **[12 periods]**

Project management: sources of business idea – project classifications – identifications – formulation and design – feasibility analysis – preparation of project report and presentation. Financial analysis – concept and scope project cost estimate – operating revenue estimate – ratio analysis – investment.

Unit III: **[12 periods]**

Project finance: sources of finance – institutional finance – role of IFC, IDBI, ICICI, LIC, SFC, SIPCOT, commercial bank – appraisal of bank for loans. Institutional aids for entrepreneurship development

Unit IV: **[12 periods]**

The innovation process – the diagnosis – the consultation of group – selecting a strategy preparing the organization setting up the investment. Women entrepreneur – problems face by women entrepreneur – economic impact of women entrepreneur

Unit V: **[12 periods]**

Setting small scale industries – step in setting SSI unit – problems of entrepreneur – sickness in small industries – reason and remedies – Incentives and subsidies role of DICS, SIDCO, NSICS, IRCI, NIDC, SIDBI, SISI, SIPCOT.

Text books:

1. . Robert D. Hisrich, Mathew J Manimala, Michael P Peters, Dean A Shepherd, "Entrepreneurship", McGraw Hill Education, 2014

Reference Books :

2. Bhushan Y.K, "Entrepreneurial Development" Sultan Chand & Sons, Nineteenth Edition -2013.
3. L.M. Prasad, "Entrepreneurial Development", 5th Edition, Himalaya publication, Mumbai – 2006.

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	3	3	3	1	3	1	1	1	3	3	3	1	3
CO2	3	2	3	1	3	1	2	1	3	3	2	2	2
CO3	3	3	3	1	3	1	2	1	3	3	3	1	3
CO4	3	2	3	1	3	1	2	1	3	3	2	3	2
CO5	3	3	3	1	3	1	2	1	3	3	3	2	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Allied-II Discrete Mathematics	**3**	**4**	**1**	**-**	**Core Theory**

Introduction:
To build the necessary competencies and creativity and prepare them to undertake entrepreneurship as a desirable and feasible career option.

Course Outcome:

CO1	:	Students will gain an understanding of the Basic definition of Logics with examples.
CO2	:	Students will gain knowledge of Predicate Logic
CO3	:	Students will be able to implement and evaluate types of Lattices and Boolean Algebra
CO4	:	Students will learn about Pigeon Hole principle and Permutation andCombination
CO5	:	Students will be able to gather information about Formal Languages.

UNIT-I: Propositional Logic: Definition, Statements & Notation, Truth Values, Connectives, Statement Formulas & Truth Tables, Wellformed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Examples.

UNIT-II:
Predicate Logic: Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; The Universe of Discourse, Examples, Valid Formulas & Equivalences, Examples.

UNIT-III: Lattices & Boolean Algebra: Properties of lattices – Lattice as Algebraic System-Sub lattices- lattice Homomorphism- Special Lattices – Boolean Algebra- sub algebra- Boolean Expression and Boolean functions- expression of a Boolean function in canonical formlogic Gates- Karnaugh Map Method

UNIT – IV: Basics of Counting: The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations, Inclusion-Exclusion Principle.

UNIT-V: Formal Language: Introduction- Phrase –Structure Grammar- Types – BNF- Finite state Machine – Input output stringsFinite state Automata

Reference Books :

1. Discrete Mathematical Structures with application to Computer Science, Tremblay and Manohar – (Tata McGraw Hill, New Delhi) 1997. 2. Discrete mathematics, Venkataraman .M.K. and others –2000 The National Publishing Company

Course Outcomes	Program Outcomes								
	P01	**P02**	**P03**	**P04**	**P05**	**P06**	**PS01**	**PS02**	**PS03**
CO1	3	1	3	2	1	1	3	3	3
CO2	1	3	2	2	1	1	3	3	2
CO3	3	2	1	2	1	1	3	3	2
CO4	2	2	3	2	1	1	3	3	2
CO5	3	2	1	2	1	1	3	3	2

Subject	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Code						
	Value Added Course - IoT Essentials: A Beginner's Guide	**2**	**3**	**-**	**-**	**Theory & Practical**

Unit I: Introduction to IoT and Development Setup **[5 Hours]**

Introduction to IoT: Overview and applications of IoT. - Setting Up the Development Environment: Installing and configuring Arduino/Raspberry Pi. - Basic programming (C/C++, Python) - Basic Concepts and Practices: Blinking an LED - Reading a button press.

Unit II: Working with Basic Sensors **[5 Hours]**

Humidity and Smoke Sensors: -Interfacing with humidity and smoke sensors - Light and Distance Sensors: Interfacing with light sensors - Interfacing with distance sensors.

Unit III: Display Modules and Additional Sensors **[5 Hours]**

LCD Display - Displaying data on an LCD screen - Vibration and Tilt Sensors: Basics and interfacing. RFID and Touch Sensors - Interfacing with RFID and touch sensors.

Unit 4: Advanced Sensors and Actuators: **[5 Hours]**

Weight and Soil Moisture Sensors - Interfacing with weight sensors - Interfacing with soil moisture sensors - Interfacing Water Pumps: Controlling water pumps.

Unit 5: Data Collection, Cloud Integration, and Security: **[5 Hours]**

Data Logging and Cloud Integration - Storing sensor data locally and remotely. - Introduction to cloud services for IoT - Security in IoT - Basics of IoT security.

Text books:

1. Bahga, Arshdeep, and Vijay Madisetti. Internet of Things: A hands-on approach. Vpt, 2014.

Reference Books:

1. Buyya, Rajkumar, and Amir Vahid Dastjerdi, eds. Internet of Things: Principles and paradigms. Elsevier, 2016.

Subject	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Code						
31T	Part I Tamil	**3**	**6**	**1**	**0**	**Theory**

Introduction: மூன்றாம் பருவப் பாடத்திட்டம் சிறுகதை, வானொலி, தொலைக்காட்சி, கணிப்பொறி,
மொமிப்பெயர்ப்பு ஆகியவைகள் கொண்டு உருவாகியுள்ளது.

Course Outcome:

CO1	:	சிறுகதை எழுதுதல்- சிறுகதையின் வடிவம் மையக்கதாபாத்திரம். பயனுள்ளதாக அமையும். சிறுகதை இலக்கணம் அறிதல், தலைப்பு, கதைக்களம் சிறுகதையின் அமைப்பு அறிந்து கொள்ள முடிகிறது.
CO2	:	வானொலியில் இடம் பெறும் நிகழ்ச்சிகள் - தமிழ் சார்ந்த பேச்சு, விவாதம், மாணவர்கள் அறிந்து கொள்ள பயன் உள்ளது.
CO3	:	தொலைக்காட்சியின் இயல்பு-தொலைக்காட்சியின் நன்மைகள், நிகழ்ச்சி தயாரிக்கும் முறை- நிகழ்ச்சி ஒருங்கிணைப்புகள், நிகழ்;ச்சி நடத்துதல்.
CO4	:	கணிப்பொறி வரலாறு- கணிப்பொறி வகைகள்,. கணிப்பொறி பயன்பாடுகள் ஆகியவைகள் மாணவர்களுக்கு பயனுள்ளது.
CO5	:	மொழிப்பெயர்ப்;பு வரலாறு, மொழிபெயர்ப்பு இயல்புகள் மற்றும் முக்கியத்துவம் பற்றித் தெளிவாக புரிந்து கொள்ள முடியும்.

அலகு I : [12 **பாட வகுப்புகள்**]
சிறுகதை எழுதுதல் - சிறுகதையின் வடிவம். மையக்கதாபாத்திரம், எதிர் கதாபாத்திரங்கள். சிறுகதை இலக்கணம் அறிதல், தலைப்பு கதைக்களம் சிறுகதையின் அமைப்பு சிறுகதை பயன்பாடு, சிறுகதையின் தொடக்கம் தெளிவுரையுடன் விளக்கம் கொடுத்து கற்பிக்கப்படும்.

அலகு II : [12 **பாட வகுப்புகள்**]
வானொலி வரலாறு. வானொலி பயன்பாடு, வானொலியில் இடம் பெறும் நிகழ்ச்சிகள் - தமிழ் சார்ந்த பேச்சு, விவாதம்,பட்டிமன்றம். வானொலியில் கல்வி ஒலிபரப்பு, வேலைவாய்ப்பு, வேளாண்மை நிகழ்ச்சிகள், மருத்துவக் குறிப்புகள் ஆகியவைகள் பற்றி விளக்கம் மற்றும் பேச்சுக்கலைகள் வளர்க்க கற்றுக்கொடுக்கப்படும்.

அலகு III: [12 **பாட வகுப்புகள்**]
தொலைக்காட்சியின் வரலாறு-தொலைக்காட்சி தன்மைகள், இயல்பு, நன்மைகள், நிகழ்ச்சி தயாரிக்கும் முறை-நிகழ்ச்சி ஒருங்கிணைப்புகள், நிகழ்ச்சி நடத்துதல். தொலைக்காட்சி வர்ணனைகள் விருதுகள், நிகழ்ச்சிகள் ஆகியவைகள் பற்றி விளக்கம் தருதல்.

அலகு IV: [12 **பாட வகுப்புகள்**]
கணிப்பொறி வரலாறு- கணிப்பொறி வகைகள், கணிப்பொறி பயன்பாடுகள், மாத.
நாட்காட்டி தயாரித்தல் விளம்பரம் உருவாக்கம், மதிப்பெண் பட்டியல் தயாரித்தல், கணினி கலைச்சொல்லாக்கம் விளக்கம் கொடுத்து கற்பிக்கப்படும்.

அலகு V : [12 **பாட வகுப்புகள்**]
மொழிப்பெயர்ப்பு வரலாறு, இயல்புகள் பயன் ஆகியவைகள் அறிந்து கொள்ள பயிற்சிகள் கொடுத்து கற்பிக்கப்படும்.

பாடநூல்கள்:

1. எழுதுவது எப்படி- மகரம் வாசகர் வட்டம், **2.** தமிழ் இணைய இதழ்கள் - அண்ணா கண்ணன்
3. .மொழிபெயர்ப்புக்கலை : மு.வளர்மதி, **4.** மொழிபெயர்ப்பியல் : சு.சண்முக வேலாயுதம்,
5. மொழி பெயர்ப்பும், சொல்லாக்கமும் தென்புலோலியூர், மு.கணபதிப்பிள்ளை

Subject	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Code						
32E	**General English**					

Introduction: To encourage students to inculcate and use effective communication skills in their day-to-day lives. To develop the LSRW skills to enhance the culture and thoughts through language

Course Outcome:

CO1	:	Broaden their outlook and sensibility and be acquainted with cultural diversity and divergence in perspectives.
CO2	:	Be updated with basic informatics skills and attitudes relevant to the emerging knowledge society
CO3	:	Produce grammatically and idiomatically correct language
CO4	:	Gain knowledge in writing techniques to meet academic and professional needs
CO5	:	Be equipped with sufficient practice in Vocabulary, Grammar, Comprehension and Remedial English from the perspective of career-oriented tests.

[12 Hours]

Unit I:

1.1 The Voice of the Mountains -Mamang Dai - 1.2 Romeo & Juliet- The Balcony Scene - 1.3 Writing Letters and Emails - 1.4 Data Interpretation and Reporting

[12 Hours]

Unit II:

2.1 Sita- Toru Dutt - 2.2 Macbeth-Banquet Scene - 2.3 Writing and messaging on Social Media Platforms (blogs, Twitter, Instagram, Facebook)

[12 Hours]

Unit III:

3.1 A Song of Hope- Oodgeroo Noonuccal - 3.2 Julius Caesar- Murder Scene - 3.3 Tryst with Destiny- Jawaharlal Nehru - 3.4 Learning netiquette, email etiquette

[12 Hours]

Unit IV:

4.1 In an Artist's Studio- Christina Rossetti - 4.2 Yes, We Can Barack Obama - 4.3 Meeting Etiquettes- Language, dress code, voice modulation. - 4.4 Online Meetings- Terms and expressions used - 4.5 Framing Questions

[12 Hours]

Unit V:

5.1 You've Got to Find What You Love- Steve Jobs - 5.2 Group Discussion - 5.3 Conducting and participating in meetings - 5.4.Voices

Text books:

1. Arden Shakespeare Complete works by Shakespeare (Author), William (Author), Bloomsbury, 2011

Reference Books :

1. The Shakespeare Book. Big Ideas Simply Explained, Stanley Wells et al. DK Publishing, 2015
2. Famous Speeches by Mahatma Gandhi, Creatingspace Independent Publishing Platform,2016
3. How to Build a Professional Digital Profile Kindle Edition
4. by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5. Keys to Teaching Grammar to English Language Learners, Second Ed.: A Practical Handbook by Keith S Folse, Michigan Teacher Training, 2016
6. 5. Role Play-Theory and Practice. Krysia M Yardley-Matwiejczuk, SAGE Publications Ltd, 1997

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Software Engineering	4	4	0	0	Theory

Introduction:
This Subjects deals with the concept of present the role of software, system analysis, design concepts, testing methods and strategies.

Course Outcome:

CO1	:	This gives the Knowledge about various models in software engineering.
CO2	:	It gives the brief description about requirements
CO3	:	To understand knowledge about Planning.
CO4	:	To analyze various testing in software testing
CO5	:	It deals the concept of Maintenance.

UNIT I **[12 periods]**
The Evolving Role of Software – Definition of Software Engineering – The Changing Nature of Software – Software Myths – Terminologies – Software Life Cycle Models: Build and Fix Model – Evolutionary Process Models – Selection of a Life Cycle Model.

UNIT II **[12 periods]**
Requirements: Analysis and Specifications: Type of Requirements–Feasibility Studies–Requirement Elicitation: interviews, brain storming sessions, FAST – Requirement analysis: Data flow diagram, Data Dictionaries - Requirements Validation

UNIT III **[12 periods]**
Project Planning: Size Estimation–The Constructive Cost Model (COCOMO)–ThePutnam Resource Allocation Model.

UNIT IV **[12 periods]**
Software Design: Design: Conceptual and Technical designs, Objectives of design–Modularity - Function Oriented Design – Software reliability: Basic concepts, software reliability, maturity levels.

UNIT V **[12 periods]**
Software Testing: A Strategic Approach to Software Testing – Testing – Functional Testing – Structural Testing – Levels of Testing – Validation Testing. **Software Maintenance:** Categories of Maintenance–Problems during Maintenance–Maintenance is Manageable – Potential Solutions to maintenance problems – Maintenance process –Estimation of maintenance cost.

Text Book:
1. K.K.Aggarwal, Yogesh Singh, "Software Engineering", New Age International Publishers, Jan 2008

Reference Book:
2. Richard e.Fairley “Software Engineering Concepts”, , McGrawHill,2012.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	PO2	P03	P04	P05	P06	P07	P08
CO1	1	3	3	1	1	1	1	1
CO2	2	3	1	1	1	1	2	1
CO3	1	1	1	1	1	1	1	3
CO4	2	3	2	1	1	1	1	1
CO5	1	3	3	3	1	3	1	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Software Engineering Lab	**2**	**0**	**0**	**4**	**Practical**

Introduction: Understand the basic ideas and its usage of key diagrams in Software Engineering.

Course Outcome:

CO1	:	To Understanding the Requirement tasks.
CO2	:	To Understanding the Requirement analysis and SRS.
CO3	:	To Implement a DFD and Structured chart.
CO4	:	To Understand and Implement the concept of Use case Diagram
CO5	:	To Understand and Implement the concept of Class Diagram & Object Diagram.

Lab Experiments:

1. To assign the requirement engineering tasks
2. To perform the system analysis : Requirement analysis, SRS
3. To perform the function oriented diagram : DFD and Structured chart
4. To perform the user's view analysis : Use case diagram
5. To draw the structural view diagram : Class diagram, object diagram

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	**Program Outcomes**							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	3	2	2	1	1	1	1
CO2	1	3	2	2	1	1	1	1
CO3	1	3	3	2	1	1	1	1
CO4	1	3	3	2	2	1	1	1
CO5	1	3	3	2	3	2	1	1

Subject Code	**Subject Title**	**Credit**	**Lecture**	**Tutorial**	**Practical**	**Type**
	Allied – NUMERICAL METHODS	**4**	**4**	**0**	**0**	**Theory**

Introduction:
This Subjects deals with the concept of present the role of software, system analysis, design concepts, testing methods and strategies.

Course Outcome:

CO1	:	To demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problem
CO2	:	To apply numerical methods to obtain approximate solutions to mathematical problems
CO3	:	To analyse and evaluate the accuracy of common numerical methods
CO4	:	To analyse error obtained in the numerical solution of the problem
CO5	:	To apply numerical methods in modern scientific computing with finite precisioncomputation.

UNIT I **[12 periods]**

Solutions of algebraic and transcendental equations: Introduction – Bisection method – The Iteration method – Newton-Raphson Method – Ramanujan's method.

UNIT II **[12 periods]**

Interpolation – Errors in Polynomial interpolation, Finite differences, Differences of a polynomial, Newton's forward and backward interpolation, Central differences, Gauss, Stirling, Bessel's and Everett's Formulae, Lagrange's Interpolation formula.

UNIT III **[12 periods]**

Linear systems of equations: Consistency of Linear System of equations, Solutions of Linear Systems by direct method: Gaussian elimination, Gauss Jordan, solution of tridiagonal systems, Solutions of linear systems by iterative methods: Jacobi method, Gauss-Seidel method.

UNIT IV **[12 periods]**

Numerical integration: Trapezoidal rule – Geometrical interpretation and error of Trapezoidal rule – Simpson's one third rule and three eighth rule formulae - Romberg integration.

UNIT V **[12 periods]**

Numerical solution for ordinary differential equation-Solution of first order ODE by Taylor series method – Solution of first order ODE by Euler method – Error estimates for the Euler method – Modified Euler method – Runge-Kutta method of second, third and fourth order

Text Book:

1. Introductory Methods Numerical Analysis, S. S. Sastry Fifth Edition, Prentice-Hall Of India.

Reference Book:

1. Venkataraman M.K., "Numerical methods in Science and Engineering", National Publishing Company, Revised Edition, 2005.
2. Kandasamy P., "Numerical Methods", S.Chand and Co, Reprint 2010
3. M.K.Jain., Iyengar. S.R.K., Jain R.K., "Numerical Methods for Scientific and Engineering Computation", (6th Edition), New Age International, 2012.

Subject	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Code						
	Skill - Scripting Language	**4**	**6**	**-**	**-**	**Skill**

Introduction:

All scripting languages are programming languages. The scripting language is basically a language where instructions are written for a run time environment. They do not require the compilation step and are rather interpreted. It brings new functions to applications and glue complex system together.

Course Outcome:

CO1	:	To understand the concepts and architecture of the World Wide Web
CO2	:	To understand and practice embedded dynamic scripting on client side Internet Programming
CO3	:	· To understand and practice web development techniques on client-side
CO4	:	· To explain concept of Java Script for developing web applications
CO5	:	· To explain the working of LAMP server for executing PHP Applications

Unit I: Introduction toWWW **[12 periods]**

Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response –– Generation of dynamic web pages.

Unit II: UI Design **[12 periods]**

Markup Language (HTML): Introduction to HTML and HTML5 - Formatting and Fonts – Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames-HTML Forms. Cascading Style Sheet (CSS): The need for CSS, Introduction to CSS – Basic syntax and structure -Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds – Manipulating text - Margins and Padding - Positioning using CS.

Unit III : Introduction to JavaScript **[12 periods]**

Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements - Functions - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling- Controlling Windows & Frames and Documents - Form handling and validations

Unit IV: Advanced JavaScript **[12 periods]**

Browser Management and Media Management – Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes – JSON - jQuery and AJAX.

Unit V: Lamp Server **[12 periods]**

Introduction - How web works - Setting up the environment (LAMP server) - Programming basics - Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML Establishing connectivity with MySQL database.

Text books:

David Flanagan, 2013, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media,
Achyut S Godbole and Atul Kahate, 2012. "Web Technologies", Second Edition, Tata McGraw Hill.

Reference Books:

Thomas A Powell, Fritz Schneider, 2011. "JavaScript: The Complete Reference", Third Edition,Tata McGraw Hill
Steven Holzner, 2008. "The Complete Reference - PHP", Tata McGraw Hill,
Mcgrath Mike, "PHP & MySQL", In Easy Steps Limited

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	3	3	3	1	3	1	1	1	3	3	3	1	3
CO2	3				3	1	2	1					
CO3	3	3	3				2	1	3	3	3		
CO4	3		3	1							2		
CO5	3	3	3	1	3	1	2				3	2	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course - Understanding Blockchain	2	3	-	-	Theory &

	Technology					**Practical**

Introduction:

This course is intended to study the basics of Understanding Blockchain technology. During this course the learner will explore various aspects of Blockchain technology like application in various domains. By implementing, learners will have idea about private and public Blockchain, and smart contract.

Course Outcome:

CO1	:	Understand the history and fundamental concepts of blockchain technology, including digital money, distributed ledgers, and the basic crypto primitives such as hash functions and digital signatures.
CO2	:	Analyze and evaluate various consensus mechanisms used in blockchain, with a focus on proof of work and scalability in both permissioned and permission less blockchains.
CO3	:	Understand and implement the components and chain code in Hyperledger Fabric, including the use of SDK and front-end tools like Hyperledger Composer.
CO4	:	Apply blockchain technology in financial software and systems, including settlements, KYC, capital markets, insurance, and trade/supply chain management.
CO5	:	Explore the use of blockchain in government applications, focusing on digital identity, land records, record-keeping, and public distribution systems, with an emphasis on privacy and security.

Unit I: **[5 periods]**

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy-: Block chain Architecture and Design-Basic crypto primitives: Hash, Signature- Hash chain to Block Chain-Basic consensus mechanisms.

Unit II: **[5 periods]**

Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols**:** Permissioned Block Chains-Design Goals-Consensus protocols for Permissioned Block chains.

Unit III: **[5 periods]**

Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II: -Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

Unit IV: **[5 periods]**

Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital Markets-Insurance- Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

Unit V: **[5 periods]**

Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

Text books:

1. Mark Gates, "*Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money*", Wise Fox Publishing and Mark Gates 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "*Hands-On Block chain with Hyper ledger: Building decentralized applicationswith Hyperledger Fabric and Composer*", 2018.
3. Bahga, Vijay Madisetti, "*Block chain Applications: A Hands-On Approach*", Arshdeep Bahga,Vijay

Madisetti publishers 2017.

Reference Books :

1. 1. Andreas Antonopoulos, "*Mastering Bitcoin: Unlocking Digital Crypto currencies*", O'ReillyMedia, Inc. 2014.
2. Melanie Swa, "*Block chain "*,O'Reilly Media 2014.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

41T	Part I Tamil	3	6	1	0	Theory

Introduction: நான்காம் பருவப் பாடத்திட்டம் புதுக்கவிதை. தகவல்தொடர்பு**,** ஓரங்க நாடகம்**,** இதழியல்பு. நூல் மதிப்புரை ஆகியவைகள் கொண்டு உருவாகியுள்ளது**.**

Course Outcome:

CO1	:	புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்..கவிதையின் அமைப்பு முறை, புதுக்கவிதை, மரபுக்கவிதை, புதுக்கவிதை, மரபுக்கவிதை வேறுபாடுகள், கரு. வடிவம், உத்திகள் மாணவர்களுக்கு படைப்புத்திறன் வளர்வதற்கு பயன் உள்ளது.
CO2	:	தகவல் தொடர்பின் அடிப்படைகள்- பண்புகள்- சிறப்புகள், பயன்பாடுகள் ஆகியவைகள் குறித்து மாணவர்களுக்கு விளக்கம் தருதல்.
CO3	:	தொலைக்காட்சியின் இயல்பு-தொலைக்காட்சியின் நன்மைகள், நிகழ்ச்சி தயாரிக்கும் முறை நிகழ்ச்சி ஒருங்கிணைப்புகள், நிகழ்ச்சி நடத்துதல். ஆகியவைகள் மாணவர்கள் தெரிந்து கொள்ளல்.
CO4	:	கணிப்பொறி வரலாறு- கணிப்பொறி வகைகள்.. கணிப்பொறி பயன்பாடுகள் ஆகியவைகள் மாணவர்களுக்கு பயனுள்ளது.
CO5	:	மொழிப்பெயர்ப்பு வரலாறு, மொழிபெயர்ப்பு இயல்புகள் பற்றி தெளிவாக புரிந்து கொள்ள முடியும்.

அலகு I : [12 **பாட வகுப்புகள்**]

புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் - கவிதையின் அமைப்பு முறை, புதுக்கவிதை, மரபுக்கவிதை - புதுக்கவிதை, மரபுக்கவிதை வேறுபாடுகள், கரு, வடிவம், உத்திகள் - கவிதை எழுதுவதின் நோக்கம். எழுதும் முறைகள், வரிகள் வரையறை - கவிதை உருவாக்கம் தலைப்பு தேர்வுசெய்யும் முறைகள்.

அலகு II : [12 **பாட வகுப்புகள்**]

தகவல் தொடர்பின் அடிப்படைகள்- பண்புகள்- சிறப்புகள், பயன்பாடுகள் - தகவல் தொடர்பு சாதனங்களின் பணிகள் - தகவல் தொடர்பில் ஏற்படும் தடைகள், தகவலை ஏற்பவரின் தகுதிகள் - பொதுமக்களும் தகவல் தொடர்பு சாதனங்களும்.

அலகு III: [12 **பாட வகுப்புகள்**]

ஓரங்க நாடகம் வரலாறு, நடகத்தின் தோற்றமும், வளர்ச்சியும். - ஓரங்க நாடகம் எழுதுதல், கதை அமைப்பு, அடிப்படைக்கூறுகள் - வானொலி அல்லது தொலைக்காட்சி மற்றும் திரைப்படத்துக்கு - ஓரங்க நாடகம் எழுதுதல்.

அலகு IV: [12 **பாட வகுப்புகள்**]

இதழியல் விளக்கம் - பத்திரிக்கை நிர்வாக அமைப்பு மற்றும் ஆசிரியர்கள் - 3.இன்றைய தமிழ் நாளிதழ்கள் பற்றிய செய்கள் (தினமணி, தினமலர், தினத்தந்தி, தினகரன்).

அலகு V : [12 **பாட வகுப்புகள்**]

1. நூல் மதிப்புரை - திறனாய்வு செய்தல் - 2.கடிதம் மற்றும் விண்ணப்பம் எழுதுதல் - கட்டுரை திறனை வளர்த்தல்- கட்டுரை தலைப்பு, கட்டுரை அமைப்பு முறைகள்

பாடநூல்கள்:

1.புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் வல்லிக்கண்ணன்
மக்கள் தகவல் தொடர்பியல்- முனைவர் கி.இராசா
3..கலைச்சொல்லாக்கம் இராதா செல்லப்பன்
4 இதழியல் கலை டாக்டர் மா.பா.குருசாமி

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

42E	English for Communication-II					

Introduction: To encourage students to inculcate and use effective communication skills in their day-to-day lives. To develop the LSRW skills to enhance the culture and thoughts through language and Literature

Course Outcome:

CO1	:	Learn to communicate effectively and appropriately in real-life situation
CO2	:	Use English effectively for study purposes across the curriculum
CO3	:	Develop interest in and appreciation of Literature
CO4	:	Develop and integrate the use of the four language skills
CO5	:	Enhance their language skills, especially in the areas of grammar and pronunciation

Unit I: **[12 Hours]**

1.1 I am Malala -Malala Yousafzai- Chapter1 –
1.2 Nelson Mandela's Interview with Larry King –
1.3 Job Applications: Cover Letters, CV/Resume –
1.4 Refuting, Discussion & Debating

Unit II: **[12 Hours]**

2.1 The Zoo Story- Edward Albee –
2.2 Rakesh Sharma's Interview with Indira Gandhi from Space –
2.3 Making Suggestions& Responding to Suggestions, Asking for and Giving Advice or Help –
2.4 Creating a digital profile-LinkedIn

Unit III: **[12 Hours]**

3.1 My Inventions-Nikola Tesla- Chapter 2 –
3.2 Lionel Messi with Sid Love-(Print) –
3.3 Body Language-Practical Skills for Interviews - 3.4 Interviews (face-to-face, telephone, and video conferencing)

Unit IV: **[12 Hours]**

4.1 The Proposal- Anton Chekhov –
4.2. Filling forms (Online & Manual) creation of account, railway reservation, ATM, Credit/ Debit card –
4.3. Speaking in a Formal situation (welcome address, Vote of the thanks

Unit V: **[12 Hours]**

5.1 Public Speaking -
5.2 Chicago Address-Swami Vivekananda -
5.3 SWOT Analysis

Text books:

1 Am Malala The Girl Who Stood Up for Education and Was Shot by the Taliban by Malala Yousafzai, Christina Lamb, Little Brown, 2013
2. My Inventions by Nikola Tesla, Ingram Short title, 2011 Edition

Reference Books :

1. Writing Your Life: A guide to writing Autobiographies, Mary Borg Taylor Francis, 2021.
2. One-act Plays for Acting Students: An Anthology of Short Norman A. Bert • 1987
3. The One-Act Play Companion: A Guide to plays, playwrights ... Colin Dolley, Rex Walford • 2015
4. How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish,Bernish Communications Associates, LLC; 1st edition (May)

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Core – PHP & MySQL	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

Learning Php and Mysql is designed to equip you with the essential skills to build dynamic and interactive web applications. This course covers the fundamentals of PHP, a popular server-side scripting language, and MySQL, a robust relational database management system. You'll learn how to create and manage databases, write efficient SQL queries, and integrate them with PHP to develop functional web applications. Through hands-on projects and practical examples, you'll gain a comprehensive understanding of back-end web development, enabling you to create, manage, and deploy dynamic websites with ease.

Course Outcome:

CO1	:	To provide an insight of PHP basics
CO2	:	Understand and practice the function and array handling in PHP
CO3	:	Understand and practice the the file handling and date functions
CO4	:	To provide an insight of MYSQL basics
CO5	:	Strategies of file handling and Cookies in MYSQL

Unit I : **[12 periods]**

Introduction to PHP - The structure of PHP-Using comments, Basic syntax -The structure of PHP -Variable, operators, Variable assignment, Multiple line commands -Variable typing- Constants- Predefined constants- The Difference Between the echo and print Commands -Functions-Variable Scope Expressions and Control Flow in PHP - Expression, Operators – Conditionals –Looping -Implicit and Explicit Casting.

Unit II: **[12 periods]**

PHP Functions and Objects -PHP Functions- Defining a Function- -Returning a Value- Returning an Array - PHP Functions - Do Not Pass Arguments by Reference- Returning Global Variables-Recap of Variable Scope - Including and Requiring Files -PHP Version Compatibility - PHP Objects- PHP Arrays- Basic Access- Numerically Indexed Arrays - Associative Arrays - Assignment Using the array Keyword..

Unit III: **[12 periods]**

PHP Arrays- Basic Access- Numerically Indexed Arrays - Associative Arrays - Assignment Using the array Keyword - The foreach...as Loop - Multidimensional Arrays -Using Array Functions. Practical PHP- Using printf - Date and Time Functions -Date Constants - Using checkdate -File handling - System Calls - XHTML or HTML5?.

Unit IV: **[12 periods]**

Introduction to MySQL- Basics -Accessing MySQL via the Command Line –Indexes -MySQL Functions - Accessing MySQL via phpMyAdmin - Mastering MySQL -Database Design- Normalization – Relationships – Transactions -Using EXPLAIN - Backing Up and Restoring -Querying a MySQL - Database with PHP - A Practical Example - Practical MySQL - Practical MySQL - Preventing Hacking Attempts.

Unit V: **[12 periods]**

Form Handling- Building Forms -Retrieving Submitted Data -An Example Program- What's New in HTML5? - Features Awaiting Full Implementation -Cookies, Sessions, and Authentication- Using Sessions. Learning PHP, MySQL & JavaScript , 4th edition, Robin Nixon , Some Generic Restrictions. Applets: basics - Skeleton, life cycle of applet – applet methods - Passing parameters to Applets.

Reference Books :

1. Robin Nixon, "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5", 4th edition, O'Reilly, 2014.

2. Luke welling, Laura Thomson, " PHP and MySQL Web Development", 4th edition, Developer's Library , 2015
3. Joel Murach,"Murach's PHP and MySQL",3rd Edition,Mike Murach & Associates,2017

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	3				3		3		3		3		3
CO2	2	3		2	3	2		3				3	
CO3	3	2	3			3	2		2	1	3		1
CO4			2	3	3					1		2	2
CO5	1	3		1		2	2		3		1		

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Php and MySQL Lab	**4**	**0**	**-**	**5**	**Core Practical**

Introduction:

To understand the functionality of web pages and to develop a website.

Course Outcome:

CO1	:	To understanding the basics of the PHP.
CO2	:	To apply PHP programming to generate static pages and dynamic.
CO3	:	To evaluate the integration of PHP with HTML and MySQL.
CO4	:	To create a model website using PHP and MySQL..

Lab Experiments:

1. Creating web pages using different XHTML elements like lists ,images, tables, frames
2. Formatting web pages using cascading style sheets
3. Creating dynamic web pages using form elements
4. Implementing various control structures using PHP script
5. OOP exercises using PHP
6. PHP application to handle forms
7. Database connectivity using PHP
8. CRUD operations on database using PHP

Course Outcomes	**Program Outcomes**												
	P01	**P02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**PS01**	**PS02**	**PS03**	**PS04**
CO1	**2**				**3**		**3**		**3**		**3**		**3**
CO2	**2**	**3**		**2**	**3**	**2**		**3**				**3**	
CO3	**3**	**1**	**3**			**3**	**2**		**2**	**1**	**3**		**1**
CO4			**2**	**3**	**3**					**1**		**2**	**2**
CO5	**1**	**3**		**1**		**3**	**2**		**3**		**1**		

Subject Code	**Subject Title**	**Credit**	**Lecture**	**Tutorial**	**Practical**	**Type**
	Allied-– STATISTICS AND PROBABILITY	**4**	**4**	**0**	**0**	**Theory**

Introduction:

To encourage students to explore and unshackle their creative abilities in statistics and probability

Course Outcome:

CO1	:	Understand the importance of statistics in different research areas
CO2	:	Understand the basic concepts of Statistics and its evolution
CO3	:	Understand the suitable statistical measures to describe and summarize the data
CO4	:	Understand the application of statistical test to appropriate research environment
CO5	:	Understand the basic concepts of probability, its applications and regression analysis in finding the expected values.

UNIT I **[12 periods]**

History of statistics, importance of statistics in different field of research, Types of statistics, types of data, variables, types of variables – based on measurement, based on observation, difference between cross sectional and time series data, importance of cross sectional and time series data in statistical analysis, important terminologies – sample, population, universe, statistics, statistic, parameter, estimation, estimator, probability distribution function, probability density function, probability mass function, sampling distribution and standard error.

UNIT II **[12 periods]**

Descriptive Statistics – Measure of central tendency - Mean: Arithmetic mean, median for raw data – odd number and even number, grouped data, mode for raw data and grouped data, measure of dispersion – standard deviation, variance, covariance and its properties, coefficient of variation, quartiles, quartile deviation and mean deviation, graphical representation of data: One-dimensional, bidimensional and multidimensional.

UNIT III **[12 periods]**

Introduction to testing of hypothesis, Statistical assumptions, Level of significance, confidence level, Type I Error, Type II error, Critical value, power of the test, sampling distribution, small sample test – t test for one and two sample mean, F test. One way analysis of variance - assumptions of ANOVA, layout of one way ANOVA.

UNIT IV **[12 periods]**

History of probability theory, definition of various terms related to probability – trial, events, exhaustive events, mutually exclusive events, equally likely events, independent events, introduction to prior probability, limitations of classical probability, statistical or empirical probability, theory of sets, elements of sets, and operations on sets.

UNIT V **[12 periods]**

Random variables- discrete and continuous random variables, statistical properties of random variables, Expectation of a random variables, expectation of random variable in terms of variance and covariance, jointly distributed random variables, moment generating function, characteristic function, limit theorems related to random variables.

Text Book:

1. Fundamentals of mathematical statistics – SC Gupta and VK Kapoor, Sultan Chand & Sons Publication, New Delhi

Reference Book:

1. Introduction to probability Models, Ninth Edition – Sheldon M. Ross, Elsevier Publication, Academic Press, UK.
2. Introduction to Probability and Statistics for Engineers and Scientists, Third Edition - Sheldon M. Ross, Elsevier Publication, Academic Press, UK.
3. An introduction to Probability and Statistical Inference – George Roussas, Academic Press.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Data Structures	**4**	**4**	**0**	**0**	**Theory**

Introduction :

Assess how the choice of data structures and algorithm design methods impacts the performance of programs.

Course Outcome:

CO1	:	Students develop knowledge of basic data structures for storage and retrieval of ordered or unordered data.
CO2	:	Students develop knowledge of linked lists.
CO3	:	Students develop knowledge of applications of searching, and sorting of each data structure.
CO4	:	Student develop Knowledge of Tree
CO5	:	Student develop Knowledge of Graph

Unit I: [12 Periods]

Introduction - Basic Terminology - Data Structures - Abstract Data Types. Stacks – operation of Stack- Array Representation - Arithmetic Expressions - Polish Notation - Application of Stacks - Queue – Operation of Queue- Application of Stacks Queue.

Unit II: [12 Periods]

Linked Lists Introduction - Linked lists- Operation of Linked List - Linked List Implementation of Stack and Queue- Circular Linked list – Doubly Linked List.

Unit III: [12 Periods]

Sorting Introduction- Sorting - Merging - Merge-Sort - Quick Sort - Heap sort.

Unit IV: [12 Periods]

Introduction- Binary Trees - Representing Binary Trees in memory- Traversing Binary Trees - Traversal Algorithm using Stacks - Binary Search Trees - Searching - Inserting and deleting in Binary Search Trees

Unit V: [12 periods]

Graphs Introduction – Definitions and terminology – graph representations – Depth first search – Breadth first search.

Text Books:

1. M. A. Weiss, “Data Structure and Algorithm Analysis in C”, Pearson Education Asia,2002.

2. Gilberg, F Richard & Forouzan, A Behrouz, Data Structures: A Pseudocode approach with C, d Edition, Cengage, 2008.

3.Horowitz Sahni Anderson-Freed, Fundamental of Data Structures in C, Universities Press, Reprint 08.

Reference Books:

1. Richard Johnsonbaugh, Algorithims, Pearson Education, 2nd Edition, 2008.

2.L.Kathirvelkumaran and R. Muralidharan , "Data Structure for Beginners ",Coimbatore Institute of Information Technology ,First Edition 2019.

3. Knuth, Donald E, Art of Computer Programming, Sorting & Searching, Addison-Wesley, 3rd Edition, 2005.

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	3		3		3			2		3			3
CO2		2		3	3	3	3		3	3		3	2
CO3	3	3	2	1	2		2			3	3	3	3
CO4	3			2		3		3	1		3	3	
CO5	3	3	1			2	3				2		

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course: Software Engineering Principles	**2**	**3**	**-**	**-**	**Theory & Practical**

UNIT I: Introduction to Software Engineering: **[5 hours]**

Overview of Software Engineering: Definition and importance of software engineering. Software Development Life Cycle (SDLC): Phases of SDLC, including planning, analysis, design, implementation, testing, deployment, and maintenance. Software Process Models: Waterfall, Agile, Spiral, V-Model, etc.

UNIT II: Requirements Engineering: **[5 hours]**

Introduction to Requirements Engineering: Importance of requirement gathering. Requirements Elicitation Techniques: Interviews, questionnaires, observation, document analysis.

Functional vs. Non-functional Requirements: Definitions and differences. Requirements Specification and Documentation: Creating and maintaining requirements documents. Requirements Validation and Management: Ensuring accuracy and managing changes.

UNIT III: Software Design: **[5 hours]**

Introduction to Software Design: Design principles and concepts. Architectural Design: Software architecture and design patterns. UML Diagrams: Use case diagrams, class diagrams, sequence diagrams, activity diagrams. Design Patterns: Singleton, Factory, Observer, Strategy, and other design patterns. Design Best Practices: Modularity, cohesion, coupling, and encapsulation.

UNIT IV: Software Implementation and Coding: **[5 hours]**

Coding Standards and Best Practices: Writing clean, maintainable code. Code Refactoring and Optimization: Improving code quality and performance. Source Code Version Control: Using Git and GitHub for version control. Introduction to Clean Code Principles: Writing code that is easy to understand and maintain. Collaborative Development: Techniques for effective team-based coding.

UNIT V: Software Testing and Maintenance: **[5 hours]**

Types of Software Testing: Unit testing, integration testing, system testing, acceptance testing. Test-Driven Development (TDD): Writing tests before code to ensure functionality. Debugging Techniques: Identifying and fixing bugs. Maintenance and Evolution: Managing changes and updates to software over time. Software Quality Assurance: Ensuring software meets quality standards.

Text books:

1. Sommerville, Ian. Software Engineering (10th Edition). Pearson, 2015.
2. Pressman, Roger S. Software Engineering: A Practitioner's Approach (9th Edition). McGraw-Hill Education, 2019.

Reference Books :

1. Martin, Robert C. Clean Code: A Handbook of Agile Software Craftsmanship. Prentice Hall, 2008.

Subject	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Code						
	Core- Python Programming	**4**	**5**	**-**	**0**	**Core Theory**

Introduction:

After learning the Syntax and Semantics and create Functions, Handle Strings and Files, Understand Lists, Dictionaries and Regular expressions, Implement Object Oriented Programming concepts, Build Web Services and introduction to Network and Database Programming students are able to develop rich dynamic websites in Python.

Course Outcome:

CO1	:	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
CO2	:	Demonstrate proficiency in handling Strings and File Systems
CO3	:	Understand Lists, Dictionaries and Regular expressions in Python
CO4	:	Interpret the concepts of Object-Oriented Programming as used in Python
CO5	:	Implement exemplary applications related to Network Programming, Web Services and Databases in Python

Unit I : [12 periods]

Installing Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, Multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard.

Unit II: [12 periods]

A Boolean Type , Choosing Statements to Execute, Nested If Statements , Remembering the Results of a Boolean Expression Evaluation , A Modular Approach to Program Organization, Importing Modules , Defining Your Own Modules, Testing Code Semi automatically Grouping Functions Using Methods: Modules, Classes, and Methods , Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores.

Unit III: [12 periods]

Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists. Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue Reading and Writing.

Unit IV: [12 periods]

Files: Kinds of files, opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms That Use the File-Reading Techniques, Multiline Records. Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections.

Unit V: [12 periods]

Collection of New Information Object-Oriented Programming : Understanding a Problem Domain , Function "Isinstance," Class Object, and Class Book , Writing a Method in Class Book, Plugging into Python Syntax: More Special Methods, Creating Graphical User interface: Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess.

Reference Books :

1. L. Halterman, "Fundamentals of Python Programming", Southern Adventist University July 26, 2018, Copyright © 2017 Richard L. Halterman Richard.
2. John V Guttag, —Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, —Exploring Python||, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
5. Kenneth A. Lambert, —Fundamentals of Python: First Programs||, CENGAGE Learning, 2012.

Charles Dierbach, Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013

Course Outcomes	Program Outcomes												
	P01	**P02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**PS01**	**PS02**	**PS03**	**PS04**
CO1	**1**	**3**		**3**		**2**				**3**	**3**		**3**
CO2		**2**	**3**		**1**		**3**	**2**	**3**				
CO3	**2**	**1**	**2**			**1**				**2**	**1**	**3**	**2**
CO4	**3**			**1**	**3**	**3**			**1**	**3**		**1**	**3**
CO5		**3**			**2**		**2**	**3**					

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Python Programming Lab	**4**	**4**	**-**	**-**	**Practical**

Introduction:

Understand the basic operations and creations of various applications using python.

Course Outcome:

CO1	:	Write, test, and debug simple Python programs
CO2	:	Implement Python programs with conditionals and loops for stack, sorting algorithms.
CO3	:	Read and write data from/to files in Python.
CO4	:	Use Python lists, dictionaries for representing compound data.
CO5	:	Write Script to SQL and Demonstrate Exception in Python.

List of Experiments:

1. Create a calculator program using Python.
2. Create Python program using different String functions.
3. Implement Selection sort algorithm using Python Program.
4. Implement stack Operation using Python Program.
5. Read and Write into a file using Python Program.
6. Demonstrate use of Dictionaries in Python Program.
7. Create Comma Separate Files (CSV), Load CSV files into internal Data Structure.
8. Write script to work like a SQL SELECT statement for internal Data Structure made in
9. earlier exercise.
10. Write script to work like a SQL Inner Join for an internal Data Structure made in
11. earlier exercise.
12. Demonstrate Exceptions in Python.

Course Outcomes	**Program Outcomes**											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	**3**		**3**					**3**	**3**		**2**	
CO2		**3**			**2**		**3**	**2**	**3**	**3**		**2**
CO3	**3**	**2**		**3**		**1**	**3**		**2**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**1**			**3**	
CO5			**3**	**2**		**2**				**2**		

Subject	**Subject Title**	**Credit**	**Lecture**	**Tutorial**	**Practical**	**Type**

Code						
	Elective -I OPTIMIZATION TECHNIQUES	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:
Optimization problems typically have three fundamental elements. The first is a single numerical quantity, or objective function, that is to be maximized or minimized. The objective may be the expected return on a stock portfolio, a company's production costs or profits, the time of arrival of a vehicle at a specified destination, or the vote share of a political candidate.

Course Outcome:

CO1	:	Familiarity with the basics of several biologically inspired optimization techniques.
CO2	:	Familiarity with the basics of several biologically inspired computing paradigms.
CO3	:	Ability to select an appropriate bio-inspired computing method and implement for any application and data set.
CO4	:	Theoretical understanding of the differences between the major bio-inspired computing methods.
CO5	:	Learn Other Swarm Intelligence algorithms and implement the Bio-inspired technique with other traditional algorithms.

Unit I:INTRODUCTION **[12 periods]**
Optimization Techniques: Introduction to Optimization Problems – Single and Muti- objective Optimization – Classical Techniques – Overview of various Optimization methods – Evolutionary Computing: Genetic Algorithm and Genetic Programming: Basic concept – encoding – representation – fitness function – Reproduction – differences between GA and Traditional optimization methods

UnitII:**SWARMINTELLIGENCE** **[12period**s]
Introduction – Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Ant Colonies: Ant Foraging Behaviour – Towards Artificial Ants – Ant Colony Optimization (ACO) – S- ACO – Ant Colony Optimization Metaheuristic: Combinatorial Optimization – ACO Metaheuristic – Problem solving using ACO – Other Metaheuristics – Simulated annealing – Tabu Search – Local search methods – Scope of ACO algorithms.

Unit III : NATURAL TO ARTIFICIAL SYSTEMS **[12 periods]**
Biological Nervous Systems – artificial neural networks – architecture – Learning Paradigms – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks– hybrid neural systems – Biological Inspirations in problem solving

Unit IV: SWARM ROBOTICS **[12 periods]**
Foraging for food – Clustering of objects – Collective Prey retrieval – Scope of Swarm Robotics – Social Adaptation of Knowledge: Particle Swarm – Particle Swarm Optimization (PSO) – Particle Swarms for Dynamic Optimization Problems

Unit V: CASE STUDIES **[12 periods]**
Other Swarm Intelligence algorithms: Fish Swarm – Bacteria foraging – Intelligent Water Drop Algorithms – Applications of biologically inspired algorithms in engineering. Case Studies: ACO and PSO for NP-hard problems.

Text books:

1. E. Elben and J. E. Smith, "Introduction to Evolutionary Computing", Springer, 2010.
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.

Reference Books :

1. Eric Bonabeau, Marco Dorigo, Guy Theraulaz, "Swarm Intelligence: From Natural to Artificial Systems", Oxford University press, 2000.
2. Christian Blum, Daniel Merkle (Eds.), "Swarm Intelligence: Introduction and Applications", Springer Verlag, 2008.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Skill Enhancement Course - Vue JS	**4**	**6**	**0**	**0**	Theory

Introduction:

The integration of AI with cloud computing revolutionizes data processing and decision-making by enhancing scalability, efficiency, and intelligence. This synergy enables businesses to leverage advanced analytics and automation, driving innovation and operational transformation across various sectors. **Course Outcome:**

CO1	:	Understand basic intelligent agent frameworks.
CO2	:	Use decision-making and Apply problem solving techniques.
CO3	:	Apply game playing and CSP techniques.
CO4	:	Perform logical reasoning.
CO5	:	Perform logical reasoning.

Unit I **[12 periods]**

Introduction to JavaScript and Fundamental Concepts: Why learn JavaScript - Setting up environment – Variables - Data types – Operators – Arrays –Objects - Logic Statements (if, else, switch) - Loops (while, for, do-while).

Unit II **[12 periods]**

Functions and Object-Oriented Programming : Functions (basic, parameters, arguments) - Function scope and closures - Function expressions and arrow functions - Callback functions - Classes and constructors - Prototypes and inheritance Encapsulation, polymorphism, and abstraction - The DOM (Document Object Model) - DOM manipulation techniques - Event handling and event listeners.

Unit **[12 periods]**

Advanced JavaScript Topics and Practical Applications : Regular expressions - Debugging techniques - Concurrency (callbacks, promises, async/await) - HTML5 features - Canvas basics - Integrating JavaScript with HTML5 - Next steps in web development (libraries, frameworks, backend).

Unit IV **[12 periods]**

Advanced Vue.js Concepts and Techniques: Form Handling: Input fields – validation and async actions; Vue Router: Client-side routing - navigation and route guarding; Vuex State Management: Store setup - data management and communication; Custom Events: Component communication techniques.

Unit V **[12 periods]**

Testing and Full-Stack Development with Vue.js : Unit Testing: Setting up Jest, writing tests. - Server Communication: HTTP requests, handling responses. Full-Stack Development: Backend integration, deployment

Text books:

1. Fullstack Vue, The Complete Guide to Vue.js and Friends, Written by Hassan Djirdeh, Nate Murray, and Ari Lerner, Published in San Francisco, California, 2018.

Reference Books :

1. Erik Hanchett, Benjamin Listwon, Vue.js in Action, Published: Shelter Island, New York, 2018
2. Olga Filipova. Learning Vue.js 2, Published: Birmingham, UK, 2017
3. John Au-Yeung, Vue.js 3 By Example, Published: Birmingham, UK, 2021
2. Hassan Djirdeh, Nate Murray, Ari Lerner, Fullstack Vue: The Complete Guide to Vue.js and Friends, Published: San Francisco, California, 2018

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course: Fundamentals of Data Science	**2**	**3**	**-**	**-**	**Theory & Practical**

	and Machine Learning					

UNIT I: Introduction to Data Science **[5 hours]**

Overview of Data Science - Data Science Life Cycle - Data Science Tools and Technologies - Data Collection and Data Cleaning - Exploratory Data Analysis

UNIT II: Introduction to Machine Learning **[5 hours]**

What is Machine Learning - Types of Machine Learning: Supervised, Unsupervised, and Reinforcement Learning - Key Terminologies in Machine Learning - Overview of Machine Learning Algorithms - Model Evaluation and Validation

UNIT III: Supervised Learning: **[5 hours]**

Regression Analysis: Linear and Logistic Regression - Decision Trees and Random Forests - Support Vector Machines - Neural Networks and Deep Learning Basics - Model Evaluation Techniques: Cross-Validation, Confusion Matrix, ROC Curve

UNIT IV: Unsupervised Learning **[5 hours]**

Clustering Techniques: K-means, Hierarchical Clustering - Dimensionality Reduction: PCA, LDA, t-SNE - Association Rule Learning: Apriori, Eclat - Anomaly Detection - Applications of Unsupervised Learning

UNIT V: Practical Applications and Case Studies **[5 hours]**

Real-world Applications of Data Science and Machine Learning - Case Studies in Healthcare, Finance, and Marketing - Ethics and Bias in Data Science and Machine Learning - Future Trends in Data Science and Machine Learning - Capstone Project: End-to-End Machine Learning Project

Text books:

1. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett

Reference Books :

2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
3. "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core Course – XI Theory Machine Learning	**4**				**Core Theory**

Introduction: This course introduces fundamental concepts and practical applications of machine learning (ML). Starting with essential Python libraries, it covers supervised and unsupervised learning, feature engineering, model evaluation, and advanced topics like text data processing and deployment.

Course Outcome:

CO1	:	Understand ML basics, data preprocessing, and model evaluation.
CO2	:	Apply supervised learning with algorithms like k-NN and decision trees.
CO3	:	Use unsupervised learning for clustering and dimensionality reduction.
CO4	:	Perform feature engineering and model evaluation with relevant metrics.
CO5	:	Use Python libraries (NumPy, SciPy, pandas, scikit-learn) for ML tasks and visualization.

Unit I: Introduction to Machine Learning and Python Basics: **[12 Hours]**

Why Machine Learning? - Problems Machine Learning Can Solve - Essential Python Libraries: NumPy, SciPy, matplotlib, pandas - Setting up the environment and installing scikit-learn - A First Application: Classifying Iris Species - Exploring the Iris dataset - Training and testing data - Building a k-Nearest Neighbors model - Evaluating the model

Unit 2: Supervised Learning: **[12 Hours]**

Classification and Regression - Generalization, Overfitting, and Underfitting - Supervised Machine Learning Algorithms: k-Nearest Neighbors - Linear Models - Decision Trees - Ensemble Methods (Random Forests, Gradient Boosting) - Neural Networks (Introduction) - Uncertainty Estimates from Classifiers - Evaluating Model Performance

Unit 3: Unsupervised Learning and Preprocessing: **[12 Hours]**

Types of Unsupervised Learning -Challenges in Unsupervised Learning - Preprocessing and Scaling Data - Dimensionality Reduction Techniques: - Principal Component Analysis (PCA) - Manifold Learning (t-SNE) - Clustering Algorithms: k-Means Clustering - Agglomerative Clustering – DBSCAN - Evaluating Clustering Algorithms

Unit 4: Feature Engineering and Model Evaluation: **[12 Hours]**

Representing Data and Engineering Features: Categorical Variables - One-Hot-Encoding - Feature Scaling and Transformation - Feature Selection Techniques - Cross-Validation Techniques - Grid Search for Hyperparameter Tuning - Evaluation Metrics for Classification and Regression - Building Algorithm Chains and Pipelines

Unit 5: Advanced Topics and Application: **[12 Hours]**

Working with Text Data - Representing Text Data (Bag-of-Words, tf-idf) - Text Preprocessing Techniques (Tokenization, Stemming, Lemmatization) - Topic Modeling (Latent Dirichlet Allocation): - Wrapping Up and Practical Considerations: Approaching Machine Learning Problems - From Prototype to Production - Testing and Deploying ML Systems - Future Directions and Continuing Education in Machine Learning

Text books:

1. Müller, A. C., & Guido, S. (2016). Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.".

Reference Books :

1. James, D. (2018). Introduction to Machine Learning with Python: A Guide for Beginners in Data Science. CreateSpace Independent Publishing Platform.
2. Lee, W. M. (2019). Python machine learning. John Wiley & Sons.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**

CO1	3	2	3	2	3	2	3	3	3	3	2	3
CO2	2	3	2	3	3	3	3	2	3	3	3	2
CO3	3	2	3	3	2	3	2	3	2	2	2	3
CO4	3	3	3	2	3	2	3	3	3	3	2	3
CO5	2	2	3	2	3	3	3	3	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Core Course – XII Theory / Practical Machine Learning Lab	**4**				**LAB**

Introduction:

Machine Learning Lab focuses on practical Python-based machine learning skills. Students learn setup, data exploration, and algorithm implementation.

Course Outcome:

CO1	:	Set up Python environments and install necessary libraries for machine learning.
CO2	:	Use pandas for data exploration and analysis.
CO3	:	Implement various machine learning algorithms and evaluate their performance
CO4	:	Assess model performance using metrics like accuracy, precision, recall, and silhouette score.
CO5	:	Apply advanced techniques such as PCA for dimensionality reduction and process text data for sentiment analysis.

List of Experiments:

1. Setting up Python environment with Anaconda and installing necessary libraries (NumPy, SciPy, matplotlib, pandas).
2. Explore the Iris dataset using pandas.
3. Implementing a k-Nearest Neighbors classifier for Iris species classification and evaluating its performance using metrics such as accuracy, precision, and recall.
4. Exploring overfitting and underfitting using a decision tree classifier on a synthetic dataset.
5. Training a linear regression model to predict housing prices and evaluating its performance.
6. Implementing a Random Forest classifier for a classification problem and comparing it with a single decision tree.
7. Introduction to neural networks using a simple feedforward network for digit recognition.
8. Applying PCA to reduce the dimensionality of the Iris dataset and visualizing the results.
9. Implementing k-means clustering on a dataset and evaluating clustering quality using metrics like silhouette score.
10. Processing text data for sentiment analysis using techniques like tokenization, stemming, and tf-idf representation.

Text books:

1. Müller, A. C., & Guido, S. (2016). Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.".

Reference Books :

1. James, D. (2018). Introduction to Machine Learning with Python: A Guide for Beginners in Data Science. CreateSpace Independent Publishing Platform.
2. Lee, W. M. (2019). Python machine learning. John Wiley & Sons.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective – IV **i) Blockchain Technology**	**4**				**Core Theory**

Introduction: This Blockchain Technology course is designed to explain what the technology is and how it works at a high level. The course aims to build an awareness of Blockchain Technology and its application in processing cryptocurrency transactions across an open and distributed ledger.

Course Outcome:

CO1	:	Understand what Blockchain is and why it is used.
CO2	:	Explain the different components involved within Blockchain.
CO3	:	Identify when and why Blockchain may be useful in various environments.
CO4	:	Learn about security measures and various services that facilitate trading and transacting with Bitcoins.
CO5	:	Explore the applications of Blockchain in real-world systems and regulations.

Unit I: [12 Periods]

Say you want a Revolution: The Trust Protocol – How this Worldwide Ledger works – A Rational Exuberance for the Blockchain – Achieving Trust and the Black box of Identity – A Plan for Prosperity - Promise and Peril of the New Platform – Bootstapping the future: Seven Design Principles of Blockchain Economy – The Seven Design Principles – Designing the Future.

UnitI II: [12 Periods]

Transformations: Reinventing Financial Services – The Golden Eight – The Bank App – Reputation – The Blockchain IPO – Re-architecting the Firm: The Core and the Edges – New Business Models: Making it Rain on the Blockchain – bAirbub versus Airbub – Global Computing: The Rise of Distributed Applications – The DApp Kings – The Big Seven – Hacking Your Future.

Unit III: [12 Periods]

The Ledger of Things: Animating the Physical world – The Evolution of Computing – From Mainframes to Smart Pills – The Twelve Disruptions – Animating Things – The Economic Payoff – The Future: From Uber to Suber – Solving the Prosperity Paradox: Economic Inclusion and Entrepreneurship – Road Map to prosperity – Remittances – The story of Analie Domingo.

Unit IV: [12 Periods]

Rebuilding Government and Democracy – High-Performance Government Services and Operations – Empoering People to serve selves and others – Blockchain Voting – Alternative Models of Politics and Justice – Wielding Tools of Twent-first-century Democracy – Freeing Culture on the Blockchain – Music to Era – Fair Trade Music – Getting the Word Out.

Unit V: [12 Periods]

Promise and Peril: Overcoming Showstoppers – Ten Implementation Challenges – Reasons Blockchain will Fail or Implementation Challenges – Leadership for the Next Era – The Blockchain Ecosystem – A Cautionary Tale of Blockchain Regulation – The Senator Who would change the world – Central Banks in a Decentralized economy – Regulation Versus Governance.

Text books:

1. Dan Tapscott and Alex Tapscott, “Blockchain Revolution”, portfolio / Penguin trade paperback edition, (2018).

Reference Books :

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, (2016).
2. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,” Yellow paper, (2014).
3. Josh Thompsons, “Blockchain for beginners guide to Blockchain technology and leveraging Blockchain Programming”, Copyright, (2017).
4. Daniel Drescher, “Blockchain basics: A Non-Technical Introduction in 25 steps”, Apress, (2017).

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	SKILL ENHANCEMENT COURSE - DATABASE MANAGEMENT SYSTEMS USING MONGODB	**4**	**6**	**0**	**0**	**Theory**

Introduction:
Relational Database Management Systems are expensive and not in a position to support these unstructured data. NoSQL database technology is now getting popularity to manage these voluminous unstructured data. The objective of this course is to make candidates familiarize with NoSQL database Technology and give some hands-on on one of the most popular NoSQL database MongoDB.

Course Outcome:

CO1	:	Understand the basics of database management system in MongoDB
CO2	:	MongoDB course will help you to understand & learn the leading document-oriented NoSQL database, MongoDB Architecture.
CO3	:	The instructors will help you understand why more organizations are using MongoDB as a database for their business requirements.
CO4	:	MongoDB is a distributed database at its core, so high availability, horizontal scaling, and geographic distribution are built-in and easy to use
CO5	:	MongoDB course allows you to work on real-time projects that help in building your career.

Unit I : [12 periods]

Introduction to MongoDB-Getting Started-Using the MongoDb shell-Inserting and Saving documents-Removing document-Updating document-Query Criteria-Type specific query – Cursors – Database Commands.

Unit II: [12 periods]

Introduction to Indexing – Using explain() and hint() – Identifying and changing indexes – Capped Collections – Aggregation – Pipeline operation – Mapreduce – Aggregation commands – Normalization versus Denormalization – Optimization for Data manipulation – Planning.

Unit III: [12 periods]

Introduction to Replication – Configuring a replica set – Member Configuration Options – Component of replica set – Connecting to a replica set – Administration.

Unit IV: [12 periods]

Introduction to sharding – configuring Sharding – Choosing a shared key – Sharding Administration

Unit V: [12 periods]

Application Administration – Data Administration – Durability – Server Administration

Text books:

1. MongoDB: The Definitive Guide, Second Edition by Kristina Chodorow

Reference Books :

1. MongoDB Basics "A quick introduction to MongoDB" by David Hows,Peter membrey.

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	2	1	2	1	2	2	2
CO2	2	1	2	1	3	1	1	3
CO3	2	2	2	2	1	2	3	2
CO4	3	2	1	3	2	2	2	3
CO5	1	1	2	1	2	3	3	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course - Problem Solving and Algorithm Development	**2**	**3**	**-**	**-**	**Theory & Practical**

UNIT I: Problem Solving and Algorithmic Thinking **[5 Hours]**

Problem Solving and Algorithmic Thinking Overview – problem definition, logical reasoning; Algorithm – definition, practical examples, properties, representation, algorithms vs programs.

UNIT II: Problem Understanding and Analysis **[5 Hours]**

Algorithmic thinking – Constituents of algorithms – Sequence, Selection and Repetition, input-output; Computation – expressions, logic; Problem Understanding and Analysis – problem definition, input-output, variables

UNIT III: Introduction to Problem Solving programs **[5 Hours]**

Introduction to Problem Solving through programs, Steps to develop a program, Representation of Algorithm, Software development life cycle, Programming approaches, Types of programming languages, Introduction to c, Developing a c program, Console input and output functions, Syntax and Semantic errors.

UNIT IV: Operators and Expressions **[5 Hours]**

Identifiers and keywords, Data types, Constants, Variables, Declarations, Expressions, Statements, Arithmetic operators, Unary operators, Relational and logical operators, Assignment operators, Conditional operator.

UNIT V: Algorithm Implementation **[5 Hours]**

Branching, Looping, Arrays, Function implementation algorithm for these concepts.

Text books:

1. Riley DD, Hunt KA. Computational Thinking for the Modern Problem Solver. CRC press; 2014 Mar 27
2. Byron Gottfried, “Schaum's Outline of Programming with C”,McGraw Hill Education (India), 4th edition, 2018, ISBN: 978-9353160272

Reference Books :

1. Yashavant Kanetkar, “Let Us C”, Bpb Publications, 15th edition, 2016, ISBN:9788183331630