RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Rathinam Tech Zone, Eachanari, Coimbatore – 641021.

DEPARTMENT OF COMPUTER SCIENCE

Syllabus for

BCA

(I to VI 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 become a globally recognized and deeply connected with the tech industry, fostering a culture of knowledge, skills, research, and values in aspiring computer scientists, empowering them to drive India's holistic technological advancement.

Mission

To empower students and cultivate academic and research brilliance and provide them to leverage Technology as a tool for innovation and fostering global competitiveness and employability in diverse field

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 Digital & Cyber Forensics expertise effectively as members of technological Teams.
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 acceleratesthe 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 (Disciplinary Knowledge)	:	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 the primary 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 of such 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	:	Implementing theoretical concepts in practical scenarios to prepare students for industry roles in digital forensics.
PSO2	:	Empowering students with entrepreneurial skills through course content tailored for self-employment in digital forensics.

PSO3	:	Providing a strong foundation for advanced studies in digital forensics investigation techniques and evidence handling.

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
PO10	:	1	3	1	3	3
PO11	:	3	2	2	2	1
PO12	:	3	1	2	2	3
PSO1	:	2	3	1	1	2
PSO2	:	3	2	2	3	1
PSO3	:	2	3	3	3	3

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

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

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

BCA DEGREE PROGRAMME

BCA 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 in Techniques in C	4	5	50	50	100
4	1	3	Core		Core Course – II Practical Problem solving in Techniques 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 Practical Java Programming	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 Python Programming	4	6	50	50	100
4	3	3	Core		Core Course – VI Practical Python Programming	4	4	50	50	100
5	3	3	Allied		Allied-III Quantitative Techniques	4	5	50	50	100
6	3	4	SEC		Skill Enhancement Courses – II Practical / Training - Internet Of Things	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 Android Programming	4	6	50	50	100
4	4	3	Core		Core Course – VIII Practical in Android Programming with Augmented and Virtual Reality	4	4	50	50	100
5	4	3	Allied		Allied-IV Operations Research	4	5	50	50	100

8	4	3	Elective		Elective - II Software Project Management/ Information and Cyber Security/ Blockchain Fundamentals	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 Web Technology	4	6	50	50	100
2	5	3	Core		Core Course – X Practical Web Technology	4	6	50	50	100
3	5	3	Elective		Elective - III Software Quality and Assurance/ Operating System/ Business Analytics	4	6	50	50	100
	5	3	PRJ		Project	0	6	0	0	0
4	5	4	SEC		Skill Enhancement Courses – III Practical / Training - Agile Methodologies	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 R Programming	4	6	50	50	100
2	6	3	Core		Core Course – XII Practical R Programming	4	4	50	50	100
3	6	3	Elective		Elective – IV Computer Architecture and Design/ Cloud Infrastructure and Services/ Software Testing	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 - PHP & MySql	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**	**Course Code**	**Course Name**	**Credit**	**Hours**	**INT**	**EXT**	**Total**
1	2	6	VAC		VAC - Microsoft CoE Course / NPTEL	2	2	50	0	50
2	3	6	IDC		VAC - Microsoft CoE Course / NPTEL	2	2	50	0	50
3	4	6	IDC		VAC - Microsoft CoE Course / NPTEL	2	2	50	0	50
4	5	6	VAC		VAC - Microsoft CoE Course / NPTEL	2	2	50	0	50

Certificate on Minor Discipline										
S.No.	**Sem**	**Part**	**Sub Type**	**Course Code**	**Course Name**	**Credit**	**Hours**	**INT**	**EXT**	**Total**
1	2	6	MD		Course - I	5	2	0	100	100
2	3	6	MD		Course - II	5	2	0	100	100
3	4	6	MD		Course - III	5	2	0	100	100
4	5	6	MD		Course - IV	5	2	0	100	100

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	2	4	4	24
Part V		1	1	1	1		4

Total	**24**	**25**	**28**	**25**	**20**	**24**	**146**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	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

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	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 –Subramania Bharathi, JRD-Harish Bhat, The Faltering Pendulum- BhabaniBhattacharya 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.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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 1- C Programming	**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 go to 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. 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. Byron S Gottfried, "Programming with C", Fourth Edition, McGraw-Hill, 2018
2. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw-Hill, 2021

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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.

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
3. E.Balagurusamy, "Programming in ANSI C", Seventh Edition McGraw Hill, 2017

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Allied- MATHEMATICS FOR COMPUTER SCIENCE	**4**	**4**	**-**	**-**	**Core Theory**

Introduction:

This paper focuses on the Mathematical logic, Relations& Functions, Formal languages and Graph Theories To understand the basic concepts of set theory. To understand the various statements in light of mathematical logic. To study various relations and functions. To understand graph theory in the course's context. To understand the deeper concepts of graph theory.

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 –Euler-Venn 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.

Reference Books :

1) Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
2) William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

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:

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type

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

	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.

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 using Maven

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
2. 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
	Part I Tamil	**3**	**6**	**1**	**0**	**Theory**

Introduction:

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Course Outcome:

CO1	:	□□.
CO2	:	□□ற□□.
CO3	:	□□.
CO4	:	□□ற□□.
CO5	:	□□ற□□.

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MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	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	:	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.

Unit I : [12 periods]

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

Unit II: [12 periods]

Still I Rise- Maya Angelou-kindly Adjust Please- Shashi Tharoor-Verbs and Tenses-Subject Verb Agreement

Unit III: [12 periods]

Alchemist-Paulo Coelho

Unit IV: [12 periods]

The Flower- Tennyson-The Spoon-Fed Age. W.R. Inge- Paragraph Writing-Error detection

Unit V: [12 periods]

On Killing a Tree- Gieves Patel-Taking and Note Making-Reading news and weather reports-Precis Writing.

Text books:

1. The Alchemist - Paulo CoelhoHarper - 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.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

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 Fundamental **[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, 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 rags: 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, try blocks, 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:

1. 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.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

*W*rite 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.

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	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 – DISCRETE MATHEMATICS	**4**	**4**	**-**	**-**	**Core Theory**

Introduction:

To understand the fundamental concepts of discrete mathematics. • To develop the ability to solve proble combinatorics, propositional and predicate logic, relations and recurrence relations. • To develop logical th skills and problem-solving skills**.**

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 **[12periods]**

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

Unit II: **[12 periods]**

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: **[12 periods]**

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: **[12 periods]**

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

Unit V: **[12 periods]**

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

Text books:

1. Discrete Mathematical Structures with application to Computer Science, Tremblay and Manohar – (Tata McGraw Hill, New Delhi) 1997.

Reference Books :

1) Discrete mathematics, Venkataraman .M.K. and others –2000 The National Publishing Company.

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	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
	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: **[12periods]**

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.

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	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
	Value Added Course - IoT	2	3	-	-	Theory &

	Essentials: A Beginner's Guide					**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 Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	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

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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	2	3	3	3	2	2	3	2	2
CO3	3	3	3	2	3	3	3	2	3	3	3	2
CO4	3	3	3	3	2	3	3	2	2	3	2	2
CO5	3	2	3	3	3	3	2	3	2	3	3	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	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	:	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.

Unit I : [12 periods]

The Voice of the Mountains -Mamang Dai-Romeo & Juliet- The Balcony Scene-Writing Letters and E.mails-Data Interpretation and Reporting

Unit II: [12 periods]

Sita- Toru Dutt-Macbeth-Banquet Scene-Writing and messaging on Social Media Platforms (blogs, Twitter, Instagram, Facebook)-Data Presentation and Analysis

Unit III: [12 periods]

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

Unit IV: [12 periods]

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

Unit V: [12 periods]

You've Got to Find What You Love- Steve Jobs-Group Discussion-Conducting and participating in meetings 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. 2 Famous Speeches by Mahatma Gandhi, Creatingspace Independent Publishing Platform,2016 How to Build a Professional Digital Profile Kindle Edition
3. 3 by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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	2	3	3	3	2	2	3	2	2
CO3	3	3	3	2	3	3	3	2	3	3	3	2
CO4	3	3	3	3	2	3	3	2	2	3	2	2
CO5	3	2	3	3	3	3	2	3	2	3	3	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core -Web Technology	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

To know the fundamentals of Web based Language and its features.

Course Outcome:

CO1	:	Understand the basics of Internet and Its Protocol.
CO2	:	To Learn about HTML Language and its feature
CO3	:	To learn about basic knowledge about CSS.
CO4	:	Understand basic in Servlet and HTTP
CO5	:	Understand basic of JSP and Cookies

Unit I : **[12periods]**

Introduction –History of the Internet –Services and Accessibility –Uses –Protocols –Internet Standards

Unit II: **[12 periods]**

HTML –Introduction –HTML Document –Head Section –Body Section –HTML Forms –Java Script –Introduction –Language Elements –Objects of Java Script –Other Objects –Array

Unit III: **[12 periods]**

Cascading Style Sheets –Advantages of CSS –Properties of Tags –Property Values –Embedded Style Sheets –External Style Sheets –Grouping –Inheritance –Class as Selector –Pseudo Classes and Pseudo Elements –Positioning –Backgrounds –Element Dimensions.

Unit IV: **[12 periods]**

Servlets –Introduction –Advantages of Servlets -Servlet Life Cycle -The Servlet API -A Simple Servlet –Handling HTTP GET Requests –Handling HTTP POST Requests –Cookies –Session Tracking

Unit V: **[12 periods]**

Introduction –Advantages of JSP –Developing First JSP –Components of JSP –Reading request information –

Retrieving the data posted from a HTML file to a JSP File –JSP Sessions –Cookies –Disabling Session.

Text books:

1) Web Technology –A Developers Perspective –N P Gopalan, J Akilandeswari, Prentice Hall of India Pvt. Ltd.

Reference Books :

1. Mastering Javascript, J Jaworkski, BPB Publications, 1999.
2. Core SERVLETS AND JAVA SERVER PAGES VOLUME 1: CORE TECHNOLOGIES By Marty Halland Larry Brown Pearson, Pearson Education India

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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 Paper VII: Android Programming	**4**	**6**	**-**	**-**	**Theory**

Introduction:

The course understands the architecture, platform and tools required for android programming and develop real time mobile applications.

Course Outcome:

CO1	:	Understand the basics of android, relate the need of different user interface component in an application and in designing
CO2	:	Design an application with the given user interface component
CO3	:	Develop an application using menus
CO4	:	Understand the various drawing shapes in Android programming
CO5	:	Create real life mobile applications using android platform

Unit I : **[12 periods]**

Introduction-Getting Started-Downloading and installing Android Studio-Creating an Application-Running the Application on the Emulator – The Application Structure – Debugging Your Application-The Android SDK Manager- Creating an Android Virtual Device. Activities - An Activities Life cycle - Activity Demo Example - Changing the Application Icon - Using Android Resources - Starting Another Activity – Activity related Intents.

Unit II : **[12 periods]**

UI Components–Overview-Using the Android studio UI Tool - Using Basic Components – Toast - Alter Dialog - Notifications. Layouts – overview - Linear Layout - Relative Layout – Frame Layout-Table Layout – Grid Layout-Creating a Layout Programmatically. Listeners - Overview-Using the on click Attribute-Implementing a Listener

Unit III : **[12 periods]**

The Action Bar: Adding Action Items-Adding Drop down Navigation - Going Backup. Menus: Overview - The Menu File The option Menu – The Context Menu-The Popup Menu. List View **:** Overview-Creating A List Adapter – Using A List View- Extending List Activity and Writing A Custom Adapter-Styling The Selected Item. .

Unit IV : **[12 periods]**

Grid View – Styles and Themes –Bitmap Processing. Graphics and Custom Views - Over View - Hardware Acceleration - Creating a Custom View – Drawing Basic Shapes – Drawing Text– Transparency – Shades – Clipping - Using Paths - The Canvas Demo Application - Fragments.

Unit V : **[12 periods]**

Multi Pane Layouts – Animation : Overview-Property Animation - An Animation project – Preferences - Working With Files–Overview-Creating a Notes Application-Accessing the Public Storage-Working with Database.

Text books:

1. Budi Kurniawan ,**A Beginner's Tutorial, Android Application Development**,BrainySoftware,2015
   - **Unit I :** Sections: 1.1to 1.9,2.1to 2.8,3.1to 3.13(Chapter 1and2)
   - **Unit II :** Sections:4.1to4.5, 5.1to 5.9,6.1to6.6 (Chapter3 and5)
   - **Unit III :** Sections:7.1 to7.7,8.1, 8.8.6 to8.8 (Chapter6and 8) **Unit IV :** Section:10.1 to10.5,10.9, 11.1 to11.8 (Chapter9 and 13)
   - **Unit V :** Sections:12.1 to12.6 (Chapter 14and 18)

Reference Books:

1. Charlie Collins, Michael Galpin, Matthias Kappler, **Android in Practice**,Manning,2011
2. Anubhav Pradhan, Anil V. Desh pande, **Composing Mobile Apps: Learn, Explore, Applyusing Android,** Wiley, Publications, 2014.

3. Jeff Mcwherter, Scott Go well, **Professional Mobile Application Development** ,Wrox Publisher, 2012

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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	Tutorial	Practical	Lecture	Type
	Core Course –VIII Practical in Android Programming with Augmented and Virtual Reality	**4**	-	4	-	**Core**

Introduction: This course provide a “Android Programming with Augmented and Virtual Reality" course, students will have gained the skills to design, develop, and deploy immersive AR and VR applications on the Android platform. They will understand essential AR/VR concepts, including GUI components. Students will be able to incorporate 3D models and animations into their applications, creating highly engaging user experiences while learning performance optimization techniques to ensure smooth operation on mobile devices.

Course Outcome:

CO1	:	Design the application using basics of android programming
CO2	:	Develop an application using Graphics and Animation
CO3	:	Develop an application to perform different Dialog Boxes
CO4	:	Develop an application with different function of SQL lite
CO5	:	Develop 3D Object using AR and VR

LIST OF PRACTICALS

1. Create "Hello World" application. Display it in the middle of the screen in red color with white Background
2. Develop an application that uses GUI components, Font and Colors
3. Develop an application that uses Layout Managers and event listeners.
4. Write an android program to change the image displayed on the screen
5. Design an application representing a simple calculator
6. Create a simple application with login
7. Develop an application for working with Menus and Screen Navigation
8. Develop an Application for working with Notifications
9. Write an android program to demonstrate Alert Dialog Box
10. Augmented reality program to create a 3D object visualization
11.Create an infra of your college using AR Technology
11. 3D tour of your own house or famous place using VR and AR

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
	Core Practical - I – Web Technology Lab	**4**	**-**	**-**	**6**	**Core Practical**

Introduction:

To highlight the basic concepts of HTML and help the student to equip with the programming skills in implementing and developing web-based applications. Each exercise should be completed within two hours. It is compulsory to complete all the exercises given in the list in the stipulated time.

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 website using internal links and images.
2. Design a calendar using table tag.
3. Create a HTML document to display a list of five flowers and link each one to another document displaying brief description of the flower, Add pictures wherever possible.
4. Write an HTML code to display a list of 5 cars in a frame, Link each one to a brief description in second frame. The left frame should display the list and the right frame should display the paragraph about the frame.
5. Create a simple HTML Form covering major form elements.
6. Embed Audio and Video in an HTML page.
7. Rotate an element using CSS. 8. Build a simple quiz.

Text books:

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

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

	Allied – Quantitative Aptitude	**4**	**4**	**-**	**-**	**Core Theory**

Introduction:

To enhance the problem-solving skills, to improve basic mathematical skills and to help students wl preparing for any type of competitive examinations**.**

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 **[12periods]**

Area-Average-Calendar-Chain Rule-Puzzles .

Unit II: **[12 periods]**

Partnership-Percentage-Pipes and Cisterns-Problems on ages

Unit III: **[12 periods]**

Problems on boat and Stream-Ratio- Simple Interest-Time and work.

Unit IV: **[12 periods]**

Mental Ability and logical reasoning - Analogy Test- Series Test- Same Class (Odd) Test- Logical Venn Diagram - Syllogism

Unit V: **[12 periods]**

Analytical Reasoning-Mirror Images-Water Image (Number Letter Figure)-Completion of Incomplete Pattern-Grouping of Identical figures.

Text books:

1) Dr. R.S.Aggarwal ," Quantitative Aptitude" , S.Chand, company limited

Reference Books :

1. Dr.R.S.Aggarwal ,"A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S.Chand.
2. Edgar Thorpe "Mental ability and Quantitative Aptitude", 2 Edition

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Skill- Cloud Computing	**4**				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.

[12 periods]

Unit I: INTRODUCTION Cloud Computing Introduction, From, Collaboration to cloud, working of cloud computing, pros and cons, benefits, developing cloud computing services, Cloud service development, discovering cloud services.

[12 periods]

Unit II: CLOUD COMPUTING FOR EVERYONE Centralizing email communications, cloud computing for community, collaborating on schedules, collaborating on group projects and events, cloud computing for corporation, mapping, schedules, managing projects, presenting on road.

[12 periods]

Unit III: USING CLOUD SERVICES Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.

[12 periods]

Unit IV: OUTSIDE THE CLOUD Evaluating web mail services, evaluating instant messaging, evaluating web conference tools, creating groups on social networks, evaluating on line groupware, collaborating via blogs and wikis.

[12 periods]

Unit V: STORING AND SHARING Understanding cloud storage, evaluating on line file storage, exploring on-line book-marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web-based desktops.

Text books:

1. Michael Miller, “Cloud Computing”, Pearson Education, New Delhi, 2009
2. Ian Foster and Dennis B Gannon, "Cloud Computing for Science and Engineering", MIT Press, Massachusetts, 2017.
3. RajkumarBuyya, James Broberg and AndrzejGoscinski, "Cloud Computing: Principles and Paradigms", Wiley India Pvt Ltd, New Delhi, 2017.

Reference Books :

1. Mathew Portnoy, "Virtualization Essentials", Wiley India Pvt Ltd, New Delhi, 2017.
2. Thomas Erl, ZaighamMahmood and Ricardo Puttini, "Cloud Computing: Concepts, Technology and Architecture", Pearson Education, Chennai, 2017.
3. Anthony T Velte, Toby J Velte and Robert Elsenpeter, "Cloud Computing – A Practical Approach", McGraw Hill Education (I) P Ltd, Chennai, 2017.
4. Kris Jamsa , "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security, and More", Jones and Bartlett, New Delhi, 2014.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Value Added Course - Understanding Blockchain Technology	**2**	**3**	**-**	**-**	**Theory & 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
	Part I Tamil	**3**	**6**	**1**	**0**	**Theory**

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Course Outcome:

CO1	:	□□ பய□□ உ□□ள□□.
CO2	:	□□ □□ள□□க□□ த□□த□□.
CO3	:	□□ள□□.
CO4	:	□□ள□□.
CO5	:	□□.

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

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MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	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	:	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	:	Develop the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.

Unit I : **[12 periods]**

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

Unit II: **[12 periods]**

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

Unit III: **[12 periods]**

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

Unit IV: **[12 periods]**

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

Unit V: **[12 periods]**

Public Speaking-Chicago Address-Swami Vivekananda-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

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Graphics and multimedia	**4**	**4**	**0**	**0**	**Theory**

INTRODUCTION

Graphics and multimedia understanding and awareness how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users

Course Outcome:

CO1	:	To understand the three-dimensional graphics and their transformations.
CO2	:	To appreciate illumination and color models
CO3	:	To become familiar with understand clipping techniques
CO4	:	To become familiar with Blender Graphics
CO5	:	To gain knowledge about graphics hardware devices and software used.

UNIT: I ILLUMINATION AND COLOR MODELS [12periods]

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection. Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitive

UNIT: II TWO-DIMENSIONAL GRAPHICS [12periods]

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, two-dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms

UNIT: III THREE-DIMENSIONAL GRAPHICS [12 periods]

Three dimensional concepts; Three-dimensional object representations – Polygon surfaces Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -BSpline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three-dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods

UNIT : IV MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING [12periods]

Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases. Compression and decompression – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval technologies

UNIT: V HYPERMEDIA **[12 periods]**
Multimedia authoring and user interface - Hypermedia messaging -Mobile messaging − Hypermedia message component − Creating hypermedia message − Integrated multimedia -message standards − Integrated document management − Distributed multimedia systems. CASE STUDY: BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modelling – Shading & Textures
Text books: **1.**Donald Hearn and Pauline Baker M, —Computer Graphics", Prentice Hall, New Delhi, 2.Andleigh, P. K and KiranThakrar, —Multimedia Systems and Design‖, PHI
Reference Books : 1. Judith Jeffcoate, —Multimedia in practice: Technology and Applications‖, PHI 2.Foley, Vandam, Feiner and Hughes, —Computer Graphics: Principles and Practice‖, 2nd Edition, Pearson Education

Mapping of Course Outcomes with Program Outcomes:

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

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Graphics and multimedia Lab	**2**	**0**	**0**	**4**	**Practical**

Introduction:

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

Course Outcome:

CO1	:	To Demonstrate a solid understanding of fundamental graphics concepts including rasterization, vector graphics, transformations, and rendering pipelines.
CO2	:	To Implement algorithms for 2D and 3D graphics operations such as line drawing, circle drawing, polygon filling, and transformations (translation, rotation, scaling).
CO3	:	To Utilize graphics libraries (such as OpenGL, WebGL, or DirectX) to create interactive multimedia applications.
CO4	:	To Apply multimedia techniques including image manipulation, animation, and audio integration in programming projects.
CO5	:	To Develop interactive graphical applications incorporating user interfaces, event handling, and multimedia elements..

Lab Experiments:

1. Write a program to draw a line using DDA algorithm
2. Write a program to draw a line using Bresenham's 's algorithm.
3. Write a program to draw a circle using midpoint algorithm.
4. Write a program to draw a circle using Bresenham's 's algorithm
5. Write a program to draw a rectangle using line drawing algorithm.
6. Write a program to perform 2D Transformation on a line
7. Write a program to perform shear transformation on a rectangle.

8.Write a program to rotate a circle (alternatively inside and outside) around the

circumference of another circle

9.Write a program to draw a car using in build graphics function and translate it from

bottom left corner to right bottom corner of screen.

10.Write a program to draw balloons using in build graphics function and translate it

from bottom left corner to right top corner of screen.

11.Write a program to draw a cube using in build library function and perform 3D transformations

12.Write a program to implement line clipping (Cohen Sutherland algorithm).

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

Subject	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Code						
	Allied – Operations Research	**4**	**4**	**-**	**-**	**Theory**

Introduction:

This paper enables the students to learn the basic skills of solving very common problems which we come acr various fields like transportation, sequencing and industries with machines.

Course Outcome:

CO1	:	To identify the goals and objectives of LPP and describe the procedure of solving LPP.
CO2	:	To develop the ability to handle the LPP equation to analyze the effect of objective function.
CO3	:	To understand the various methods of solving the Transportation Problem.
CO4	:	To understand how to reduce the cost value of the Assignment Problems.
CO5	:	To develop the sequence procedure for solving a real-life problem.

Unit : I **[12periods]**

LPP: Introduction- Linear Programming Problem – Formulation of L.P.P. – Graphical solutions of L.P.P – Canonical & standard form of LPP – Simplex Method – Big-M Method

Unit II: **[12 periods]**

Duality in LPP: - Duality in Linear Programming - General primal-dual pair - Formulating a Dual problem - Primal-dual pair in matrix form -Dual simplex method.

Unit III: **[12 periods]**

Transportation problem: Introduction- LP formulation of the TP - Solution of a TP - Finding an initial basic feasible solution (NWCM - LCM -VAM) – Degeneracy in TP – Transportation Algorithm (MODI Method).

Unit IV: **[12 periods]**

Assignment problem: Introduction- Solution methods of assignment problem – special cases in assignment problem.

Unit V: **[12 periods]**

Sequencing Problem: Introduction- Problem of sequencing-processing n jobs through Two machines- processing n jobs through k machines- processing 2 jobs through k machines

Text books:

1. Operations Research by Kanti Swarup , P.K.Gupta and Man Mohan, S. Chand & Sons Education Publications, New Delhi (2008).

Reference Books :

1. Sundaresan.V, Ganapathy Subramanian. K.S. and Ganesan.K, Resource Management Techniques, A.R. Publications, 2002.
2. Prem Kumar Gupta D. S. Hira, “Operations Research”, S. Chand & Company Ltd, Ram Nagar, New Delhi.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Elective II - AI in Cloud Computing	**4**	**6**	**-**	**-**	**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 probabilistic reasoning under uncertainty.

Unit I : **[12periods]**

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

Unit II: **[12 periods]**

Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments.

Unit III: **[12 periods]**

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories

Unit IV: **[12 periods]**

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack

Unit V: **[12 periods]**

CLOUD SECURITY: Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyper jacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.

Text books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021
2. Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.

Reference Books :

1. 1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education,2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Elective II- Data Mining	**4**	**6**	**-**	**-**	**Theory**

Introduction:

To provide the knowledge on Data Mining and Warehousing concepts and techniques. To study the basic concepts of cluster analysis to study a set of typical clustering methodologies, algorithms, and applications

Course Outcome:

CO1	:	To understand the basic concepts and the functionality of the various data mining and data warehousing component
CO2	:	To know the concepts of Data mining system architectures
CO3	:	To analyse the principles of association rules
CO4	:	To get analytical idea on Classification and prediction methods.
CO5	:	To Gain knowledge on Cluster analysis and its methods.

Unit I : **[12periods]**

Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction

Unit II: **[12 periods]**

Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures

Unit III: **[12 periods]**

Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules from Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses

Unit IV: **[12 periods]**

Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction –

Introduction – Classifier Accuracy

Unit V: **[12 periods]**

Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method

Text books:

1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

Reference Books :

1. K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ", Prentice Hall of India Pvt. Ltd, New Delhi
2. Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Elective II- Deep Learning	**4**	**6**	**-**	**-**	**Theory**

Introduction:

To introduce students to the basic concepts and techniques of deep Learning. Importance of Deep Learning lies in solving many problems that are difficult or impossible for traditional algorithms or human experts. It can handle large and complex data sets, such as images, videos, audio, text, and more.

Course Outcome:

CO1	:	Understanding of neural networks, machine learning principles, and their practical applications
CO2	:	Solid understanding of TensorFlow, its core concepts
CO3	:	Apply Convolutional Neural Networks
CO4	:	To apply this knowledge to implement and optimize models using TensorFlow for a variety of tasks, including sequence processing, language translation, and tasks requiring memory and reasoning.
CO5	:	To apply this knowledge to design, implement, and optimize reinforcement learning models for various sequential decision-making tasks.

Unit I : **[12periods]**

Introduction to Learning Basic Neural Network – Limits of Traditional Computer Program – The Mechanics of Machine Learning – Neuron – FF Neural Networks – Types of Neurons –Soft max output layers.

Unit II: **[12 periods]**

Creating and Manipulating TensorFlow Variables – TensorFlow Operations – Place holders Tensors– Sessions in TensorFlow – Navigating Variable Scopes and Sharing Variables– Managing Models over the CPU and GPU – Leveraging Tensor Board to Visualize Computation Graphs and Learning.

Unit III: **[12 periods]**

Convolutional Neural Network – Full Architectural Description of Convolution Networks – Max Pooling - Full Architectural Description of Convolution Networks – Building a Convolutional Network for CIFAR-10- Visualizing Learning in Convolutional Networks – Learning Lower-Dimensional Representation – Principal Component Analysis –

Motivating the Autoencoder Architecture – Implementing an Autoencoder in TensorFlow.

Unit IV: **[12 periods]**

Analysing Variable – Length Inputs - RNN 17 Recurrent Neural Networks – Long Short-Term Memory (LSTM) Units — TensorFlow Primitives for RNN Models – Augmenting Recurrent Networks with attention – Dissecting a Neural Translation Network – Differentiable Neural Computers – The DNC Controller Network – Implementing the DNC in TensorFlow.

Unit V: **[12 periods]**

Reinforcement Learning Networks - Reinforcement Learning 18 Reinforcement Learning – MDP – Q (Learning and Deep Q-Networks) – Deep Q-Network – Target Q-Network – Updating our target Q-Network – DQN Main Loop – Improving and Moving Beyond DQN – Deep Recurrent Q-Networks (DRQN).

Text books:

1. NikhilBuduma, Nicholas Locascio — Fundamentals of Deep Learning: Designing Next Generation Machine Intelligence Algorithms, O'Reilly Media.

2. Josh Patterson & Adam Gibson – Deep Learning, O'Reilly Media.

Reference Books :

1. IanGoodfellow, YoshuaBengio, AaronCourville, Deep Learning (Adaptive Computation and Machine Learning series, MITPress,2017.

2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	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 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 Neighbours 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.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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 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.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Elective III- Network Security and Cry topography	**4**	**6**	**-**	**-**	**Theory**

Introduction:

Network security and cryptography are crucial for protecting sensitive information from cyber threats. They ensure the secure transmission of data across networks, safeguard privacy, and maintain trust in digital systems. Without these measures, individuals and organizations are vulnerable to a wide range of cyber risks, including identity theft, financial loss, and reputational damage. As cyber threats continue to evolve, the importance of robust network security and cryptographic practices cannot be overstated.

Course Outcome:

CO1	:	Remember the basic concept of Cryptography and various types of attacks.
CO2	:	Understand about various types of protocols for Internet Security.
CO3	:	Implement various algorithms for Cryptography
CO4	:	Review Firewall and IP security
CO5	:	To be familiar with network security threats and countermeasure

Unit I : SERVICEMECHANISM [12 periods]

Service mechanism and attacks – The OSI security architecture – A model for network security – symmetric Cipher model – Substitution techniques – transposition techniques – simplified des – block chipper principles – the strength of des – block chipper design principles and modes of operation.

Unit II: TYPES OF DES [12 periods]

Triple des-blow fish – RCS Advanced Symmetric Block Ciphers –RC4 stream Cipher confidentially using symmetric encryption – introduction to number theory – public – key cryptography and RSA.

Unit III: KEY MANAGEMENT [12 periods]

Key management – Diffle Hellman key exchange – message authentication and hash function – hash algorithm – digital signature and authentication protocols – digital signature standard.

Unit IV: AUTHENTICATION [12 periods]

Authentication application – pretty good privacy – S/MIME – ip security – web security considerations – secure socket layer transport layer security –secure electronic transaction.

Unit V: INTRUDERS [12 periods]

Intruders –intrusion detection – password management –viruses and related threats – virus countermeasures – fire wall design principles – trusted systems

Text books:

1. William Stallings, Cryptography and Network Security Principles and Practices, Fourth edition, PHI Education Asia.

Reference Books :

1) Atul Kahate, Cryptography and Network Security, 2nd Edition, TMH.
2) 2 Behrouz A.Forouzan, Cryptography and Network Security, TMH.

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	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
	Elective -III Data Communication and Networks	**4**	**6**	**-**	**-**	**Theory**

Introduction:

A data communication analyst oversees the operations of information and network systems. After conducting research on which technologies will best suit a company's needs, these analysts are in charge of designing, testing and maintaining these systems.

Course Outcome:

CO1	:	To become familiar with layered communication architectures (OSI and TCP/IP).
CO2	:	· To understand the client/server model and key application layer protocols
CO3	:	To learn sockets programming and how to implement client/server programs.
CO4	:	· To understand the concepts of reliable data transfer
CO5	:	To learn about TCP and implement it.

Unit I : Introduction to Computer Network **[12 periods]**

Structure of the communications network - point-to-point and multidrop circuits - data flow and physical circuits –Various network topologies - topologies and design goals. The telephone network, switched and non-switched options - channel speed and bit rate - voice communications and analogy waveforms - bandwidth and the

frequency spectrum

Unit II: Layered Protocols & LAN **[12 periods]**

Layered Protocols and the OSI Model: Goals of Layered Protocols, network design problems" communication between layers- introduction to standard organizations and the OSI model - Layers of OSI. Local Area Networks: Why LANs? Primary attributes of a LAN - Broadband and baseband and base LANs - IEEE LAN standards - connection options with LANs

Unit III : Network Protocols **[12 periods]**

Network Protocols: TCP, UDP, IP, ICMP, SNMP, and RMON.TCP/IP: TCP/IP and internetworking - related protocols ports and sockets - The IP address structure - major features of IP - IP datagram - Major IP services -IP source routing -Value of the transport layer – TCP- Major features of TCP -Passive and active operation - the transmission control block (TCP) - route discovery protocols - application layer protocols.

Unit IV: Protocols **[12 periods]**

Polling/Selection Protocols: Character and bit protocols - binary synchronous control (BSC) HDLC - HOLC options - HDLC frame format - code transparency and synchronization -HDLC transmission process -HDLC subsets - SDLC Protocol conversion. Switching and Routing in Networks: Message switching - packet switching -packet routing - packet switching support to circuit switching networks

Unit V: Network Security **[12 periods]**

Network Security: IP Security: Architecture, Authentication header -Encapsulating security payloads- combines security associations - key management. DNS spoofing, VLAN hopping. Web Security: Secure socket layer and transport layer security - secure electronic transaction(SET). System Security: Intruders, Viruses and related threats - firewall design principles- trusted systems

Text books:

1. B. Forouzan, Debdeep Mukhopadhyay, 2015. Cryptography and Network Security, TMH.
2. Michael A. Miller, 2008. “Data & Network Communications”, Vikas Publication

Reference Books :

1. Stallings. W, 2007. “Computer Communication Networks”,4th edition, Prentice Hall of India.
2. Tanneabaum. A.S, 2003. “Computer Networks”, 4th edition, Prentice Hall of India

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Elective -III OPERATING SYTEM AND NETWORK	**4**	**6**	**0**	**0**	**Theory**

Introduction:

This course is aimed at providing students with a practical and theoretical knowledge of cryptography and network security. To develop an understanding of different cryptographic protocols and techniques, understand methods for authentication, access control, intrusion detection and prevention.

Course Outcome:

CO1	:	To understand basics of Cryptography and Network Security
CO2	:	To be able to secure a message over insecure channel by various means.
CO3	:	To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
CO4	:	To understand various protocols for network security to protect against the threats in the networks.
CO5	:	Apply methods for authentication, access control, intrusion detection and prevention

Unit I : [12 periods] What is Operating System – History - Hardware Review - OS Zoo - OS Concepts - System Calls - OS Structure, World in C
Unit II: [12 periods] Processes – Threads – Inter process Communication – Scheduling - Classical Problems - Memory Management – Virtual memory abstraction – Swapping – Paging.
Unit III: [12 periods] Page Replacement Algorithms - File Manger – File Types – Directories Paths – File system Layout – contiguous Allocation Linked List – File Allocation Table – Disk Space Management – Input/output Controller – Disks – Deadlocks.
Unit IV: [12 periods] Virtualization and Cloud – Why do we need Virtualization – VMM Requirements for Virtualization – Type1 Hypervisor – Type 2 Hypervisor – Virtual Machine Interface -
Unit V: [12 periods] Security Environment – Operating System Security – Controlling Access to Resource – Basics of Cryptography
Text books: 1. Modern Operating Systems 4E, Andrew S. Tanenbaum, Herbert Bos, Prentice Hall
Reference Books : 1.Operating Systems Concepts – 6th ed., by Silberschatz, Galvin, & Gagne; John Wiley & Sons.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Skill- Linux and Shell Programming	**4**	**6**	**-**	**-**	**Theory**

Introduction:

The "Linux and Shell Programming" course aims to equip students with a comprehensive understanding of the Linux operating system and the intricacies of shell scripting. The course begins with an introduction to the Linux environment, covering essential commands, file systems, and system architecture. Students will learn to navigate the command line interface effectively, manage files and directories, and utilize various utilities for system maintenance. The core focus then shifts to shell programming, where students will delve into writing and debugging scripts using popular shells such as Bash

Course Outcome:

CO1	:	Describe the architecture and features of Linux Operating System and distinguish it from another Operating System.
CO2	:	Describe the architecture and features of Linux Operating System and distinguish it from another Operating System.
CO3	:	Develop shell scripts using pipes, redirection, filters and Pipes
CO4	:	Apply and change the ownership and file permissions using advance Unix commands.
CO5	:	Build Regular expression to perform pattern matching using utilities and implement shell scripts for real time applications.

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

Introduction to LINUX Operating System: Introduction - The LINUX Operating System.

Unit II: MANAGING FILES AND DIRECTORIES **[12 periods]**

Managing Files and Directories: Introduction – Directory Commands in LINUX – File Commands in LINUX.

Unit III : VI EDITOR **[12 periods]**

Creating files using the vi editor: Text editors – The vi editor. Managing Documents: Locating files in LINUX – Standard files – Redirection – Filters – Pipes

Unit IV: SECURING FILE **[12 periods]**

Securing files in LINUX: File access permissions – viewing File access permissions – Changing File access permissions. Automating Tasks using Shell Scripts: Introduction – Variables- Local and Global Shell variables – Command Substitution.

Unit V: CONDITIONAL EXECUTION IN SHELL SCRIPTS **[12 periods]**

Using Conditional Execution in Shell Scripts: Conditional Execution – The case…esac Construct. Managing repetitive tasks using Shell Scripts: Using Iteration in Shell Scripts – The while construct – until construct – for construct – break and continue commands – Simple Programs using Shell Scripts.

Text books:

1. Operating System LINUX, NIIT, PHI, 2006, Eastern Economy Edition.
2. N.B. Venkateswarlu , Introduction to Linux: Installation and Programming, BS Publications, 2008, 1st Edition

Reference Books :

1) Richard Petersen, Linux: The Complete Reference, Sixth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2008.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Value Added Course: Fundamentals of Data Science	**2**	**3**	**-**	**-**	**Theory &**

	and Machine Learning					**Practical**

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 :

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

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Big Data Analytics	**4**	**4**	**-**	**-**	**Theory**

Introduction:

In this course, students to understand more advanced tools used to wrangle and analyze big data. Through this course the students got guided in basic approaches to querying and exploring data using higher level tools built on the top of a Hadoop platform. **Course Outcome:**

CO1	:	To understand the meaning of big data, need of big data and how worth to study by understands their characteristics of big data.
CO2	:	To gain knowledge in evolution of Hadoop, understanding the components of Hadoop.
CO3	:	To understand the value of data analyst and how to implementing a big data in organization.
CO4	:	To analysis the big data in context, getting the knowledge of predictive analytics and big data.
CO5	:	To understanding the concepts of humanizing and consumerization of big data analytics.

Unit I : **[12 periods]**

Big Data- Form the Business perspective: What is big data- Characteristics of big data- Can There be enough? The Volume of the Data- Variety Is the spice of Life- How Fast Is Fast? The Velocity of Data- Data in the Warehouse and Data in Hadoop- Wrapping It Up.

Unit II: **[12 periods]**

Big data- From the Technology perspective: All about Hadoop- The History of Hadoop- Components of Hadoop- Application Development in Hadoop- Getting your Data into Hadoop.

Unit III: **[12 periods]**

Getting Started with the big data Analytics- Changing Focus with big data- The role of the Data Analyst- Implementing Big Data Analytics within an Organization Using Alteryx- Blending Data from Multiple Sources- Looking at Alteryx Designer Desktop.

Unit IV: **[12 periods]**

Analyzing big data in context: Focus on Context: Focus on Context, not just Integration- Combining Big Data with Spatial Data- Leveraging External Data Provider Resources. **Getting Value form predictive Analytics and big data:** Why do Predictive Analytics on Big data? - Moving predicative Analytics to the from predictive analysis.

Unit V: **[12 periods]**

Humanizing Big Data Analytics: Putting Big Data in the Hands of Those Who Need it- Humanizing Data Design Principles- Humanizing Big Data Analytics Workflow- Considering Consumerization of Big Data Analytics- Getting an Alteryx Analytics Gallery overview- publishing Data and Analytics to Cloud Service- focusing on Consuming Applications- The Best platform for Strategic Analytics.

Text books:

1. Understanding Big Data (Analytics for Enterprise Class Hadoop and Streaming Data), Chris Eaton, Drik roos, Tom Deutsch, George Lapis, Paul Zikopoulos, 2011(Unit-I, II).
2. Big Data Analytics for Dummies, Micheal Wessler, OCP & CISSP, 2012(Unit-III, IV, V)

Reference Books :

1. Big Data Analytics Using Splunk, Peter Zadrozny and Rahu Kodali, Apress 2013.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Practical - Big Data Analytics Lab	**2**	**-**	**-**	**4**	**Practical**

Introduction:

In this course, students to understand more advanced tools used to wrangle and analyze big data.

Course Outcome:

CO1	:	Understanding the necessary infrastructure and software for setting up a single node Hadoop cluster.
CO2	:	Develop programs in Setting up the single node cluster, configuring and installing required software.
CO3	:	Implement Testing the cluster and exploring the Hadoop ecosystem via Web UI.
CO4	:	Executing basic Hadoop commands to manage HDFS
CO5	:	Implement Setting up Eclipse IDE to run and debug MapReduce jobs, highlighting the role of dependent libraries in processing.

1. Prepare infrastructure and understand objective for software requirement for setting up single node Hadoop cluster.

WinSCP
Putty
Ubuntu
VMPlayer
Hadoop version

2. Create single node Hadoop cluster.

Installing Ubuntu on VM
Installing Java
SSH Configuration
Core-site.xml Configuration
Hdfs-site.xml Configuration
Yarn-site.xml Configuration

3. Testing Single Node cluster, Web UI ports and Exploring different daemons of Hadoop Cluster.

4. Perform / Execute below sets of Hadoop basic commands:

appendToFile
cat
chgrp
chmod
chown
copyFromLocal
copyToLocal
count
cp

5. Install eclipse IDE on single node cluster for executing Map Reduce Job and understand the role of dependent libraries for processing job.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Elective IV- Data Structures and Algorithms	**4**	**6**	**-**	**-**	**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]**

Trees 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, 2nd Edition, Cengage, 2008.
3. Horowitz Sahni Anderson-Freed, Fundamental of Data Structures in C, Universities Press, Reprint 2008.

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.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

	Elective IV-Computational Intelligence	**4**	**6**	**-**	**-**	**Theory**

Introduction:

Computational Intelligence integrates principles from computer science, artificial intelligence (AI), machine learning, and cognitive psychology to emulate and extend human-like intelligence in machines. Unlike traditional AI approaches that rely heavily on explicit programming and rules, CI focuses on learning from data, adaptive behaviour, and evolutionary processes to achieve intelligent outcomes.

Course Outcome:

CO1	:	Understanding of Computational Intelligence principles and Neural Networks
CO2	:	Understanding supervised and unsupervised learning algorithms and their applications
CO3	:	understand how fuzzy logic can complement traditional crisp logic approaches
CO4	:	Understanding of Genetic Algorithms and their applications
CO5	:	Apply Computational Intelligence techniques

Unit I: **[12periods]**

Computational intelligence (CI): Adaptation, Self-organization and Evolution, Biological and artificial neuron, Neural Networks Basic Concepts, - Single Layer Perception-Multilayer perceptron

Unit II: **[12periods]**

Supervised and unsupervised learning- Back propagation networks-Kohnen's self-organizing networks-Hopfield networks- Implementations.

Unit III: **[12periods]**

Fuzzy systems: Basic Concepts, Fuzzy sets- properties- membership functions- fuzzy operations, Applications, Implementation, Hybrid systems.

Unit IV: **[12periods]**

Evolutionary computing: -Introduction to Genetic Algorithms. The GA computation process natural evolution-parent selection-crossover-mutation-properties – classification – Advances in the theory GA.

Unit V: **[12 periods]**

CI application: case studies may include image processing, digital systems, control, forecasting and time-series predictions.

Text books:

1. R.C. Eberhart, "Computational Intelligence: Concept to Implementations", Morgan Kaufmann Publishers, 2007.
2. A Konar, "Computational Intelligence: Principles, Techniques and Applications", Springer - Verlag, 2005.

Reference Books:

1. Laurence Fausett, "Fundamentals of Neural Networks", Prentice Hall,1994
2. Timothy J Rose, "Fuzzy Logic with Engineering Applications", Third Edition, Wiley, 1995.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	Skill - Internet of Things	**4**	**4**	**-**	**-**	**Theory**

Introduction:

The internet of things paradigm promises to make things including consumer electronic devices or home appliances, such as medical devices, fridge, cameras, and sensors, part of the internet environment.

Course Outcome:

CO1	:	Students can understand and develop their knowledge of Internet of Things.
CO2	:	Analyse basic protocols in wireless sensor network.
CO3	:	Students can develop their knowledge of applications related with IOT.
CO4	:	Design IoT applications in different domain and be able to analyze their performance
CO5	:	Implement basic IoT applications on embedded platform.

Unit I : Introduction to IoT **[12 periods]**

Defining IoT - Characteristics of IoT - Physical design of IoT – Logical design of IoT - Functional blocks of IoT - Communication models & APIs - Machine to Machine - Difference between IoT and M2M - Software define Network.

Unit II: Network & Communication aspects **[12 periods]**

Wireless medium access issues - MAC protocol survey - Survey routing protocols - Sensor deployment & Node discovery - Data aggregation & dissemination.

Unit III: Challenges in IoT **[12 periods]**

Design challenges - Development challenges - Security challenges - Other challenges.

Unit IV: Domain specific applications of IoT **[12 periods]**

Home automation - Industry applications - Surveillance applications - Other IoT applications.

Unit V: Developing IoTs **[12 periods]**

Introduction to Python - Introduction to different IoT tools - Developing applications through IoT tools - Developing sensor-based application through embedded system platform - Implementing IoT concepts with python

Text books:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”

Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice

Reference Books :

1) Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
2) Anna Hac, "Wireless Sensor Network Designs", John Wiley & Sons Ltd.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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
	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 [5Hours]
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 [5Hours]
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 [5Hours]
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