B.Sc.,
COMPUTER SCIENCE
WITH
ARTIFICIAL INTELLIGENCE

SYLLABUS

FROM THE ACADEMIC YEAR
2025 – 2026

1. Introduction

B.Sc. Computer Science with Artificial Intelligence

Artificial Intelligence is a hot core field that is rapidly growing in the fast-changing world and powering for great industrial revolution. The world workforce has changed the way the business grows without affecting humanity. A software giant predicted that around 75 million conventional jobs may disappear while 130 million jobs created during the revolution of AI. It is estimated that by 2025, 30% of the jobs will end-up unfilled due to required skills shortage.

Many organizations already face a shortage of skilled talents across different verticals. Technical jobs increasingly require technology skills, organizations have begun to search for skilled persons with specialized skills such as data scientists, robotics experts and AI engineers and block chain developers etc.

The course is designed to bridge the gap between IT industries and academic institutes by incorporating the latest Artificial Intelligence technologies into the curriculum and to give students a complete understanding within a structured framework. The curriculum supports students to gain adequate knowledge in advanced programming as well as Artificial Intelligence practices along with theoretical foundation and also includes interdisciplinary courses and electives for widening the domain expertise. State-of-the-art infrastructure provides an excellent learning environment to hone the knowledge of each student.

The course provides a strong foundations in fundamentals of computer science with the knowledge of AI for employability and/or further studies in Post-graduation. Empower students with competencies in creative thinking, working in virtual domain with AI technique problem solving in virtual domain, inter-personal communication and managerial skills. Facilitate overall understanding of technological development with legal and ethical issues. Equip the students in providing professional solutions to next generation solutions using AI techniques and adopting Virtual Reality concepts.

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.Sc., Computer Science with Artificial Intelligence**
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study** **PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.** **PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.** **PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.** **PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.** **PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation** **PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work**

	efficiently as a member of a team **PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.** **PO9: Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.** **PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.** **PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.** **PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.** **PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demon starting the ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.** **PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.** **PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn‟, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.**

Programme Specific Outcomes:	**PSO1: Think in a critical and logical based manner** **PSO2: Familiarize the students with suitable software tools of Computer Science, Information Technology and industrial applications** **PSO3: Understand, formulate, develop programming model with logical approaches to address issues arising in social science, business and other contexts.** **PSO 4: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.** **PSO 5: Equip with Computer Science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.**

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	Y	Y	Y	Y	Y	Y	Y	Y
PSO 2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO 4	Y	Y	Y	Y	Y	Y	Y	Y
PSO 5	Y	Y	Y	Y	Y	Y	Y	Y

3 – Strong, 2- Medium, 1- Low

Highlights of the Revamped Curriculum:

- **Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.**
- **The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.**
- **The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.**

- **The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.**
- **The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.**
- **The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.**
- **Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.**
- **State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.**

B.Sc. COMPUTER SCIENCE with ARTIFICIAL INTELLIGENCE

Semester I			
Component	**List of courses**	**Credits**	**No. of Hrs**
Part I	Language – Tamil	3	6
Part II	English	3	6
Part-III	Core Course CC- I C Programming	5	5
Part-III	Core Course CC-II C Programming Laboratory	5	5
Part-III	Discrete Mathematics	3	4
Part- IV	Skill Enhancement Course SEC – 1 Computer Fundamentals Laboratory	2	2
Part- IV	Fundamentals of Computers	2	2
TOTAL		23	30

Semester II			
Component	**List of courses**	**Credits**	**No. of Hrs**
Part I	Language – Tamil	3	6
Part II	English	3	4
Part III	Core Course CC III Programming in C++	4	5
Part III	Core Course CC IV Programming in C++ Laboratory	4	5
Part III	Artificial Intelligence & Knowledge Representation	3	4
Part IV	Skill Enhancement Course SEC 2 Data Structures	2	2
Part IV	Skill Enhancement Course SEC 3 Data Structures Laboratory	2	2
	Naan Mudhalvan	2	2
TOTAL		23	30

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	C PROGRAMMING	CCI	5	-	-	I	5	25	75	100

UNIT	Contents	No. of Hours
I	C Declarations:- Character Set – C tokens – Keywords and Identifiers – Identifiers – Constants – Variables – Data types – Declaration of Variables – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants Operators and Expressions:- Arithmetic Operators – Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operator – Bitwise Operators – Special Operators – Arithmetic Expressions – Evaluation of Expressions – Precedence of Arithmetic Expressions. Managing Input and Output Operations:- getchar( ) – putchar( ) – scanf( ) – printf( ).	15
II	Decision Making and Branching: Introduction – Decision Making with IF statement – Simple IF Statement – The IF.. Else Statement – Nesting of IF.Else Statements – ELSE IF Ladder – Switch statement – The? Operator –The GOTO Statement. Decision Making and Looping: Introduction – the WHILE Statement – The DO Statement- FOR Statement –Jumps in Loops	15
III	Arrays: Introduction – One Dimensional Arrays – Declaration of One Dimensional Arrays – Initialization of One Dimensional Arrays-Two Dimensional Arrays – Initializing Two Dimensional Arrays –Multi – Dimensional Arrays Character Arrays and Strings: Introduction – Declaring and Initializing string Variables – Reading strings from Terminal – Writing Strings to screen - Comparison of Two strings – String Handling Functions	15
IV	Function – Elements of User Defined Functions –Definition of Functions – Return values and their types – Function Calls – Function Declaration – Category of Functions – Recursion- Passing Arrays to Functions – Passing Strings to Functions – The Scope,	15

	Visibility and Lifetime of Variables **Structure and Unions: Defining a Structure – Declaring Structure Variables - Accessing Structure Members – Unions – Bit Fields.**	
V	**Pointers: Understanding Pointers – accessing the Address of a Variable – Declaring Pointer Variables – Initialization of pointer variables – Accessing a variable through its pointer – chain of pointers Expressions – pointer increments and scale Factor – pointers and Arrays – Pointer and Character Strings – Array of pointers – pointers as Function Arguments – Functions Returning pointers –pointers to functions** **File Management in C: Introduction – Defining and Operating a File – Closing a file – Input /output Operations on Files –Error handling During I/O Operations**	**15**
TOTAL HOURS		**75**

Course Outcome		**Programme Outcome**
CO	**On completion of this course, students will**	
CO1	**Describe the procedural paradigm**	**PO1, PO2, PO3, PO4, PO5, PO6**
CO2	**Demonstrate decision making and loop statements**	**PO1, PO2, PO3, PO4, PO5, PO6**
CO3	**Understand pass by value and pass by reference**	**PO1, PO2, PO3, PO4, PO5, PO6**
CO4	**Identify the use of structure and union**	**PO1, PO2, PO3, PO4, PO5, PO6**
CO5	**Explain the various file stream**	**PO1, PO2, PO3, PO4, PO5, PO6**

Textbook

1	**Programming in ANSI C – 6th Edition by E Balagurusamy – Tata McGraw Hill Publishing Company Limited.**

Reference Books

1. Computer System and Programming in C by Manish Varhney, Naha Singh – CBS Publishers and Distributors Pvt Ltd.

2. Introduction to Computer Science, ITL Education Solutions Limited, Second Edition, Pearson Education

3. Computer Basics and C Programming by V. Rajaraman – PHI Learning Private Limited

4. Programming with C, Third Edition, Byron S Gottfried, Tata McGraw Hill Education Private Limited.

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	C PROGRAMMING LABORATORY	CCI	5	-	-	I	5	50	50	100

1. To find all possible roots of a quadratic equation using if statement

2. Program to check vowel or consonant using switch case statement

3. Evaluate Sine series using while loop

$$\sin(x) = x - x^3 / 3! + x^5 / 5! - \ldots\ldots\ x^n / n!$$

4. Sort a list of numbers in ascending order

5. Search an element in an array

6. Reverse a number

7. Check if the given string is palindrome or not

8. Find the binomial coefficient (nCr) value & gcd using recursion

9. Multiply two matrices (check for compatibility)

10. Transpose of a matrix

11. Find the sum of 'n' numbers by making function call (passing array as argument to function)

12. Alphabetical sorting

13. Exchange values using pointers and function

14. Prepare the student details using structure

15. Prepare mark sheet using file

DISCRETE MATHEMATICS

Subject Code	L	T	P	Semester	Credits	Inst. Hours	Marks		
							CIA	External	Total
	4	0	0	I	3	4	25	75	100

Learning Objectives	
LO1	To get the knowledge about the relations
LO2	To understand the functions and their classifications
LO3	To understand the propositions and normal forms
LO4	To understand the usage of matrix
LO5	To acquire knowledge about the graphs

Prerequisites: Mathematics Fundamentals

Unit	Contents	No. of Hours
I	Introduction to Relations – Binary relation – Classification of Relations – Composition of Relations–Inverse of Relation–Closure operation on Relations–Matrix representation of Relation – digraphs	12
II	Introduction to Functions–Addition and Multiplication of Functions –Classifications of Functions – Composition of Function – Inverse Function	12
III	Introduction – Statement (Propositions) – Laws of Formal Logic –Basic Set of Logical operators/operations-Propositions and Truth Tables–Algebra Propositions-Tautologies and Contradictions – Logical Equivalence – Logical Implication – Normal Forms.	12
IV	Definition of a Matrix –Types of Matrices– Operations on Matrices – Related Matrices–Transpose of a Matrix–Symmetric and Skew-symmetric Matrices – Complex Matrix–Conjugate of a Matrix– Determinant of a Matrix– Typical Square Matrices–Adjoint and Inverse of a Matrix – Singular and Non-singular Matrices – Adjoint of a Square Matrix – Properties – Properties of Inverse of a Matrix.	12
V	Introduction–Graph and Basic Terminologies–Types of Graphs–Sub Graph and Isomorphic Graph – Operations on Graphs – Representation of Graph	12
TOTAL		60

CO	Course Outcomes
CO1	To recall basic concepts for clear understanding of mathematical principles
CO2	To explain practical problems
CO3	To construct matrices using discrete mathematics
CO4	To analyze techniques to draw graph using mathematics
CO5	To design graphs using the representations

Textbooks
DISCRETE MATHEMATICS, Swapan Kumar Chakraborty and Bikash Kanti Sarkar, OXFORD University Press
Reference books
DISCRETE MATHEMATICS, Third Edition, Seymour Lipschutz and Marc Lars Lipson, Tata McGraw Hill Education Private Limited
Discrete Mathematical Structures with Applications to Computer Science by J.P.Tremblay, R.Manohar TMH edition
Web Reference
https://www.tutorialspoint.com›discrete_mathematics

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	2	3
CO 5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	15	14	15	14	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	L	T	P	S	Credits	Marks		
							CIA	External	Total
	COMPUTER FUNDAMENTALS LABORATORY	2	-	-	I	2	50	50	100

Use Editing Options in WORD
Insert Chart in Excel
Create a Presentation with Animation
Create your own Google classroom and invite all your friends through email id. Post study material in Google classroom using Google drive.
Create a meeting using Google calendar and share meeting id to the attendees. Transfer the ownership to the Manager once the meeting id is generated.
Create one-page story in your mother tongue by using voice recognition facility of Google Docs
Create a registration form for your Department Seminar or Conference using Google Forms.
Create a question paper with multiple choice types of questions for a subject of your choice,using Google Forms.

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the basics of Computer and its Generations. Be able to understand the components of computer.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To Understand the introduction about MS Word. Be able to perform the Elements of window, Text Formatting, Text Manipulating options in MS Word.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To Understand the introduction about MS Excel. Be able to inserting and sizing the cells Implementing formulas and inserting worksheet.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	To Understand the introduction about MS PowerPoint Be able to perform the slides manipulation. Implementing Multimedia and templates.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	To Understand the introduction about Internet and Intranet. Be able to access the browsers. To get knowledge about basic components of E-Mail and E-Commerce	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	G. Manjunath, “Computer Basics”, Vasan Publications, 2010.
2	Pradeep K. Sinha&PritiSinha, “Computer Fundamentals”, 6th Edition, BPB Publications, 2004.

Web Resources	
1.	https://www.tutorialspoint.com/computer_fundamentals/index.htm
2.	https://www.tutorialspoint.com/basics_of_computers/index.htm
3.	https://www.tutorialspoint.com/word/index.htm
4.	https://www.tutorialspoint.com/excel/index.htm
5.	https://www.tutorialspoint.com/powerpoint/index.htm

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	2	2	3	3	2
CO 3	2	3	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	2	3
Weightage of course contributed to each PSO	14	14	13	15	14	14

S-Strong-3 M-Medium-2 L-Low-1

Fundamentals of Computers

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	2	0	0	I	2	2	25	75	100

Learning Objectives	
LO1	To analyze a problem with appropriate problem solving techniques
LO2	To understand the main principles of imperative, functional and logic oriented programming languages and
LO3	to increase the ability to learn new programming languages.
Prerequisites: Basic knowledge about programming concepts	

Unit	Contents	No. of Hours
I	Introduction: Characteristics of Computers - Evolution of Computers Basic Computer Organization: I/O Unit - Storage Unit - Arithmetic Logic Unit - Control Unit - Central Processing Unit	6
II	Computer Software: Types of Software - System Architecture Computer Languages: Machine Language - Assembly Language - High Level Language - Object Oriented Languages	6
III	Problem Solving Concepts: Problem Solving in Everyday life - Types of Problems - Problem solving with computers - Difficulties with Problem Solving	6
IV	Problem Solving concepts for the computer: Constant Variables - Data Types - Functions -Operators - Expressions and Equations - Organizing the Solution: Analyzing the problem - Algorithm - Flowchart - Pseudo code	6
V	Programming Structure: Structuring a solution - Modules and their function - Local and Global variables - Parameters - Return values - Sequential Logic Structure - Problem solving with Decision - Problem Solving with Loops	6
TOTAL		30

CO	Course Outcomes
CO1	Outline the Computer fundamentals and various problem solving concepts in Computers
CO2	Describe the basic computer organization, software, computer languages, software development life cycle and the need of structured programming in solving a computer problem
CO3	Identify the types of computer languages, software, computer problems and examine how to set up expressions and equations to solve the problem.
CO4	Choose most appropriate programming languages, constructs and features to solve the problems in diversified domains.
CO5	Analyze the design of modules and functions in structuring the solution and various Organizing tools in problem solving.

Textbooks	
➢	Pradeep K.Sinha and Priti Sinha, (2004) —Computer Fundamentals‖, Sixth Edition, BPB Publications. (Unit I : Chapter 1 & 2, Unit II : Chapter 10 & 12)
➢	Maureen Sprankle and Jim Hubbard, (2009) —Problem Solving and Programming Concept, Ninth Edition, Prentice Hall. (Unit III: Chapter 1,2 &3) Unit IV : Chapter 3, Unit V : Chapter 4,5 ,6,7 & 8)
Reference Books	
1.	R.G. Dromey, (2007), —How to Solve it by Computer‖, Prentice Hall International Series in Computer Science.
2.	C. S. V. Murthy, (2009), —Fundamentals of Computers‖, Third Edition, Himalaya Publishing House.
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1.	http://www.tutorialspoint.com/computer_fundamentals/
2.	http://www.comptechdoc.org/basic/basictut/
3.	http://www.homeandlearn.co.uk/
4.	http://www.top-windows-tutorials.com/computer-basics/
5.	https://www.programiz.com/article/flowchart-programming (Algorithm and flow chart)

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	3
CO2	3	2	2	2	3	2
CO3	3	3	3	3	2	2
CO4	3	2	2	2	2	3
CO5	3	3	2	2	3	2
Weightage of course contributed to each PSO	15	12	11	11	12	12

FIRST YEAR –SEMESTER- II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	OBJECT ORIENTED PROGRAMMING IN C++	CCI	5	-	-	II	4	25	75	100

Learning Objectives	
LO1	To make students understand the concepts of Object Oriented Programming concepts using the C++ language.
LO2	To describe and use constructors and destructors.
LO3	To impart knowledge on the principles of Operator overloading and inheritance.
LO4	To understand tokens, expressions, and control structures
LO5	To understand and employ file management.

UNIT	Contents	No. of Hours
I	Introduction to C++ - key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures: - Decision Making and Statements: If ... else, jump, goto, break, continue, Switch case statements - Loops in C++: for, while, do - functions in C++ - inline functions – Function Overloading	15
II	Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.	15
III	Operator Overloading: Overloading unary, binary operators – Overloading Friend functions – type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.	15
IV	Pointers – Declaration – Pointer to Class, Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.	15
V	Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Templates – Exception Handling - String – Declaring and Initializing string objects – String Attributes – Miscellaneous functions.	15
	TOTAL HOURS	75

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Demonstrate the various basic programming constructs like decision making statements. Looping statements and functions	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Explain the object oriented concepts like overloading, inheritance, polymorphism, virtual functions , constructors and destructors	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Explain the various file stream classes; file types, usage of templates and exception handling mechanisms.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Compare the pros and cons of procedure oriented language with the concepts of object oriented language	PO1, PO2, PO3, PO4, PO5, PO6
	Textbooks	
1	Ashok N Kamthane, Object-Oriented Programming with Ansi and Turbo C++, Pearson Education, 2006..	
	Reference Books	
1.	E. Balagurusamy, Object-Oriented Programming with C++, TMH, 2000	
2.	Maria Litvin& Gray Litvin, C++ for you, Vikas publication, 2002	
3.	John R Hubbard, Programming with C, 2nd Edition, TMH publication, 2002.	
	Web Resources	
1.	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2.	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PROGRAMMING IN C++ LABORATORY		-	-	5	II	4	50	50	100

Course Objectives:

1. Be able to design and program C++ applications.
2. Be able to create loops and decision statements in C++.
3. Be able to work with functions and pass arguments in C++.
4. Be able to work on the concept of Inheritance.
5. Be able to read and write files in C++.

	Required Hours
LAB EXERCISES: 1. Program using Class and Object. 2. Program using C++ operators. 3. Program using Decision-making Statements 4. Program using Loop Statements. 5. Program using Inline Function. 6. Program for Passing object to function and Returning object from function 7. Program using Constructor and Destructor. 8. Program using Function Overloading 9. Program using Virtual Function 10. Program using operator overloading 11. Program using Inheritance. 12. Program using Command line arguments.	75

Course Outcomes	
On completion of this course, students will	
CO1	To understand the concepts of Object-Oriented Programming Paradigm
CO2	Illustrate the concept of Virtual Classes, inline functions and friend function
CO3	Analyze ile stream classes; file types, usage of templates and exception handling
CO4	Know the pros and cons of procedure oriented language & object oriented language
CO5	Apply the various basic programming constructs like decision making statements. Looping statements, functions, concepts like overloading, inheritance, polymorphism, virtual functions , constructors and destructors

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Artificial Intelligence & Knowledge Representation	Core	4	-	-	II	3	5	25	75	100

Course Objective	
C1	To learn various concepts of AI Techniques.
C2	To learn various Search Algorithm in AI.
C3	To learn probabilistic reasoning and models in AI.
C4	To learn about Markov Decision Process.
C5	To learn various type of Reinforcement learning.

UNIT	Contents	No. of Hours
I	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree	15
II	Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search	15
III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	15
IV	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning	15
V	Parallel and Distributed AI: Psychological Modelling – Parallelism in Reasoning Systems – Distributed Reasoning Systems - Hopfield networks, neural networks	15
	Total	75

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6
5	Understand various Reinforcement learning Techniques.	PO3, PO4

Textbook	
1	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 4th Edition, Prentice Hall.

2	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
3	Carl Townsend, "Introduction to Prolog Programming"
4	Ivan Bratko, "PROLOG Programming for Artificial Intelligence", Addison-Wesley, 2nd Edition.
5	Klocksin and Mellish, "Programming with PROLOG"
Reference Books	
1.	Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.
2.	SarojKaushik, "Artificial Intelligence", Cengage Learning India, 2011
3.	David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010
Web Resources	
1.	https://github.com/dair-ai/ML-Course-Notes
2.	https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html
3.	https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tlqU1LXlRFbcghLMZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to Each PSO	15	12	10	11	12	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	DATA STRUCTURES	SEC	2	-	-	II	2	25	75	100

Learning Objectives	
LO1	Understand the meaning asymptotic time complexity analysis and various data structures
LO2	To enhancing the problem solving skills and thinking skills
LO3	To write efficient algorithms and Programs
LO4	To make the students learn best practices in programming
LO5	To understand how to handle the files in Data Structure

UNIT	Contents	No. Of. Hours
I	Arrays and ordered Lists Abstract data types – asymptotic notations – complexity analysis- Linked lists: Singly linked list – doubly linked lists-	6
II	Stacks – Queues – Circular Queues Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees	6
III	Searching and Sorting: Sorting – Insertion Sort, Quick Sort, Merge Sort Searching – Linear search, Binary search	6
IV	Graphs - Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees	6
V	Backtracking – 8-Queen"s problem - Graph Colouring– Branch And Bound:– Travelling Sales Person Problem	6
	TOTAL HOURS	30

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To understand the concepts of Linked List, Stack and Queue.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To understand the Concepts of Trees and Graphs	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To apply searching and sorting techniques	PO1, PO2, PO3, PO4, PO5, PO6

	Textbooks
1	**Seymour Lipshutz(2011),Schaum‟s Outlines - Data Structures with C, Tata McGraw Hill publications.**
2	**Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd.**
3	**Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and Python Programming(2018)**
	Reference Books
1.	**Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore.**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	DATA STRUCTURES LABORATORY	CC 4 -1	-	-	2	II	2	50	50	100

Objectives

To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem

LIST OF PROGRAMS	Required Hour
1. Perform stack operations 2. Perform queue operations 3. Perform tree traversal operations 4. Search an element in an array using linear search. 5. Search an element in an array using binary search 6. Sort the given set of elements using Merge Sort. 7. Sort the given set of elements using Quick sort. 8. Sort the given set of elements using Insertion sort. 9. Create a Linked list and perform insertion and deletion 10. Create a Doubly Linked list and perform insertion and deletion	

Course Outcomes

CO	On completion of this course, students will
CO1	To understand the concepts of Linked List, Stack and Queue.
CO2	Concepts of Trees and Graphs. Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.

CO3	**To apply searching and sorting techniques**
CO4	**To determine the concepts of Greedy Method To apply searching techniques.**
CO5	**Usage of File handlings in python, Concept of reading and writing files, Do programs using files.**

Learning Resources:

- **RecommendedTexts**

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press

2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press

Reference Books

1. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.

2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.

3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.

4. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997.

5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, "The design and analysis of Computer Algorithms", Addison Wesley, Boston, 1974

6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009

7. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

Course Outcomes

CO	**On completion of this course, students will**
CO1	**Implement data structures**
CO2	**Implement various types of linked lists and their applications**
CO3	**Implement Tree Traversals**
CO4	**Implement various algorithms**
CO5	**Implement different sorting and searching algorithms**

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	2	2	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	1	2
Weightage of course contributed to each PSO	15	15	14	14	13	14

S-Strong-3 M-Medium-2 L-Low-1