



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

---

DEPARTMENT OF COMPUTER APPLICATIONS

Bachelor of Computer Applications (B.C.A)

(Applicable for Students admitted from Academic Year 2022-2023)

BACHELOR OF COMPUTER APPLICATIONS  
DEPARTMENT OF COMPUTER APPLICATIONS  
SCHOOL OF COMPUTATIONAL STUDIES



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

### VISION AND MISSION

**Motto:**

To Make Every Man a Success and No Man a Failure

**Vision:**

To develop an institution of excellence in education, training and research at both under graduate and post graduate level in arts and science

**Mission:**

To offer the best education and to develop the young mind into an all-around personality to meet the growing challenges of industries and the social needs of the technology-oriented global community.

### DEPARTMENT OF COMPUTER APPLICATIONS

#### VISION AND MISSION

**VISION**

To transform graduates into software experts with high degree of technical skill and to encourage students towards research.

**MISSION**

To empower and inspire students to become highly skilled, innovative, and ethical professionals in the field of computer applications. Through a comprehensive and industry-relevant curriculum, we aim to cultivate a passion for lifelong learning, critical thinking, and problem-solving abilities.



**Dr. S. THIRUMAGAN**  
Principal  
Hindustan College of Arts & Science  
Rajiv Gandhi Salai (OMR), Padur,  
Kelambakkam, Chennai - 603 103



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

We strive to create a collaborative and inclusive learning environment that fosters creativity, leadership, and teamwork.

### Our mission encompasses the following key objectives:

1. **Academic Excellence:** We are committed to providing a rigorous and up-to-date curriculum that aligns with industry standards, emerging technologies, and global trends. We strive to ensure that our students gain a strong foundation in computer science principles, programming languages, data management, software development, and other essential areas of computer applications.
2. **Practical Application:** We emphasize hands-on learning experiences through practical projects, case studies, internships, and industry collaborations. Our goal is to equip students with the necessary skills and practical knowledge to apply theoretical concepts in real-world scenarios. We encourage innovation, experimentation, and the development of problem-solving skills to address technological challenges effectively.
3. **Professional Development:** We aim to nurture students' professional growth by offering opportunities for personal and career development. We provide guidance on communication skills, teamwork, leadership, project management, and entrepreneurship, preparing students for successful careers in various sectors of the IT industry. We promote ethical behavior, social responsibility, and an understanding of the impact of technology on society.
4. **Research and Innovation:** We foster a culture of research and innovation among faculty and students. By encouraging exploration and discovery, we strive to contribute to the advancement of knowledge in the field of computer applications. We support research initiatives, encourage participation in conferences, and provide resources to facilitate innovation, entrepreneurship, and the development of cutting-edge solutions.
5. **Continuous Learning:** We recognize the rapid evolution of technology and the need for continuous learning. We instill a passion for lifelong learning and professional growth in

  
**Dr. S. THIRUMAGAN**  
Principal  
Hindustan College of Arts & Science  
Rajiv Gandhi Salai (OMR), Padur,  
Kelambakkam, Chennai - 603 103



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

our students. We encourage them to stay abreast of emerging technologies, industry trends,

and best practices. Our faculty members serve as mentors, guiding students in their pursuit of knowledge and encouraging them to adapt to the dynamic nature of the IT industry.

6. Collaboration and Community Engagement: We promote collaboration among students, faculty, industry professionals, and the community at large. We foster an environment where diverse ideas and perspectives flourish, encouraging teamwork, creativity, and the exchange of knowledge. We actively engage with the community through partnerships, projects, and initiatives that address societal challenges and contribute to the betterment of society.

Through our mission, we aim to produce competent and well-rounded professionals who are equipped to make significant contributions to the IT industry and positively impact society. We are dedicated to creating a supportive and nurturing learning environment that prepares students for success in their careers and encourages a lifelong commitment to personal and professional growth.

### **Bachelor of Computer Applications (B.C.A)**

#### **PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

The Program Educational Objectives (PEOs) are defined and developed for each program with the consultation and involvement of various stakeholders such as management, students, industry, regulating authorities, alumni, faculty and parents. Their interests, social relevance and contributions are taken into account in defining and developing the PEOs.

The Program Educational Objectives (PEOs) of the **Computer Applications** are listed below:

  
**Dr. S. THIRUMAGAN**  
Principal  
Hindustan College of Arts & Science  
Rajiv Gandhi Salai (OMR), Padur,  
Kelambakkam, Chennai - 603 103



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

**PEO1. Technical Proficiency:** Develop technical proficiency in computer science and its applications by acquiring a solid foundation in programming languages, algorithms, data structures, databases, software engineering, and computer networks.

**PEO2. Problem Solving:** Cultivate problem-solving skills to analyze complex computer-related problems, design efficient solutions, and implement them using appropriate programming paradigms, tools, and technologies.

**PEO3. Software Development:** Gain the ability to design, develop, and test software applications that meet specified requirements, adhere to industry standards, and demonstrate an understanding of software development life cycle methodologies.

**PEO4. Adaptability and Lifelong Learning:** Instill a passion for learning and adaptability in the face of rapidly evolving technologies, enabling graduates to stay updated with emerging trends, acquire new skills, and pursue lifelong learning and professional development.

**PEO5. Research and Innovation:** Encourage students to explore research opportunities, engage in innovative projects, and contribute to the advancement of computer science by fostering critical thinking, analytical reasoning, and the ability to evaluate and apply new technologies.

**PEO6. Industry Readiness:** Prepare students for successful careers in the IT industry by equipping them with industry-relevant skills, practical experience through internships, industry collaborations, and exposure to real-world projects.

These educational objectives aim to provide a comprehensive foundation for BCA students, equipping them with the necessary knowledge, skills, and values to excel in their careers and contribute positively to society.

### PROGRAM OUTCOMES:

  
**Dr. S. THIRUMAGAN**  
Principal  
Hindustan College of Arts & Science  
Rajiv Gandhi Salai (OMR), Padur,  
Kelambakkam, Chennai - 603 103



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

**PO1.** To **Identify, formulate, review** research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO2.** To **Design** solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO3.** To **Conduct** investigations of complex problems: To Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO4.** To **Create, select, and apply** appropriate techniques, resources, and modern engineering and IT tools.

**PO5.** To **Apply** the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

**PO6.** To Convert the real-world problems into computational problem to solve them by using various computational and problem-solving skills.

### PROGRAM SPECIFIC OUTCOME:

**PSO1:** The three-year course of BCA course helps the students to **develop** programming skills, networking skills, learn applications, packages, programming languages and modern techniques of IT

**PSO2:** The program helps the students to **implement** the analytical skill, communication skill, decision making and problem-solving skill in the field of computational studies.

**PSO3:** The program helps the students to **fetch** employment in Information Technology Sector of National / International standards and to become a social responsible person.

**PSO4:** To **Pursue** higher studies in the area of Computer Science / Computer Applications / Information Technology.

**Dr. S. THIRUMAGAN**

Principal  
Hindustan College of Arts & Science  
Rajiv Gandhi Salai (OMR), Padur,  
Kelambakkam, Chennai - 603 103



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

COURSE TITLE	DATA STRUCTURES			CREDITS	4
COURSE CODE	SZ23A	COURSE CATEGO RY	PC	L-T-P-S	3- 1- 0 -0
Version	1.0	Approval Details		LEARNING LEVEL	BTL-4
<b>ASSESSMENT SCHEME</b>					
Continuous Internal Assessment		Seminar	Assignments	Attendance	ESE
10%		5%	5%	5%	75%
Course Description	The course covers analysis and design of fundamental data structures and engages learners to use data structures as tools to algorithmically design efficient computer programs that will cope with the complexity of actual applications. The course focuses on basic and essential topics in data structures, including array-based lists, linked lists, hash tables, recursion, binary trees, scapegoat trees, red-black trees, heaps, sorting algorithms, graphs, and binary tree.				
Course Objective	<ol style="list-style-type: none"> <li>1. To learn the basic techniques of algorithm analysis.</li> <li>2. To demonstrate several searching and sorting algorithms.</li> <li>3. To implement linear and non-linear data structures.</li> <li>4. To demonstrate various tree and graph traversal algorithms.</li> <li>5. To analyse and choose appropriate data structure to solve problems in real world.</li> </ol>				
Course Outcome	After completion of this course, the students will be able to <ol style="list-style-type: none"> <li>1. To <b>Implement</b> abstract data types for linear data structures.</li> <li>2. To <b>Apply</b> the different linear and nonlinear data structures to solve</li> </ol>				

  
**Dr. S. THIRUMAGAN**  
 Principal  
 Hindustan College of Arts & Science  
 Rajiv Gandhi Salai (OMR), Padur,  
 Kelambakkam, Chennai - 603 103



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

computational problems.

3. To **Analyze** the various sorting algorithms.
4. To **Solve** linear and non-linear data structure problems.
5. To **Evaluate** various sorting methods and searching algorithms.

**Prerequisite: Basic Java**

### CO, PO AND PSO MAPPING

CO	PO -1	PO-2	PO-3	PO-4	PO-5	PO -6	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	3	-	1	1	2	-	2	1
CO-2	1	2	1	-	-	-	2	-	-	3
CO-3	3	1	2	1	-	1	1	1	2	-
CO-4	2	2	1	-	-	-	1	-	-	-
CO-5	3	1	1	-	-	3	-	-	2	2

**1: Weakly related, 2: Moderately related and 3: Strongly related**

### MODULE 1 – ABSTRACT DATA TYPES (ADTS) (12L+3T)

Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation-singly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations - Insertion-Deletion-Merge-Traversal.

**Practical component:**

Traversal Implementations in Java

**Suggested Readings:**

Data Types, Types of Data Structures.

**CO-1**  
**BTL-2**

### MODULE 2 – LISTS, STACKS AND QUEUES(12L+3T)

Stack ADT-Operations- Applications- Evaluating arithmetic expressions - Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue-Priority Queue- deQueue-applications of queues.

**Practical component:**

**CO-2**  
**BTL-2**

  
**Dr. S. THIRUMAGAN**  
Principal

Hindustan College of Arts & Science  
Rajiv Gandhi Salai (OMR), Padur,  
Kelambakkam, Chennai - 603 103





# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

Implementation of LISTS, STACKS AND QUEUES in Java.		
<b>Suggested Readings:</b> Abstract Data types, Applications of Linear Data structure		
<b>MODULE 3 – TREES(12L+3T)</b>		
Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADTThreaded Binary Trees-AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.		<b>CO-3</b> <b>BTL-3</b>
<b>Practical component:</b> Implementation of Binary Tree structure in Java		
<b>Suggested Readings:</b> Applications of Tress, Heaps		
<b>MODULE 4 – GRAPHS(12L+3T)</b>		
Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits- Applications of graphs		<b>CO-4</b> <b>BTL-3</b>
<b>Practical component:</b> Graph implementation using Java Programming.		
<b>Suggested Readings:</b> Applications of Graphs, Network problems		
<b>MODULE 5 – SEARCHING &amp; SORTING(12L+3T)</b>		
Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sortHashing-Hash functions-Separate chaining- Open Addressing-Rehashing-Extendible Hashing.		<b>CO-5</b> <b>BTL-4</b>
<b>Practical component:</b> Implementation of Sorting Techniques in Java Programming.		
<b>Suggested Readings:</b> Applications of Tress, Heaps		
<b>TEXT BOOKS</b>		
1	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition.	
<b>REFERENCE BOOKS</b>		

  
**Dr. S. THIRUMAGAN**  
 Principal  
 Hindustan College of Arts & Science  
 Rajiv Gandhi Salai (OMR), Padur,  
 Kelambakkam, Chennai - 603 103



# HINDUSTAN

## COLLEGE OF ARTS & SCIENCE

Affiliated to University of Madras / Reaccredited by NAAC  
Rajiv Gandhi Salai (OMR), Padur, Kelambakkam, Chennai - 603103

1	Thomas H.Cormen,Chales E.Leiserson,Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.
2	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003.
<b>E BOOKS</b>	
1.	<a href="https://apps2.mdp.ac.id/perpustakaan/ebook/Karya%20Umum/Dsa.pdf">https://apps2.mdp.ac.id/perpustakaan/ebook/Karya%20Umum/Dsa.pdf</a>
<b>MOOC</b>	
1.	<a href="https://nptel.ac.in/courses/106106127/">https://nptel.ac.in/courses/106106127/</a>
2.	<a href="https://www.coursera.org/specializations/data-structures-algorithms">https://www.coursera.org/specializations/data-structures-algorithms</a>

**Dr. S. THIRUMAGAN**

Principal

Hindustan College of Arts & Science  
Rajiv Gandhi Salai (OMR), Padur,  
Kelambakkam, Chennai - 603 103