



# School of Computer Science & IT Devi Ahilya Vishwavidyalaya

## SYLLABUS

### BCA 3 years/ BCA (Hons./ Research) 4 years

#### Program Educational Objectives (PEOs)

- PEO 1:** Exhibit a strong inclination towards higher education and actively pursue in continuous development of their professional skills.
- PEO 2:** Develop communication and soft skills to inculcate professionalism for working in cross-cultural and global environment.
- PEO 3:** Build expertise on latest technological trends to bridge gap between industry and academia for better employability.
- PEO 4:** Evolve competency to design and develop computing applications that address the societal needs.

#### Program Specific Outcomes (PSOs)

- PSO 1:** Apply knowledge of computing and inter-disciplinary techniques to design and develop quality software applications.
- PSO 2:** Ability to use modern tools and frameworks to create innovative solutions in emerging areas.

## VII - SEMESTER

## IC-4919: Research Methodology

### Aim:

To provide a detailed plan for conducting research, and to ensure that the research is conducted in a systematic and rigorous way.

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### Course Outcomes:

- CO 1: Define research and describe the research process and research methods
  - CO 2: Understand and apply basic research methods including research design, data analysis, and interpretation.
  - CO 3: Perform literature review effectively.
  - CO 4: Understand to write and publish research papers.
  - CO 5: Understand the importance of research ethics and IPR
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### Unit-I

Basics of Research Objective of research; Types of Research approaches: fundamental research, theoretical research, applied research, evaluation research, survey research, empirical research, and scientific research; Sources of research problem; Characteristics of a good research problem; Scope of research problem; Formulation of a research problem, identifying variables, constructing hypotheses, errors in selecting a research problem. Research Process.

### Unit-II

Research planning and design Research plan; Features of a good research design, Exploratory Research Design– concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent and Dependent variables. Qualitative and Quantitative Research.

### Unit-III

Literature survey Significance of literature review; Source for literature: books, journals, proceedings, thesis and dissertations, and unpublished items. Survey using Web of Science/ Scopus; Literature survey writing up, Academic Databases for Computer science and maintenance discipline; UGC CARE/ SCI/ SCOPUS databases etc. Citation Index, Impact Factor, H-index, etc.

### Unit-IV

Writing and Publishing Papers Layout of a Research Paper; Abstract, Introduction, Background and literature review, data analysis, proposed research, experimental setup, results and discussion, conclusions, references (IEEE format), acknowledgements; Publication review process; Thesis Writing; and research presentation.

### Unit-V

Research Ethics and IPR Ethics in Research, Ethics and Research Process, Importance of Ethics in Research Plagiarism: Introduction to Plagiarism, Dimensions of Plagiarism, Detect Plagiarism, Strategies to Minimize Plagiarism. Plagiarism and Self- Plagiarism. Intellectual property rights: Copyright, patent, IPR registration in India.

**Text Books:**

- [1] C. R. Kothari, Research Methodology Methods and Techniques, 2nd. ed. New Delhi: New Age International Publishers, 2009.
- [2] R. Panneerselvam, Research Methodology, New Delhi: PHI, 2005.
- [3] P. Oliver, Writing Your Thesis, New Delhi: Vistaar Publications, 2004.
- [4] V.K. Ahuja, Intellectual Property Rights in India, Lexis Nexis; First Edition, January 2015

**Reference Book(s):**

- [1] J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd. ed. Sage Publications, 2008.
- [2] Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd. ed. Indian: PE, 2005.
- [3] B. C. Nakra and K. K. Chaudhry, Instrumentation, Measurement and Analysis, 2nd. ed. New Delhi: TMH publishing Co. Ltd., 2005.
- [4] I. Gregory, Ethics in Research, Continuum, 2005.

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## CS-4209: Data Structures using C++

### Aim:

This course aims to provide you with an understanding of data structures and algorithms, enabling you to assess how one is better in certain situations and another in others.

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### Course Outcomes:

- CO 1: Understand data structure and their applications in solving Real World Problems.
  - CO 2: Understand sorting algorithms through various algorithms techniques.
  - CO 3: Evaluate algorithms and data structures in terms of space and time complexity.
  - CO 4: Exposure to recursion and its applications in solving Real World problems.
  - CO 5: Utilize data structures to algorithmically create effective software that can handle the intricacies of real-world applications.
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### Unit-I

Introduction to Data Structure: Concepts of Data and Information, Classification of Data structures, Abstract Data Types, Data structures operations. Algorithms, Algorithm complexity notations like big Oh, Theta, and Omega. Time Complexity, Big –Oh -notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time. Implementation aspects: Memory representation. Static and Dynamic implementations. Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi dimensional array, Sparse Matrices, Pointer & Structure.

### Unit-II

Stacks, Queues and Lists Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples : Infix, postfix, prefix representation, Applications : Mathematical expression Evaluation Definition: Queues & Lists: Array based implementation of Queues / Lists, Linked List implementation of Queues / Lists, Circular implementation of Queues and Singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority queues , Applications.

### Unit-III

Trees & Graphs Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal; pre-order, post-order, in-order traversal, Binary Search Trees, Implementations, Threaded trees, AVL Trees, Implementations , Balanced multi way search trees, Applications Definition of Undirected and Directed Graphs and Networks, The Array based implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal –Breadth first Traversal, Depth first Traversal, Connectivity of graphs; Connected components of graphs, Weighted Graphs, Applications.

### Unit-IV

Introduction to Recursion, Divide and Conquer Algorithm, Evaluating time Complexity. Straight Sequential Search, Binary Search, non –recursive Algorithms, recursive Algorithms, Indexed Sequential Search. Definition, Hash function, Collision Resolution Techniques, Hashing Applications.

### Unit-V

Sorting Algorithms Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Efficiency of algorithms, Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays, The merge sort Algorithms, Quick sort Algorithm, Analysis of Quick sort, Picking a Pivot, A partitioning strategy, Heap sort, Heap Construction, Heap sort, bottom–up, Top–down Heap sort approach, Radix sort.

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**Text Books:**

- 1.Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub, 6thEdition.
- 2.How to Program C++ by Paul Deitel , Harvey Deitel, Prentice Hall; 8 edition.

**Reference Book(s):**

- 1.Theory & Problems of Data Structures by Jr. Seymour Lipschetz, Schaum'soutline by TMH 2006,Special Indian Edition.
- 2.Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
- 3.Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW, 1st Edition.
- 4.Data Structures and Program Design in C By Robert Kruse, PHI, 2nd Edition.

## CS-5511: Operating Systems

**Aim:**

Understanding of modern computer's purpose, structure and functions of operating systems with illustration of key aspects through implementation.

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**Course Outcomes:**

- CO 1: Classify different types, design and architecture of operating system
  - CO 2: Analyze process management, I/O management, memory management functions of Operating System
  - CO 3: Solve numerical problems on Process Synchronization, CPU scheduling, Memory management and Disk management
  - CO 4: Explore file management and protection and security concepts
  - CO 5: Study and analyze various Operating Systems as research aspect
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**Unit-I**

Introduction: Evolution of operating systems, operating system concepts; activities, functions and services of operating system; Computer Systems: Mainframe, Desktop, Multiprocessors, Distributed, Clustered, Realtime and Handheld systems. Computer System Operations, Storage hierarchy, Hardware protection, System calls, System structures. Process Management: Process concepts, Process scheduling, Operation on processes.

**Unit-II**

Cooperating processes, Inter-process communication. Threads: multithreading models, threading issues, thread examples. CPU Scheduling: concepts, scheduling criteria, scheduling algorithms, algorithm evaluation. Process synchronization: Critical section problem, Mutual exclusion and synchronization Techniques of inter process: Synchronization hardware, semaphore, classical problems of synchronization, critical regions and monitors. Deadlock: deadlock characterization, deadlock handling methods.

**Unit-III**

Memory Management: Concepts, single user memory management. Partition memory allocation: paging, segmentation and segmentation with paging, Virtual memory management: concept, demand paging, process creation, page replacement, allocation of frames and thrashing.

**Unit-IV**

File Management: File concepts, access methods, directory structure, file system mounting, sharing and protection of files. File system structure and implementation, allocation methods, free space management, reliability of file system. Unix file system.

**Unit-V**

Device Management: Goals of input/output software design, Structure of device hardware and software. Layers of I/O software, structure of device drivers, Disk driver, disk arm scheduling algorithms, terminal driver, clock driver etc.

**Text Books:**

A. Silberschatz, P. Galvin and Gagne, Operating System Concepts, Addison Wesley, 6th Edition, 1994.

**Reference Book(s):**

Operating systems, 4th Edition, William Stallings, Pearson Education, 2003.

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