



School of Computer Science & IT Devi Ahilya Vishwavidyalaya

SYLLABUS

M.Sc (Computer Science) 2 years

Program Educational Objectives (PEOs)

- PEO 1:** Equip students with a strong foundation of computer science, emphasizing the application of theoretical and practical knowledge to design, develop, and implement efficient software solutions.
- PEO 2:** Imbibe effective research, academic, team building and communication skills, to conduct impactful work in computer science domains.
- PEO 3:** Enable continuous professional growth in emerging trends, tools, and technologies, to build successful careers in industry, academia, or entrepreneurship.

Program Specific Outcomes (PSOs)

- PSO 1:** Apply advanced knowledge in core areas of computer science, such as algorithms, database, software engineering, compiler design, networking and data science to analyse, design, and develop robust computing solutions.
- PSO 2:** Empower students to innovate in technology-driven domains, contributing to the creation of solutions to address complex computing challenges with professional ethics and social responsibilities.

I - SEMESTER

CS-4022: Computer Organization & Assembly Language Programming

Aim:

Emphasis on the lower level abstraction of a computer system including digital logic, instruction set and assembly language.

Course Outcomes:

- CO 1: Analyze the performance of commercially available computers.
 - CO 2: Demonstrate computer architecture concepts related to design of modern processors.
 - CO 3: Demonstrate concepts related to design of Memories and I/Os.
 - CO 4: To develop logic for assembly language programming.
 - CO 5: Analysis of simple synchronous sequential circuit.
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Unit-I

Computer Organization: Digital and Analog computers, Major components of a digital computer, Memory addressing capability of a CPU, Word length of a computer, Processing speed of a CPU, Definitions of Hardware, Software and Firmware. Definitions of Dumb, Smart and Intelligent terminals.

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes: BCD code, Gray Code, ASCII code, Excess 3 Code, Error detecting Code.

Unit-II

Computer Arithmetic: Binary representation of Negative Integers using 2's complement and Signed magnitude representation, Fixed point Arithmetic operations on Positive and Signed (Negative) Integers like addition, subtraction, multiplication, Booth algorithm for multiplication, Division of positive and negative binary numbers.

Unit-III

Introduction of 8085 Microprocessor: Architecture of 8085 processor. Register Architecture: Accumulator, Temporally Register and Flag Register. Program Counter, Stack pointer and Instruction register. Addressing Modes: Direct addressing mode and Register direct Addressing Mode. Register Indirect Addressing Mode, Immediate Addressing Mode and Implicit or Implied Addressing Mode.

Unit-IV

Introduction to Assembly Language Programming: Various Instructions Classification: Instruction Format, Opcode, Operand and Hex code. Instruction Operation Status, Various Instruction Sets: Data Transfer Group Instructions, Arithmetic Group Instructions, Logical Group Instruction, Branch Group Instructions: Conditional and Unconditional and Machine control Instructions.

Unit-V

Assembly language programming: Practice on assembly language programming, pinout diagram of 8085 microprocessor, interfacing of 8085, interrupts, Direct memory access, introduction to 8086 microprocessor

Text Books:

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085/8080. Wiley Eastern Ltd. publication.
2. B Ram, Computer Fundamentals: Architecture and Organization, New Age International, 2000.
3. V. Rajaraman V and N. Adabala, Fundamentals of Computers, Prentice Hall India Learning Private Limited; 6th Revised edition edition.

Reference Book(s):

1. R Theagarajan S Dhanasekaran and S Dhanapal, Microprocessor and Its applications, New Age International (P) Ltd
2. Nicholas Carter and Raj Kamal, Computer Architecture and Organization, Schaum's Outlines Series.
3. Dr. Raj kamal, Digital Systems:

CS-5511: Operating Systems

Aim:

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

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.

SCSIT, DAVV, Indore, MP - 452017

IC-4916: Communication skills and Report Writing

Aim:

To enhance students' confidence, communication skills, and presentation abilities, preparing them for success in placements and corporate life.

Course Outcomes:

- CO 1: Strengthening the ability to speak assertively in various situations.
 - CO 2: Improving both written communication and non verbal communication.
 - CO 3: Developing the ability to understand others' perspectives and respond thoughtfully.
 - CO 4: Learning to structure content logically for ease of understanding.
 - CO 5: Developing confidence to speak during Interviews and Group discussions.
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Unit-I

Fundamentals of Communication : Definitions, Importance, Forms of communication, Process of communication, Channels, Barriers and Strategies to overcome barriers of communication.

Unit-II

Listening: Definitions, Importance, Benefits, Barriers, Approaches, Exercise and cases. Group Discussions : Definitions, Importance, Process, Points to be borne in mind while participating, Do's and Don'ts.

Unit-III

Presentation Skills, Interviews: Types of Interviews, Points to be borne in mind as an Interviewer or an Interviewee. Commonly asked questions. Do's and Don'ts.

Unit-IV

Transactional Analysis, Johari Window. Written Communication: Report Writing, Business Correspondence, Preparation of Manuals and Project Report, Minutes of meeting, Notes and Circulars.

Unit-V

Intense practice of Presentations, Group Discussions and Interviews.

Text Books:

1. Business Communication – K. K. Sinha
2. Organizational Behavior - Fred Luthans
3. Organizational Behavior - Stephen Robbins

Reference Book(s):

1. Effective Business Communication – M.V. Rodrigues
2. Business Communication - Lesikar and Flately

CS-4116: Discrete Structures

Aim:

The aim of this course is to enhance mathematical reasoning of students so that they can understand various discrete structures and algorithms used in computer science.

Course Outcomes:

- CO 1: Understand the basic concepts of set, function and mathematical reasoning.
 - CO 2: Exposure to various counting techniques and its applications in computer science.
 - CO 3: Develop an understanding about relations & its property and lattices.
 - CO 4: Understand the concepts of graph and tree and their applications.
 - CO 5: Acquainted with the language and grammar.
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Unit-I

The Foundations: Logic, Sets and Functions: Introduction to set theory, set operations, fuzzy sets, mathematical logic, prepositions, propositional equivalences, predicates and quantifiers. Importance of Quantifiers. Functions, types of functions, Inverse function and composite functions.

Mathematical reasoning: Introduction to Methods of proof, mathematical induction. Use of mathematical induction to solve different problems. Importance of recursions in computer science, scope of recursions, Recursive definitions, recursive algorithms.

Unit-II

Combinatorics: The basics of counting, sum rule, product rule, pigeonhole principle, permutations with repetitions, permutations without repetitions, circular permutations. Applications of combinations. Applications of combinatorics to solve committee problems, word problems, puzzle problems etc. Applications of combinatorics to understand telephone numbering plan, understanding Internet addresses, advanced counting techniques, recurrence relations, solving recurrence relations, algorithm design, basic understanding of complexities, basic problems of complexity of algorithms.

Unit-III

Relations: Relation definition , importance of relations in computer science, Relations and their properties, Unary relations, Binary relations, Ternary relations, n-ary relations and their applications, closures of relations, equivalence relations, partial ordering. Representing relations, relation matrix, relation graph, composite relation. Operations on relations – union, intersection and join. Concepts of least upper bound, Greatest lower bound, maximal element, minimal element, Greatest element, Least element of a partially ordered set, lattices.

Unit-IV

Graphs: Introduction to Graphs, importance of graph theory in computer science, Graph terminology, representing graphs, graph types, graph models, and graph isomorphism. connectivity, Euler and Hamiltonian Paths, shortest path problems, planar graphs, graph coloring, chromatic number, Euler's formula, Kuratowski's theorem. The four color problem, applications of Graph Coloring, introduction

to Trees, applications of trees, tree traversal, trees and sorting, Spanning trees, minimum spanning trees.

Unit-V

Languages and Grammars: Introduction to Languages and Grammars, solving problems for validity of statements according to the grammar. Importance of Language theory in Computer Science, importance of Derivation trees, solving problems of Derivation trees, importance of Parsing, Phrase-Structure Grammars, types of Phrase Structure Grammars.

Text Books:

Kenneth H. Rosen, "Discrete Mathematics and its Applications", 8th edition, Tata McGraw Hill Edition.

Reference Book(s):

Kolman, Busby & Ross, "Discrete Mathematical Structures" ,5th edition, Pearson Education.

Narsingh Deo "Graph Theory with Applications to Engineering and Computer Science", 4th edition, Prentice Hall of India.

James L. Hein, "Discrete Structures, Logic and Computability", 2nd edition, Narosa Publishing House.

Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", 5th edition, Addison-Wesley Publications.

CS-4205: Programming and Problem-Solving Using C

Aim:

To strengthen students with the logical thinking and problem-solving skills to solve complex problems through practical exercises and real-world examples.

Course Outcomes:

- CO 1: • Basic concepts of formulation of an algorithm using C.
 - CO 2: • Familiarize students with the fundamentals, structure, control flow and operations of C programming.
 - CO 3: • Significant exposure to develop algorithmic thinking by solving practical problems using arrays, strings, and functions.
 - CO 4: • Enhance analytical and logical thinking skills to solve real world problems by implementing pointers, structures, and unions.
 - CO 5: • Comprehensive understanding of file structure, operations, data storage and its applications.
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Unit-I

Introduction to Computer based Problem Solving; Algorithms and flowcharts; Programming Languages; Classification of Programming Languages; Characteristics of a program; rules/conventions of coding, documentation, naming convention; Unstructured vs Structured Programming; Procedure oriented vs Modular Programming; Programming Environment: Assembler, Interpreter, Compiler, Linker and Loader

Unit-II

Fundamentals of C programming; History of C; Structure of C Program; Character set, Identifiers and Keywords; Data types; Constants and Variables; Operators and Expressions, Type Conversion, Operator Precedence and Associativity; Basic Input/Output operations; Decision control structures: if-else, switch-case; Loop control structure: while, do-while, for; Jump statement: break, continue; goto statement

Unit-III

Array: One dimensional array -Declaration, initialization of one-dimensional arrays; Two-dimensional array -Declaration, Initialization of two-dimensional arrays; Multi-dimensional array. Strings: Declaring and initializing string, reading and writing strings, string manipulation functions, array of strings. Function: User defined and standard functions, Formal and Actual arguments, Function Prototype, Parameter Passing, – call by value, call by reference; Scope, visibility and lifetime of variables; Nesting of functions; passing arrays to function; passing strings to function. Recursion: basics, comparison with iteration, types of recursions. Scope and extent: Scope Rules, Storage Classes - Auto, Extern, Register and Static.

Unit-IV

Pointer: Pointer variable and its important, Pointer arithmetic scale factor, Chain of pointers, Pointer and Array, Pointer and Strings, Array of Pointers, Pointers as function arguments, Functions returning Pointers; Dynamic Memory management functions. Structure: Defining a Structure, Declaring & initializing structure variables, Membership Operator, Array of Structure, Nested structure, Pointer to structure, Structure as function parameters, Union: Defining union, Declaring & initializing union variables; Bit Fields; Enumerated data type; typedef; Bitwise operators.

Unit-V

Command line arguments; File handling: Defining, File opening modes, opening and closing a file, input/output operations in files; C Pre-Processor Directives: Macro substitution, file inclusion, compiler control directive

Text Books:

1. Herbert Schildt, "C The Complete Reference", Osborne/McGraw-Hill, 4 th Edition, 2000
2. Behrouz A. Forouzan and Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C", Cengage Learning, 3rd Edition, 2007.

Reference Book(s):

1. B.W. Kernighan, D.M. Ritchie, "The C Programming Language", Prentice Hall of India, 2nd Edition, 1988.
2. E Balagurusami, "Programming in ANSI C", Tata McGraw-Hill, 6th Edition, 2012.
3. Byron S Gottfried, "Programming with C", Tata McGraw-Hill, 3rd Edition 2015.