

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science & Engineering
Semester: III	Code:
Subject: Mathematics-III	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science & Engineering
Semester: III	Code:
Subject: Principles of Programming Languages	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

UNIT- I Program Design: Introduction- fundamental design concepts - Modules and modularization criteria – Design notation: Procedure template, Pseudo code - Structured flow chart decision. Tables - Design techniques: Stepwise refinement, Levels of abstraction, Top down- Test Plans-Design guidelines.

UNIT-II Programming language processors: Characteristics of programming languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues, Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time. **Data types: Properties of types and objects –elementary data types – structured data types. Abstraction: Abstract data types – encapsulation by subprograms –type definition – storage Management.**

UNIT- III Functional programming languages: Introduction, fundamentals of FPL, LISP, ML, Haskell, application of Functional programming languages and comparison of functional and imperative languages.

UNIT-IV Object-Oriented Programming Concepts-I: Introduction to Basic Object-Oriented Concepts: (Object, Class, Encapsulation, Abstraction, Data Hiding, Inheritance, Polymorphism, Message Passing), Basic structure of a C++ program, C++ Compiler, C++ Classes, Methods, Objects, Nested Class, Const, Static members, this pointer, Comparison between Pointer and Reference Variables, Comparison between New and Delete Operators.

UNIT-V Object-Oriented Programming Concepts-II: Constructor, Destructor, Function and Operator Overloading, Friend functions and Friend classes, Inheritance, Abstract classes, Polymorphism, Virtual Function and Classes, Dynamic Binding, Exception Handling and Templates.

Text Books:

1. "Software Engineering Concepts" by Richard Fairley, Tata McGraw Hill,
2. "Programming Languages, Design and implementation" by Terrance W. Pratt, and Marvin V. Zelkowitz, Prentice-Hall of India, Fourth edition, 2002.
3. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill

Reference Books:

1. "Programming Languages – Concepts and Constructs" by Ravi Sethi, Addison-Wesley, 2nd Ed. 1996.
2. "Programming Languages: Principles and Paradigms" by Allen B. Tucker, Robert Noonan, TMH, 2006.

Course Outcomes: After undergoing the course, students will be able to:

1. Obtain broad understanding of the role of computer science, fundamental software design concepts and notations.
2. Get an overview of various programming language paradigms, processors & software simulation types.
3. An understanding of the key concepts in the implementation of common features of programming languages.
4. Acquire knowledge of basic concepts about object-oriented programming languages.
5. Able to program in object-oriented programming language paradigm using various computational methods.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science & Engineering
Semester: III	Code:
Subject: Data Structures & Algorithms	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35

UNIT- I Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Row Major & Column Major Order Representation of Arrays, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

UNIT-II Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT- III Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST Trees, Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees.

UNIT-IV Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshall Algorithm and Dijkstra Algorithm.

UNIT-V Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Tree (BST) Sort; Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees, Hashing: Hash Function, Collision Resolution Strategies, Storage Management: Garbage Collection and Compaction.

Text books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C/C++", PHI
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

References books:

1. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill
2. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education
3. G A V Pai, "Data Structures and Algorithms", TMH

Course Outcomes:

1. Have a comprehensive knowledge of the data structures and algorithms on which file structures and data bases are based.
2. Understand the importance of data and be able to identify the data requirements for an application.
3. Have in depth understanding and practical experience of algorithmic design and implementation.
4. Have practical experience of developing applications that utilize databases.
5. Understand the issues involved in algorithm complexity and performance.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science & Engineering
Semester: III	Code:
Subject: Digital Electronics	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

UNIT- I Digital Fundamentals: Weighted & Non-weighted codes, Sequential codes, self-complementing codes, Cyclic codes, 8-4-2-1 BCD code, Excess-3 code, Gray code: Binary to Gray

and Gray to binary code conversion, Error detecting code, Error correcting code, 7-bit Hamming code, ASCII code, Binary Arithmetic, Boolean Algebra, Minimization of Switching Function , Demorgan's Theorem, Karnaugh's Map Method, Quine-McCluskey's Method (Tabular Method). Basic and Universal logic Gates, Realization of switching functions using gates.

UNIT-II Digital Logic Families and Memory: Transistor Inverter: Basic Concepts of RTL and DTL; TTL: Open collector gates, TTL subfamilies, IIL, ECL; MOS Logic: CMOS Logic, Dynamic MOS Logic, Interfacing: TTL to ECL, ECL to TTL, TTL to CMOS, CMOS to TTL, and Comparison among various logic families. Memories: ROM and RAM, PLA, PAL and FPGA;

UNIT- III Combinational Circuits: Adder & Subtractor: Half adder, Full adder, Half-subtractor, Full- subtractor, Parallel Binary adder, Look Ahead carry adder, Serial adder, BCD adder. Code converter, Parity bit generator/Checker, Comparator. Decoder: 3-line to 8-line decoder, 8-4-2-1 BCD to Decimal decoder, BCD to Seven segment decoder. Encoder: Octal to binary and Decimal to BCD encoder. Multiplexer: 2-input multiplexer, 4-input multiplexer. De- multiplexer: 1-line to 4-line, study of Multiplexer as Universal Logic Function Generator.

UNIT-IV Sequential Circuits: Flip-Flops: SR, JK, T, D, Master/Slave JK FF and their conversion, Excitation Tables. Introduction to registers (SISO, SIPO, PIPO, PISO) and Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT-V Machines and Application: Finite State Machine, Meelay Machine, Moore Machine, **Introduction to VHDL:** Behavioral – data flow, and algorithmic and structural description, lexical elements, data objects types, attributes, operators; VHDL coding examples.

Text Books:

1. R. P. Jain: "Modern Digital electronics", TMH.
2. B. Somanathan Nair, "Digital Electronics & Logic Design", Prentice-Hall of India.
3. Pedroni V.A., "Digital Circuit Design with VHDL", Prentice Hall, India 2nd Edition.

Reference Books:

1. R J Tocci, "Digital System principles and Applications"
2. "Digital Electronics " by A.K.Maini, Wiley India.
3. M.M. Mano: "Digital logic and computer design", PHI.
4. Floyd: "Digital fundamentals", UBS.

Course Outcomes:

1. Apply digital coding concepts to simplify circuit design.
2. Analyze the operations of various logic families and different semiconductor memories.
3. Design and implement various combinational circuits
4. Outline the concepts of latch circuits, flip flops and counters.
5. Design and develop basic digital systems using VHDL.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science & Engineering
Semester: III	Code:
Subject: Operating System	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

UNIT- I Introduction: Operation System objectives and functions, The Evolution of operating Systems, Batch Systems, interactive systems, time sharing and real time systems, Protection. Operating System Structure, System Components, operating system service, System structure. Distributed Computing.

UNIT-II Concurrent Processes: Process concept: Introduction, Definitions, Process States, Process State Transitions, The process Control Block, Operations on Processes, Suspend and Resume, Interrupt Processing. Mutual Exclusion, the Producer / Consumer problem, the critical section problem, Semaphores, Classical problems in concurrency, inter process communication. CPU scheduling: concepts, performance criteria, and scheduling Algorithms. Algorithm evaluation, Multiprocessor scheduling.

UNIT- III Dead Locks: System model, Deadlock characterization. Prevention, Avoidance and Detection, Recovery from deadlock, combined approach.

UNIT-IV Memory Management: Base machine, Resident Monitor, multiprogramming with fixed partition, Multiprogramming with variable partitions, Paging, Segmentation, paged - segmentation, virtual Memory concepts, Demand paging, performance, Page Replacement algorithms, Allocation of frames, Thrashing, cache memory organization.

UNIT-V I/O Management & Disk Scheduling: I/O system Interrupts Direct Memory Access, I/O Buffering, File system: File Concepts – File organization and Access mechanism, File Directories, File sharing, Implementation issues. Disk Scheduling algorithms. Case Study on LINUX: Kernel and Buffer Cache Architecture, concept of inode file & directory structure, Basic system calls (Open, Read, Write, namei, File and Record Close, File Creation, Creation of Special Files, Change Directory and Change Root, Change Owner and Change Mode

Text Books:

1. Operating system concepts Galvin by Silberschatz, John Wiley & Sons
2. Operating System Design & Implementation by Tanenbaum, A.S., PHI.
3. The Design of Unix Operating System, Maurice J. Bach, Pearson Education.

Reference Books :

1. Modern Operating System: Andrew S. Tanenbaum, PEARSON EDUCATION INTERNATIONAL
2. Operating System concepts by Silberschatz A and Peterson, J.L, PE- LPE.
3. Operating systems: Internals & Design Principles, William Stallings, PHI.

Course Outcomes:

1. Identify the role of operating system in making computers execute data-processing jobs.
2. Realize managing computer's resource complexity during concurrent process execution through OS layers.
3. Analyse the reasons of resource bottlenecks-concurrency, deadlock and various synchronization mechanisms available.
4. Understand the functioning of operating system components in Memory Management techniques, Virtual Memory Management.
5. Understand disk organization, file system structure, Secondary Storage Management functions of OS.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science &Engineering
Semester: III	Code:
Subject: Data Structures (Laboratory)	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

Practical consideration for Internal Sorting.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science & Engineering
Semester: III	Code:
Subject: Digital Electronics Laboratory	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

List of Experiments: (At least 8 experiments are to be performed by each student)

1. To study the characteristics and operations of TTL Inverters, OR, AND, NOR and NAND gate using ICs.
2. To study NAND and NOR gates as a universal logic.
3. To study and prove Demorgan's Theorem .
4. To design Half and Full adder circuits using logic gates.
5. To design Half and full subtractor circuits using logic gates.
6. To study the binary parallel adder.
7. To design 4 bit magnitude comparator circuits.
8. To study the 7 segment decoder .
9. To design 4:16 decoder using two 3:8 decoder and four 2:4 decoder
10. To design 16: 1 Multiplexer using 4:1 Multiplexer.
11. To study various types of flip flops using logic gates and ICs.
12. To design Mod-N and divide by K counter.
13. To construct a 4 bit binary to gray converter and vice versa using IC 7486 .
14. To study Up-Down counter.
15. To study programmable shift registers.

Experiments using VHDL (At least 4 Experiments are to be performed by each student)

1. Design AND,OR,XOR gates.
2. Design Half Adder (Data Flow Style)
3. Design Half Adder (Behavioural Style)
4. Design Half Adder (Structural style Direct entity instantiation)
5. Design Half Adder (Structural style indirect entity instantiation(Component))
6. Design Half Adder (Mixed Style)
7. Design 4 bit comparator Using std_logic_vector inputs.
8. Design 4:1 Multiplexer using Boolean expression
9. Design the 7 segment decoder .
10. Design 3:8 decoder

Laboratory Equipments / Machine Requirements: Logic gate trainer, Digital ICs Trainer, Various ICs 7400,7402,7404,7408,7432,7486,74138,74151,74155 etc, Xilinx ISE WebPACK

Recommended Books:

1. M.M. Mano : “Digital Logic and Computer Design”;
2. Kenneth L. SHORT “VHDL FOR ENGINEERS”, Pearson Education.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science &Engineering
Semester: III	Code:
Subject: Operating Systems (UNIX) Laboratory	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

1. Practice session: Study the features of Linux environment, basic Linux commands (echo, who, date, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, find, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, comm, cmp, diff, tr); also document the syntax and semantics of those commands.
2. Write a shell script that accepts a name from the user and displays whether it is a file, directory or something else.
3. Write a shell script that creates users; also check if a particular user has logged in or not. If not, continue the loop till he/she logs in. Once the required user logs in, display a message.
4. Write a shell script that searches for a given string in a text input file.
5. Write a shell script that compiles all C files in your home directory and creates executable files.
6. Write a shell script that given a filename as argument, deletes all even lines in a file & removes duplicate lines from a file.
7. Write a shell script that enhances find command by adding error messages that explain why the command failed.
8. Write a shell script to input marks of five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate percentage and grade according to following logic:
Percentage \geq 90% : Grade A, Percentage \geq 80% : Grade B, Percentage \geq 70% : Grade C,
Percentage \geq 60% : Grade D, Percentage \geq 40% : Grade E, Percentage $<$ 40% : Grade F.

9. Write a shell script to accept the name, grade, and basic salary from the user. Write the details into a file called employee, separating the fields with a colon (,) continue the process till the user wants.
10. Write an 'Awk' script to count the number of lines in a file that do not contain vowels.
11. Write an 'Awk' script to find the number of characters, words and lines in a file.
12. Write a C program to simulate following non-preemptive CPU scheduling algorithms: a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority scheduling techniques.
 - a. to find average turnaround times and waiting times;
 - b. to display / print Gantt Chart (in any convenient format).
13. Implement the Producer – Consumer problem using semaphores (using UNIX system calls).
14. Write a C program to simulate disk-scheduling algorithms: a) FCFS b) SCAN c) C-SCAN techniques.
15. Write a C program to simulate page replacement algorithms: a) FIFO b) LRU c) LFU d) OPT techniques.

Remarks: The laboratory experiments may be performed in with of the LINUX shell environments: BOURNE Shell / KORN Shell / 'C' Shell.

Recommended Books:

1. Advance UNIX, a Programmer's Guide, S. Prata, BPB Publications, New Delhi.
2. Unix Concepts and Applications, Sumitabh Das.
3. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Computer Science & Engineering
Semester: III	Code:
Subject: Software Laboratory (SciLAB / MATLAB)	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 50	Maximum / Minimum (Pass) Marks: 100 / 35
Total Tutorial Periods: 10	Duration (End Semester Exam): 03 Hours

1. Identification of different matrix types.
2. Properties and Operations of arrays and matrices.
3. Write a program to find probability of tossing a coin and rolling a die through large no. of experimentation.
4. Compute y- coordinates of a STRAIGHT LINE $y = mx + c$, where slope of line $m = 0.5$, intercept $c = -2$ and x- coordinates : $x = 0$ to 10 for 0.5 increments.
5. Plot $y = \sin x$ where $0 \leq x \leq 2$.
6. Plot $y = e - 0.4 x \sin x$ where $0 \leq x \leq 4$.
7. Find the solution of linear algebraic equations in 2 variables, 3 variables:
 - a. $x + 4y = 18$; $2x + 3y = 16$
 - b. $x + 2y + 3z = 1$; $3x + 3y + 4z = 1$; $2x + 3y + 3z = 2$
8. Determination of roots of a given polynomial & quadratic equations.
9. Determination of Eigen Value & Eigen Vectors for matrices.
10. Write a script file to draw a unit circle.
11. Write a function factorial to compute the factorial $n!$ for any integer n .
12. Write a function factorial to compute the factorial $n!$ using RECURSION for any integer n .
13. Write a function to compute the geometric series $1 + r + r^2 + r^3 + \dots + r^n$ for given r and n .
14. Write a function file *crossprod* to compute the cross product of two vectors u and v .
15. Design of a toy project as an independent study towards problem-based learning.

Laboratory Equipments: The experiments may be performed in FOSS (Spoken Tutorials SciLAB Project: www.scilab.org, www.scilab.in).

Recommended Books:

1. Getting started with MATLAB: A Quick Introduction for Scientists and Engineers by Rudra Pratap, IIS Banaglore.
2. Scilab Manual for Probability Theory and Statistics Lab by Prof S N Chandra Shekhar; https://scilab.in/lab_migration_run/82
3. Scilab Manual for Numerical techniques lab by Prof Kanika Gupta; https://scilab.in/lab_migration_run/82
4. Scilab Manual for Probability Theory and Random Processes by Prof Shital Thakkar; https://scilab.in/lab_migration_run/82.
5. Scilab Manual for Numerical Techniques by Dr Javed Dhillon; https://scilab.in/lab_migration_run/82

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program: Bachelor of Technology	Branch: Common to all Branches
Semester: III	Code:
Subject: Soft Skills & Personality Development	Class Tests / Assignments to be conducted: Two / Two
Total Theory Periods: 02 per Week	Maximum / Minimum (Pass) Marks: 40 / 24
Total Tutorial Periods: NIL	Duration (End Semester Exam): NA

UNIT-1 Communication Skills-Basics: Understanding the communicative environment, Listening: What to listen for and why, When to speak and how, Starting and sustaining a conversation, Presentation and Interaction, Common errors during communication, Humour in Communication.

UNIT-2 Interpersonal communication: Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities

UNIT- 3 Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace

UNIT-4 Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to say NO

UNIT-5 Inner Development: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others, controlling anger, Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books :

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.

- Canfield, Jack. The Success Principles (TM) — 10th Anniversary Edition: How to get from Where You Are to Where You want to Be. New York Times. 2009.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman & Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

Course Outcomes: