SARVEPALLI RADHAKRISHNAN UNIVERSITY

Scheme and Syllabus 2025-2026 onwards
(As per NEP 2020)
Faculty of Computer Science & Application

Table-3(B-1): Structure of the Undergraduate Programme and the Distribution of Credits (Annual System with Single Major)

Year	Core (Major) (Discipline Specific Courses)	Minor	Multi/Inter-disciplinary Courses	Ability Enhancement Courses (Language)	Skill Based Activities		Common Value-Added Courses	Total Credits
					Skill Enhancement/ Vocational Courses	Internship / Apprenticeship (Ap) / Project-Work (PW) / Community-Engagement (CE) / Research Project/Dissertation /OCC		
I	C-1 (6) C-2 (6) C-3 (6)	M-1 (4) M-2 (4)	MD-1 (3)	AEC-1 (2) AEC-2 (2)	SEC(VOC)-1 (3)	PW/Ap/CE (2)	VAC-1 (2)	40
*Students exiting the programme after securing 40 credits will be awarded **UG Certificate** in the relevant Discipline/Subject provided they secure an additional 5 credits in work-based vocational courses offered during the summer term or internship/apprenticeship in addition to 5 credits from skill-based courses earned during the first year.*								

SARVEPALLI RADHAKRISHNAN UNIVERSITY

BCA I Year

Course Type	Subject name	Sub Code	Credit	External	Internal	Maximum Marks
Major 1	Computer Architecture		4+2	70	30	100
Major 2	Programming Methodology		4+2	70	30	100
Major 3	Data Structures		4+2	70	30	100
Minor 1	Mathematical Foundations to Computer Science		4	70	30	100
Minor 2	Operating System		3+1	70	30	100
Multiple/Inter disciplinary Courses	Refer Table-1		3	70	30	100
AEC	1. English Language 2. Hindi Language		2 2	50 50		50 50
Skill Enhancement/VC	Refer Table-2		3	70	30	100
FW/Internship	Field Project		2	70	30	100
Value Added Course	Refer Table-3		2	70	30	100
Year Total			40	795	205	1000

Table 1: List of Multi/Inter-disciplinary Courses
(Select any one subject)
2025-26 onwards

Sl.no.	Subject	Multidisciplinary Courses
1.	For Science	Money and banking
		Entrepreneurship and Startup
		Business organization and communication
		Banking institutions in India
		Basic of business studies
		Business organization and management
		Communication Skills
		Communicative English
		Constitutional history of India
		Fundamentals of accounting
		Heritage Management in India
		Indian National Movement
		Indian Political System
		NSS
		NCC
		Physical Education
2.	For Arts	Computer Proficiency
		Logical Reasoning and Quantitative Aptitude
		Non-Conventional Energy Sources
		Banking institutions in India
		Basic of Business Studies
		Business organization and communication
		Business Mathematics
		Business organization and management

		Chemistry in Everyday Life
		Data Analysis & Visualization Through Spreadsheet
		Entrepreneurship and startup
		Fundamentals of accounting
		M S Office (Practical)
		Mathematical Logic and Sets
		Money and Banking
		NSS
		NCC
		Physical Education
3.	For Computer Science and Computer Application	Banking institutions in India
		Basic of business studies
		Business organization and communication
		Business mathematics
		Business organization and management
		Chemistry in Everyday Life
		Communication Skills
		Communicative English
		Constitutional History of India
		Entrepreneurship and startup
		Fundamentals of accounting
		Heritage Management in India
		Indian National Movement
		Indian Political System
		Logical Reasoning and Quantitative Aptitude
		Mathematical Logic and Sets
		Money and Banking
		Non-Conventional Energy Sources
		NSS
		NCC
		Physical Education

Table 2: List of Skill Enhancement/Vocational Courses
(Select any one subject)
2025-28 onwards

S.No.	Skill Enhancement/Vocational Courses
1.	Digital Marketing
2.	Tally Course
3.	Bhagavad Gita
4.	Agribusiness
5.	Computer hardware and network management
6.	Data Analytics
7.	Investment Management
8.	Programming
9.	Web-designing
10.	Electronic equipment maintenance & simulation

Table 3: List of Value Added Courses
(Select any one subject)
2025-26 onwards

S.No.	Value Added Courses
1.	Environmental Education
2.	Yoga and Meditation
3.	Nursing Management
4.	Indian Knowledge System
5.	Constitutional values
6.	Critical & Creative thinking
7.	Health and wellness
8.	Human Rights
9.	Human Values and professional ethics, environmental

	and sustainability
10.	Personality enhancement & leadership
11.	Time management
12.	Ayurvedic and Nutrition
13.	Digital Empowerment
14.	Emotional Intelligence
15.	Ethics and Culture

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Computer Architecture** (Theory)		
3.	Course Type (Core Course/DSE/Minor/MD-ID/ SEC/VOC)	**Major –I** (Core Course)		
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.		
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following:** 1. Understand the basic structure, operation and characteristics of digital computer. 2. Design simple combinational digital circuits based on given parameters. 3. Familiarity with working of arithmetic and logic unit. 4. Know about hierarchical memory system including cache memories and virtual memory. 5. Know the contributions of Indians in the field of computer architecture and related technologies.		
6.	Credit Value	**Theory – 4 Credits**		
7.	Total Marks	Max. Marks : **30 + 70**	Min. Passing Marks: **35**	

PART B: Content of the Course		
No. of Lectures (in hours per week): **2 Hrs. per week**		
Total No. of Lectures: **60 Hrs.**		
Module	**Topics**	**No. of Lectures**
I	**Indian Knowledge System:** Ancient Indian Contribution in Computer Architecture: Pingala's "Chandahśāstra", Panini Sanskrit Grammar. Modern Contribution: Dr. Vinod Dhami, Dr. Ajay Bhat, Dr. Vinod Khosla, Dr. Vijay P Bhatkar. ***Suggested Activities:*** *Debate on Pingala's "Chandahśāstra", Panini Sanskrit Grammar. Solve real-world problems inspired by PARAM's computational models. Discuss on Indian contributions to computing.*	02

II	**Fundamentals of Digital Electronics**: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic, Addition and subtraction of BCD, Octal Arithmetic, Hexadecimal Arithmetic, Binary Codes, Decimal Codes, Error detecting and correcting codes, ASCII, EBCDIC, Excess-3 Code, The Gray Code. **Logic Gates**, Boolean Algebra, Map Simplification, Combinational Circuits, Sequential Circuits, simple combinational circuit design problems. ***Suggested Activities:*** *Assignment on number systems, Verifying logic gates through truth tables,*	12
III	**Combinational Circuits:** Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, Demultiplexer. **Sequential Circuits:** Flip-Flops- SR Flip- Flop, D Flip-Flop, J-K Flip-Flop, T Flip-Flop. **Register:** 4 bit register with parallel load, Shift Registers- Bidirectional shift register with parallel load Binary. **Counters:** 4 bit synchronous and Asynchronous binary counter. ***Suggested Activities:*** *Designing combinational circuits, Hands-on session on designing adders and multiplexers, use simulation software to design basic combinational circuits, Students work in teams to optimize logic circuits for efficiency, Debate on advancements in digital logic design.*	12
IV	**Basic Computer Organization**: Instruction codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction, Input - Output & Interrupts, Instruction formats, Addressing modes, Instruction codes, Machine language, Assembly language. **Register Transfer and Micro operations**: Register Transfer Language, Register Transfer, Bus & Memory Transfer, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations. ***Suggested Activities:*** *Understand how processors access operands in memory, Implement AND, OR, XOR operations at the bit level, explore Panini's rule-based grammar and compare it with modern instruction set design, debate on addressing modes and their use cases.*	12
V	**Processor and Control Unit**: Hardwired vs. Micro programmed Control Unit, General Register Organization, Stack Organization, Instruction Format, Data Transfer & Manipulation, Program Control, Introductory concept of RISC, CISC, advantages and disadvantages of both. **Pipelining**: concept of pipelining, introduction to Pipelined data path and	12

	control – Handling Data hazards & Control hazards.	
	Suggested Activities: *Debate on Hardware vs. Microprogrammed Control, Assignment on designing a simplified processor. Discussion on RISC vs. CISC architectures, Analyze how modern processors handle instruction execution.*	
VI	**Memory and I/O Systems** - Peripheral Devices, I/O Interface. **Data Transfer Schemes** - Program Control, Interrupt, DMA Transfer, I/O Processor. **Memory Hierarchy**, Processor vs. Memory Speed, High-Speed Memories, Main memory, Auxiliary memory, Cache Memory, Associative Memory, Interleaving, Virtual Memory, Memory Management. **Ancient Manuscript Storage (Nalanda, Takshashila Libraries):** Similarity to hierarchical memory and indexing methods.	10
	Suggested Activities: *Understanding memory allocation in modern computers, Compare manuscript storage methods with modern hierarchical memory, Field Visit (if possible): Visit a digital archive/library to understand memory organization.*	

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

Textbooks:

1. Gerard G. Emch, R. Sridharan, M. D. Srinivas: Contributions to the History of Indian Mathematics. Hindustan Book Agency, Vol. 3, 2005.
2. Udayan S. Patankar & Sunil M. Patankar: Elements of Vedic Mathematics, TTU Press, Tallinn 2018.
3. M. Morris Mano: "Computer System Architecture", PHI.
4. Heuring Jordan: "Computer System Design & Architecture" (A.W.L.).
5. Donald P Leach, Albert Paul Malvino, Goutam Saha: "Digital Principles & Applications", Tata McGraw Hill Education Private Limited, 2011Edition.
4. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. William Stalling, "Computer Organization & Architecture", Pearson Education Asia.
2. V. Carl Hamacher . "Computer Organization", TMH
3. Tannenbaum, "Structured Computer Organization", PHI.
6. Er. Rajiv Chopra, "Computer Architecture", Revised 3rd Edition, S. Chand & Company Pvt. Ltd

Suggested Digital Platforms & Web links:
https://epgp.inflibnet.ac.in
https://www.eshiksha.mp.gov.in/mpdhe
Suggested Equivalent Online Courses:
https://nptel.ac.in/courses/106/105/106105163/
https://nptel.ac.in/courses/106/106/106106166/
https://nptel.ac.in/courses/106/106/106106134/

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:	**100**	
Continuous Comprehensive Evaluation (CCE):	**30** Marks	
University Exam (UE):	**70** Marks	
Internal Assessment: Continuous Comprehensive Evaluation (CCE)		**Total Marks: 30**
External Assessment: University Exam Section Time: 03:00 Hours	**Section (A)** : Very Short Questions **Section (B)** : Short Questions **Section (C)** : Long Questions	**Total Marks: 70**

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2021-22**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Computer Architecture (Practical)**		
3.	Course Type (Core Course/DSE/Minor/MD-ID/ SEC/VOC)	**Major - 1** (Core Course)		
4.	Pre-Requisite (if any)	Nil		
5.	Course Learning Outcomes(CLO)	**After the completion of this course, a successful student will be able to do the following:** 1. Realization of the basic logic and universal gates. 2. Verify the behavior of logic gates using truth tables. 3. Implement Binary-to -Gray, Gray-to -Binary code conversions. 4. Design half and full adder circuit using basic gates. 5. Design and construct flip flops and verify the excitation tables.		
6.	Credit Value	**Practical - 2 Credits**		
7.	Total Marks	Max. Marks: **100**	Min. Passing Marks: **35**	

PART B: Content of the Course		
No. of Lab. Practical's (in hours per week): 1 **Hrs. per week**		
Total No. of Labs: 30 **Hrs.**		
	Suggestive list of Practical's	**No. of Labs.**
	1. Verification and interpretation of truth table for AND, OR, NOT gates 2. Verification and interpretation of truth table for NAND, NOR gates 3. Verification and interpretation of truth table for Ex-OR, Ex-NOR gates 4. Study of half adder using XOR and NAND gates and verification of its operation 5. Study of full adder using XOR and NAND gates and verification of its operation 6. Study of half subtractor and verification of its operation 7. Study of full subtractor and verification of its operation 8. Realization of logic functions with the help of NAND -Universal Gates	30 Hrs.

	9. Realization of logic functions with the help of NOR -Universal Gates 10. Verify the truth table of RS flip-flops using NAND and NOR gates 11. Verify the truth table of JK flip-flops using NAND and NOR gates 12. Verify the truth table of T and D flip-flops using NAND and NOR gates 13. Implementation of 4x1 multiplexer using logic gates 14. Implementation of 1x4 demultiplexer using logic gates 15. Verify Gray to Binary conversion using NAND gates only 16. Verify Gray to Binary conversion using NAND gates only	

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Textbooks:

1. Gerard G. Emch, R. Sridharan, M. D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency, Vol. 3, 2005.
2. Udayan S. Patankar & Sunil M. Patankar: Elements of Vedic Mathematics, TTU Press, Tallinn 2018.
3. M. Morris Mano: "Computer System Architecture", PHI.
4. Heuring Jordan: "Computer System Design & Architecture" (A.W.L.).
5. Donald P Leach, Albert Paul Malvino, Goutam Saha: "Digital Principles & Applications", Tata McGraw Hill Education Private Limited, 2011Edition.
6. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. William Stalling, "Computer Organization & Architecture", Pearson Education Asia.
2. V. Carl Hamacher , "Computer Organization", TMH
3. Tannenbaum, "Structured Computer Organization", PHI.
4. Er. Rajiv Chopra, "Computer Architecture", Revised 3rd Edition, S. Chand & Company Pvt. Ltd

Suggested Digital Platforms Web links:

https://epgp.inflibnet.ac.in
https://www.eshiksha.mp.gov.in/mpdhe

Suggested equivalent online courses

https://nptel.ac.in/courses/106/105/106105163/
https://nptel.ac.in/courses/106/106/106106166/
https://nptel.ac.in/courses/106/106/106106134/

PART D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction/Quiz		Viva voce practical	
Attendance		Practical record file	
Assignments (Charts/ Model/Seminar/Rural Services/ Technology Dissemination/Report of Excursion/Lab visit/ Survey/Industrial Visit)		Table work/Experiment	
Total	**30**		**70**

PART A: Introduction

Program: **Certificate**	Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**

Subject: **Computer Applications**

1.	Course Code	
2.	Course Title	**Programming Methodology (Theory)**
3.	Course Type (Core Course/DSE/Minor/MD/ID/SEC/VOC)	**Major – II** (Core Course)
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following** 1. Develop simple algorithms and flow charts to solve a problem with programming using top down design principles 2. Writing efficient and well-structured computer algorithms programs 3. Learn to formulate iterative solutions and array processing algorithms for problems 4. Use recursive techniques, pointers and searching methods in programming
6.	Credit Value	**Theory – 4 Credits**
7.	Total Marks	Max. Marks: **30 + 70** | Min. Passing Marks: **35**

PART B: Content of the Course

No. of Lectures (in hours per week): **2 Hrs. per week**

Total No. of Lectures: **60 Hrs.**

Module	Topics	No. of Lectures
I	**Indian Knowledge System:** Ancient Indian Contribution: Brahmagupta "Chakravala method", Aryabhata Algorithm, The Panini Grammar System (Ashtadhyayi) Modern Contribution: Origin of Julia Programming Language, Indian Scientist who designed new programming languages and open source languages ***Suggested Activities:*** *Discuss how Panini's grammar rules resemble formal grammar in programming languages. Implement Aryabhata Algorithm*	05

II	**Introduction to Programming** - Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Design, Flowcharts, Types of Programming Methodologies. **Basics of C++:** A Brief History of C++, Application of C++, Compiling & Linking, Tokens, Keywords, Identifiers & Constants , Basic Data Types, User-Defined Data Types, Symbolic Constant, Type Compatibility, Reference Variables, Operator in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator. Conditional Statements if construct, switch-case construct. Iterative Statements: while, do-while, and for loops, use of break and continue in loops, Using Nested Statements (Conditional as well as Iterative). ***Suggested Activities:*** *Implement a console-based quiz using formatted I/O, Use flowcharts and pseudocode tools to map variable types and memory usage.*	12
III	**Functions In C++:** The Main Function, Function Prototyping, Call by Reference Call by Address, Call by Value, Return by Reference, Inline Function, Default Arguments, Constant Arguments, Function Overloading, Function with Array.	10
IV	**Classes & Objects:** A Sample C++ Program with class, Defining Member Functions, Making an Outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member, Functions, Array of Objects, Object as Function Arguments, Friend Functions, Virtual functions, Returning Objects, Constant member functions, Pointer to Members, Local Classes. ***Suggested Activities:*** *Combine all the modules to create a comprehensive Library Management System with features like adding books, managing users, calculating late fees, and tracking library statistics. Design a Simple Banking System in C++.*	12
V	**Constructor & Destructor:** Constructor, Parameterized Constructor, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructor and Destructor. **Inheritance:** Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Hierarchical Inheritance, Multiple Inheritance, Hybrid Inheritance.	12

	Suggested Activities: *Building a Simple Student Management System, Designing a Vehicle Management System. Implement dynamic memory allocation for managing multiple vehicles.*	
VI	**Various types of Classes:** Virtual Base Classes, Abstract Classes, Constructor in Derived Classes, Nesting of Classes. **Operator Overloading** & Type Conversion, Polymorphism. **Pointers:** Pointers with Arrays C++. **Streams**: C++ Stream Classes, Unformatted I/O Operation, Formatted I/O Operation, Managing Output with Manipulators, Exception Handling.	12
	Suggested Activities: *Create a Shape Management System to manage different geometric shapes like Circle, Rectangle, and Triangle. Develop a Payroll System for managing employee salaries.*	

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

Textbooks:

1. Gerard G. Emch, R. Sridharan, M. D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency, Vol. 3, 2005.

2. Udayan S. Patankar & Sunil M. Patankar: Elements of Vedic Mathematics, TTU Press, Tallinn 2018.
3. J. R. Hanly and E. B. Koffman. "Problem Solving and Program Design in C", Pearson, 2015.
4. E. Balguruswamy, "C++ ", TMH Publication ISBN O-07-462038-X
5. Herbert Shildt, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7.
6. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. R. Lafore, 'Object Oriented Programming C++"
2. N. Dale and C. Weems, "Programming and problem solving with C++: brief edition", Jones & Bartlett Learning.

Suggestive Digital Platform Web Links:

https://www.eshiksha.mp.gov.in/mpdhe

Suggested Equivalent Online Courses:

https://nptel.ac.in/courses/106/105/106105151/
https://nptel.ac.in/courses/106/105/106105234/

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: **100** Continuous Comprehensive Evaluation (CCE): **30** Marks University Exam (UE): **70** Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)		**Total Marks: 30**
External Assessment: University Exam Section Time: 03.00 Hours	**Section (A) :** Very Short Questions **Section (B) :** Short Questions **Section (C) :** Long Questions	**Total Marks: 70**

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Programming Methodology (Practical)**		
3.	Course Type (Core Course/DSE/Minor/MD-ID/ SEC/VOC)	**Major – II** (Core Course)		
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.		
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following:** 1. Develop simple algorithms and flow charts to solve a problem with programming using top down design principles. 2. Writing efficient and well-structured computer algorithms/programs. 3. Learn to formulate iterative solutions and array processing algorithms for problems. 4. Use recursive techniques, pointers and searching methods in programming.		
6.	Credit Value	**Practical – 2 Credits**		
7.	Total Marks	Max. Marks: **100**	Min. Passing Marks: **35**	

PART B: Content of the Course		
No. of Lab Practicals (in hours per week): **1 hours per week**		
Total No. of Lab.: **30 Hrs.**		
	Suggestive list of Practical's	**No. of Labs.**

	Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code in C++, execute and test it. Students should be given assignments on following: 1. Write a program to swap the contents of two variables. 2. Write a program for finding the roots of a Quadratic Equation. 3. Write a program to find area of a circle, rectangle, square using switch case. 4. Write a program to print table of any number. 5. Write a program to print Fibonacci series. 6. Write a program to find factorial of a given number using recursion. 7. Write a program to convert decimal (integer) number into equivalent binary number. 8. Write a program to check given string is palindrome or not. 9. Write a program to print digits of entered number in reverse order. 10. Write a program to print sum of two matrices. 11. Write a program to print multiplication of two matrices. 12. Write a program to generate even/odd series from 1 to 100. 13. Write a program whether a given number is prime or not. 14. Write a program for call by value and call by reference. 15. Write a program to create a pyramid structure 1 12 123 1234 16. Write a program to check entered number is Armstrong or not. 17. Write a program to input N numbers and find their average. 18. Write a program to find the area and volume of a rectangular box using constructor. 19. Write a program to design a class time with hours, minutes and seconds as data members. Use a data function to perform the addition of two time objects in hours, minutes and seconds. 20. Write a program to implement single inheritance.	30 Hrs.

PART C: Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings:
Textbooks: 1. Gerard G. Emch, R. Sridharan, M. D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency, Vol. 3, 2005.

2. Udayan S. Patankar & Sunil M. Patankar: Elements of Vedic Mathematics, TTU Press, Tallinn 2018.
3. J. R. Hanly and E. B. Koffman, "Problem Solving and Program Design in C", Pearson, 2015
3. E. Balguruswamy, "C++ ", TMH Publication ISBN O-07-462038-X
4. Herbert Shildt, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7.
5. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. R. Lafore, 'Object Oriented Programming C++"
2. N. Dale and C. Weems, "Programming and problem solving with C++: brief edition", Jones & Bartlett Learning.

Suggestive Digital Platform Web Links:

https://www.eshiksha.mp.gov.in/mpdhe

Suggested Equivalent Online Courses:

https://nptel.ac.in/courses/106/105/106105151/
https://nptel.ac.in/courses/106/105/106105234/

PART D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction/Quiz		Viva voce practical	
Attendance		Practical record file	
Assignments (Charts/ Model/Seminar/Rural Services/ Technology Dissemination/Report of Excursion/Lab visit/ Survey/Industrial Visit)		Table work/Experiment	
Total	**30**		**70**

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Data Structures (Theory)**		
3.	Course Type (Core Course/DSE/Minor/ MD-ID/ SEC/VOC)	**Major – III** (Core Course)		
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.		
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following:** 1. Will be familiar with fundamental data structures. their implementation; become accustomed to the description of algorithms in both functional and procedural styles. 2. Have knowledge of complexity of basic operations like insert. delete. search on these data structures. 3. Possess ability to choose a data structure to suitably model any data used in computer applications. 4. Design programs using various data structures including hash tables. Binary and general search trees, heaps, graphs etc. 5. Assess efficiency tradeoffs among different data structure implementations. 6. Implement and know the applications of algorithms for searching and sorting. 7. Know the contributions of Indians in the field of programming and data structures.		
6.	Credit Value	**Theory – 4 Credits**		
7.	Total Marks	Max. Marks : **30 + 70**	Min. Passing Marks: **35**	

PART B: Content of the Course		
No. of Lectures (in hours per week): **2 Hrs. per week**		
Total No. of Lectures: **60 Hrs.**		
Module	**Topics**	**No. of Lectures**
I	**Indian Knowledge System:** Resemblance of efficient Sorting & Searching techniques with Ancient Indian classification methods in Ayurveda & Sanskrit texts. The Buddhist Numerical Sorting Method (Bhāskara II). Indian	02

	contribution in Data Structure: Dr. Sartaj Sahni, Dr. Arvind, R. K. Gupta.	
	Suggested Activities: *Vedic Sorting Implementation: Develop a sorting algorithm inspired by Ayurvedic classification techniques. Study the resemblance of temple architecture to graph connectivity and model it using Graphviz/Network..*	
II	**Data Structure:** Basic concepts, Linear and Non-Linear data structures **Algorithm Specification:** Introduction, Recursive algorithms, Data Abstraction, Performance analysis. **Arrays:** Representation of single, two-dimensional arrays, triangular arrays, sparse matrices-array and linked representations.	10
	Suggested Activities: *Implementing a Simple To-Do List using Linear Data Structures, Exploring Non-Linear Data Structures with a Family Tree, Sparse Matrix Operations Using Arrays.*	
III	**Stacks:** Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, Infix to Prefix Conversion, Postfix Expression Evaluation, Recursion Implementation. **Queues:** Definition, Operations, Array and Linked Implementations. Circular Queue-Insertion and Deletion Operations, Dequeue (Double Ended Queue), Priority Queue- Implementation. **Linked Lists:** Singly Linked Lists, Operations, Concatenating, circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists-Operations, Doubly Circular Linked List, Header Linked List.	14
	Suggested Activities: *Express Calculator Using Stacks, Queue Simulation for a Bank System, Linked List-Based Music Playlist, Compare linked list pointer-based structure with ancient manuscript referencing, Develop a queue system (FIFO) for handling real-world ticket processing.*	
IV	**Trees:** Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees. **Heap:** Definition, Insertion, Deletion.	12
	Suggested Activities: *Create efficient storage models for Ayurveda medicinal records using tree-based structures. Research how Vedic knowledge management compares with modern database indexing, Implement tree traversal to simulate genealogy in Vedic lineage texts, Implement heap sorting for priority based Ayurveda classification.*	
V	**Graphs:** Graph ADT, Graph Representations, Graph Traversals, Searching. **Hashing:** Introduction, Hash tables, Hash functions, Overflow Handling.	10

VI	***Suggested Activities:*** *Model Indian temple network connectivity using graph algorithms, Social Network Graph Simulation, Implementing a Hash Map, Graph-Based Maze Solver.* **Sorting:** Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Comparison of Sorting Methods, **Search Trees:** Binary Search Trees, AVL Trees- Definition and Examples. ***Suggested Activities:*** *Students compete to optimize sorting algorithms based on Ayurvedic classification techniques, Use binary trees to model ancient Indian lineage systems.*	12

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

Textbooks:

1. Gerard G. Emch, R. Sridharan, M. D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency, Vol. 3, 2005.
2. Udayan S. Patankar & Sunil M. Patankar: Elements of Vedic Mathematics, TTU Press, Tallinn 2018.
3. Sartaj Sahani, "Data Structures, Algorithms and Applications with C++", McGraw Hill.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
5. D. S. Malik, "Data Structure using C++", Second edition, Cengage Learning.
6. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
2. M. A. Weiss, "Data structures and Algorithm Analysis in C", 2nd edition, Pearson.
3. Lipschutz, "Schaum's outline series Data structures", Tata McGraw-Hill.

Suggestive Digital Platform Web Links:

https://www.eshiksha.mp.gov.in/mpdhe

https://epgp.inflibnet.ac.in

Suggested Equivalent Online Courses:

https://nptel.ac.in/courses/106/102/106102064/

https://nptel.ac.in/courses/106/106/106106127/

https://nptel.ac.in/courses/106/105/106105085/

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: **100** Continuous Comprehensive Evaluation (CCE): **30** Marks University Exam (UE): **70** Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)		**Total Marks: 30**
External Assessment: University Exam Section Time: 03.00 Hours	**Section (A) :** Very Short Questions **Section (B) :** Short Questions **Section (C) :** Long Questions	**Total Marks: 70**

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Data Structures (Practical)**		
3.	Course Type (Core Course/DSE/Minor/MD-ID/ SEC/VOC)	**Major – III** (Core Course)		
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.		
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following:** 1. Will be familiar with fundamental data structures, their implementation; become accustomed to the description of algorithms in both functional and procedural styles. 2. Have knowledge of complexity of basic operations like insert, delete, search on these data structures. 3. Possess ability to choose a data structure to suitably model any data used in computer applications. 4. Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc. 5. Assess efficiency tradeoffs among different data structure implementations. 6. Implement and know the applications of algorithms for searching and sorting. 7. Know the contributions of Indians in the field of programming and data structures.		
6.	Credit Value	**Practical – 2 Credits**		
7.	Total Marks	Max. Marks: **100**	Min. Passing Marks: **35**	

PART B: Content of the Course	
No. of Lab Practical's (in hours per week): **1 hours per week**	
Total No. of Lab.: **30 Hrs.**	
Suggestive list of Practical's	**No. of Labs.**
Given the problem statement, students are required to formulate problem,	30 Hrs.

develop flowchart/algorithm, write code in C++, execute and test it. Students should be given assignments on following:

1. Write a program to find largest element from an array.
2. Write a program to implement push and pop operations on a stack using array.
3. Write a program to perform insert and delete operations on a queue using array.
4. Write a program for Linear search.
5. Write a program for Binary search.
6. Write a program for Bubble sort.
7. Write a program for Selection sort.
8. Write a program for Quick sort.
9. Write a program for Insertion sort.
10. Write a program to implement linked list.

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

Textbooks:

1. Gerard G. Emch, R. Sridharan, M. D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency, Vol. 3, 2005.
2. Udayan S. Patankar & Sunil M. Patankar: Elements of Vedic Mathematics, TTU Press, Tallinn 2018.
3. Sartaj Sahani, "Data Structures, Algorithms and Applications with C++", McGraw Hill.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
5. D. S. Malik, "Data Structure using C++", Second edition, Cengage Learning.
6. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
2. M. A. Weiss, "Data structures and Algorithm Analysis in C", 2nd edition, Pearson.
3. Lipschutz, "Schaum's outline series Data structures", Tata McGraw-Hill.

Suggestive Digital Platform Web Links:

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https://epgp.inflibnet.ac.in

Suggested Equivalent Online Courses:

https://nptel.ac.in/courses/106/102/106102064/
https://nptel.ac.in/courses/106/106/106106127/
https://nptel.ac.in/courses/106/105/106105085/

PART D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction/Quiz		Viva voce practical	
Attendance		Practical record file	
Assignments (Charts/ Model/Seminar/Rural Services/ Technology Dissemination/Report of Excursion/Lab visit/ Survey/Industrial Visit)		Table work/Experiment	
Total	**30**		**70**

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Mathematical Foundations to Computer Science (Theory)**		
3.	Course Type (Core Course/DSE/Minor/MD-ID/ SEC/VOC)	**Minor – I**		
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.		
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following**: 1. Perform key operations for image processing, computer graphics, and data analysis. 2. Understand and implement linear transformations in 3D modeling, robotics, and neural networks. 3. Solve linear systems that arise in cryptography, game development, and AI algorithms. 4. Use matrices in machine learning models for efficient data manipulation and optimization. 5. Implement algorithms that involve graph theory, network flow analysis, and dynamic systems. Using the principles of logic to distinguish between sound and unsound reasoning in discourse of everybody. 6. Construct truth tables for logical expressions; test statements for logical equivalence and represent mathematical statements in the language of predicate language. 7. Using the appropriate set theoretic concepts, thinking process, tools and techniques in the solution to various conceptual or real-world problems. 8. Understanding Frequency Distributions that helps in efficiently summarizing and analyzing large datasets, detecting anomalies, and optimizing algorithms for better performance in areas like searching, sorting, and recommendation systems.		
6.	Credit Value	**Theory – 4 Credits**		
7.	Total Marks	Max. Marks : **30 + 70**	Min. Passing Marks: **35**	

PART B: Content of the Course		
No. of Lectures (in hours per week): **2 Hrs. per week**		
Total No. of Lectures: **60 Hrs.**		
Module	**Topics**	**No. of Lectures**
I	**Indian Knowledge System:** Basic concepts of Mathematical Logic in ancient India: Panini's Logical Structure, Avaktavtakta, Navya-Nyaya Logic. Indian Contributions in Statistics: P. C. Mahalanobis, C. Radhakrishna Rao, Samanta Chandra Sekhar Harichandan, J. K. Ghose, P. Maiti.	05
	Suggested Activities: *Decoding Ancient Logic, Statistical Legends: A Tribute to Indian Pioneers, Logic Meets Statistics: A Fun Debate.*	
II	**Determinants:** Basic Properties of Determinants, Minor determinant, Co-factors, Applications of determinants in finding the area of a triangle. **Matrices:** Concept of Matrices, Notation, order and equality of Matrices, Types of Matrices, Operations on Matrices, Addition and multiplication, Multiplication with a scalar, Simple properties of addition, multiplication and scalar multiplication, Transpose of a Matrix, Application of Matrices to solve real world problems.	15
	Suggested Activities: *Applications of Matrices to solve the problems related to Industries, Business, Economics and real world problems.*	
III	**Statistics:** Frequency distribution, Measures of central tendency: Mean, Median, Mode. Measure of dispersion: mean deviation, variance and standard deviation of ungrouped/grouped data.	20
	Suggested Activities: *Applications of* Mean, Median, Mode, mean deviation, variance and standard deviation *to solve the problems related to Industries, Business, Economics and real world problems.*	
IV	**Mathematical Logic:** Statements and notations, Propositions and Truth table, Negation, Conjunction and Disjunction, Implications and Double implication, Bi-conditional propositions, Contrapositive Implication and converse, Contrapositive and inverse propositions, Tautology and Contradiction, Logical equivalences, De-Morgan Law.	20
	Suggested Activities: *Applications of Mathematical Logic to solve the problems related to Industries, Business, Economics and real world problems.*	

PART C: Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings:
Textbooks:

1. Gerard G. Emch, R. Sridharan, M. D. Srinivas: Contributions to the History of Indian Mathematics. Hindustan Book Agency, Vol. 3, 2005.
2. Udayan S. Patankar & Sunil M. Patankar: Elements of Vedic Mathematics, TTU Press, Tallinn 2018.
3. Nita H. Shah, Foram A. Thakkar: Matrix and Determinant Fundamentals and Applications, CRC Press, 2020.
4. H. C. Saxena and J. N. Kapoor: Mathematical Statistics, S. Chand and Company, 2010.
5. R. M. Somasundaram: Discrete Mathematical Structures, PHI Learning Pvt. Ltd., 2003.
6. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:

1. Hari Kishan: A Textbook of Matrices, Atlantic Publishers & Dist, 2008
2. Shanti Narayan and P K Mittal: A Textbook of Matrices, S. Chand Publishing, 1953.
3. E. Rukmangadachari: Probability and Statistics, Pearson Education India; First edition, 2012.
4. R. P. Grimaldi, Discrete Mathematics and Combinatorial Mathematics, Pearson Education, 1998.

Suggestive Digital Platform Web Links:

https://www.eshiksha.mp.gov.in/mpdhe
https://epgp.inflibnet.ac.in

Suggested Equivalent Online Courses:

https://nptel.ac.in/courses/111106112/
https://nptel.ac.in/courses/111105090/
https://nptel.ac.in/courses/108104157

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100**
Continuous Comprehensive Evaluation (CCE):	**30** Marks
University Exam (UE):	**70** Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)		**Total Marks: 30**
External Assessment: University Exam Section Time: 03.00 Hours	**Section (A) :** Very Short Questions **Section (B) :** Short Questions **Section (C) :** Long Questions	**Total Marks: 70**

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Operating System (Theory)**		
3.	Course Type (Core Course/DSE/Minor/MD-ID/ SEC/VOC)	**Minor – II**		
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.		
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following:** 1. Describe the importance of computer system resources and the role of operating system in their management policies and algorithms. 2. Specify objectives of modern operating systems and describe how operating systems have evolved over time. 3. Understand various process management concepts and can compare various scheduling techniques, synchronization, and deadlocks. 4. Describe the concepts of multithreading and memory management techniques. 5. Identify the best suited memory management technique for any process. 6. Describe various file operations, file allocation methods and disk space management. 7. To understand and identify potential threats to operating systems and the security features design to guard against them. 8. Learn to operate the Linux system, along with its administration and Shell programming 9. Getting to know the Android OS and its application framework.		
6.	Credit Value	**Theory – 3 Credits**		
7.	Total Marks	Max. Marks : **30 + 70**	Min. Passing Marks: **35**	

PART B: Content of the Course
No. of Lectures (in hours per week): **2 Hrs. per week**
Total No. of Lectures: **45 Hrs.**

Module	Topics	No. of Lectures
I	**Indian Knowledge System:** The BOSS operating system, open source softwares, growth of LINUX, Aryabhatt Linux, contributions of innovators – Rajen Sheth, Sunder Pichai etc.	02
	Suggested Activities: *Aryabhatt Linux Coding Sprint, Open Source Innovation Hackathon*	
II	**Introduction to Operating System**: What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Hand-held Devices, Process Control & Real time Systems. **Process Management**: Process Concepts, Process states & Process Control Block. **Process Scheduling**: Scheduling Criteria, Scheduling Algorithms (Preemptive & Non- Preemptive) – FCFS, SJF, SRTN, RR, Priority, Multiple-Processor, Real-Time, Multilevel Queue and Multilevel Feedback Queue Scheduling. **Deadlock** - Definition, Deadlock Characterization, Necessary and Sufficient Conditions for Deadlock.	15
	Suggested Activities: *OS Evolution Timeline, OS Simulator Challenge, Process Scheduling Debate, Deadlock Detection Lab, Real-Time OS Case Study, OS Simulation with Deadlock Avoidance.*	
III	**Memory Management**: Introduction, Address Binding, Logical versus Physical Address Space, Swapping, Contiguous & Non-Contiguous Allocation, Fragmentation (Internal & External), Compaction, Paging, Segmentation, Virtual Memory, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms. **File Management**: Concept of File System(File Attributes, Operations, Types), Functions of File System, Types of File System, Access Methods (Sequential, Direct & other methods), Directory Structure (Single-Level, Two-Level, Tree-Structured, Acyclic-Graph, General Graph), Allocation Methods (Contiguous, Linked, Indexed) **Disk Management**: Structure, Disk Scheduling Algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK), Swap Space Management, Disk Reliability, Recovery.	15

	Suggested Activities: *Memory Management Simulator, File System Design Challenge, Disk Scheduling Algorithm Race, Virtual Memory Management Simulation, Disk Management Case Study, File System Forensics Lab.*	
IV	**LINUX**: Introduction, History and features of Linux, advantages, hardware requirements for installation, Linux architecture, file system of Linux - boot block, super block, inode table, data blocks. Linux standard directories, Linux kernel, Partitioning the hard drive for Linux, installing the Linux system, system - startup and shut-down process, init and run levels. Process, Swap, Partition, fdisk, checking disk free spaces. Difference between CLI OS & GUI OS, Windows v/s Linux, Importance of Linux Kernel, Files and Directories. Concept of Open Source Software.	13
	Suggested Activities: *Linux OS Architecture Poster, Linux System Installation Lab, Linux File System Exploration, CLI vs. GUI Challenge, Linux Kernel Deep Dive, Open Source Software Debate.*	

PART C: Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings:
Textbooks: 1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications. 2. A. S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education. 3. Operating System by Peterson. 4. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।
Reference Books: 1. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education. 2. W. Stallings, Operating Systems, Internals & Design Principles, 8th Edition, Pearson Education. 3. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill. 4. Operating System design and Concepts by Milan Milenkovic.
Suggestive Digital Platform Web Links:
https://www.eshiksha.mp.gov.in/mpdhe https://epgp.inflibnet.ac.in
Suggested Equivalent Online Courses:
https://nptel.ac.in/courses/106/102/106102132/

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: **100** Continuous Comprehensive Evaluation (CCE): **30** Marks University Exam (UE): **70** Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)		**Total Marks: 30**
External Assessment: University Exam Section Time: 03.00 Hours	**Section (A)** : Very Short Questions **Section (B)** : Short Questions **Section (C)** : Long Questions	**Total Marks: 70**

PART A: Introduction				
Program: **Certificate**		Class: **B.C.A.**	Year: **I Year**	Session: **2025-26**
Subject: **Computer Applications**				
1.	Course Code			
2.	Course Title	**Operating System (Practical)**		
3.	Course Type (Core Course/DSE/Minor/MD-ID/ SEC/VOC)	**Minor – II**		
4.	Pre-Requisite (if any)	To study this course, a student must have basic knowledge of Computers.		
5.	Course Learning Outcomes (CLO)	**After the completion of this course, a successful student will be able to do the following:** 1. Operate the Linux system. 2. Do administration 3. Do Shell programming		
6.	Credit Value	**Practical – 01 Credits**		
7.	Total Marks	Max. Marks: **100**	Min. Passing Marks: **35**	

PART B: Content of the Course		
No. of Lab Practical's (in hours per week): **1 hours per week**		
Total No. of Lab.: **15 Hrs.**		
	Suggestive list of Practical's	**No. of Labs.**
	1. Linux Directory Commands: pwd, mkdir, rm -rf, ls, cd, cd / , cd ~ 2. Linux File Commands: touch, cat, cat >, cat >>, rm , cp, mv, rename 3. Linux Permission Commands: su, id, useradd, passwd, groupadd, chmod, groupdel, chown, chgrp 4. Linux File Content & Filter Commands: head, tail, tac, more, less, grep, cat, cut, grep, comm, sed, tee, tr, uniq, wc, od, sort, diff. 5. Linux Utility Commands: find, bc, locate, date, cal, sleep, time, df, mount, exit, clear, gzip, gunzip. 6. Linux Networking Commands: ip, ssh, mail, ping, host 7. Edit Crontab file: to wall message on system on particular time automatically. 8. Vi editor: Create file, edit, save and quit. Highlighting the searched term within a file. cut, yank, undo.	15 Hrs.

PART C: Learning Resources
Textbooks, Reference Books, Other Resources

Suggested Readings:
Textbooks: 1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications. 2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education. 3. Operating System by Peterson. 4. मध्य प्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें ।

Reference Books:
1. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education. 2. W. Stallings, Operating Systems, Internals & Design Principles, 8th Edition, Pearson Education. 3. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill. 4. Operating System design and Concepts by Milan Milenkovic.
Suggestive Digital Platform Web Links:
https://www.eshiksha.mp.gov.in/mpdhe https://epgp.inflibnet.ac.in
Suggested Equivalent Online Courses:
https://nptel.ac.in/courses/106/102/106102132/

PART D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction/Quiz		Viva voce practical	
Attendance		Practical record file	
Assignments (Charts/ Model/Seminar/Rural Services/ Technology Dissemination/Report of Excursion/Lab visit/ Survey/Industrial Visit)		Table work/Experiment	
Total	**30**		**70**