Part A Introduction				
Program : Certificate	Class : BCA I Year		Year : 2021	Session : 2021-2022
1	Course Code		S1-BCAA1T	
2	Course Title		Computer Fundamentals, Organization & Architecture	
3	Course Type (Core Course/Elective/Generic Elective/Vocational)		Major – Paper 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: • Understand the basic structure, operation and characteristics of digital computer. • Design simple combinational digital circuits based on given parameters. • Understand the working of arithmetic and logic unit. • Know about hierarchical memory system including cache memories and virtual memory. • Know the contributions of Indians in the field of computer architecture and related technologies.	
6	Credit Value		Theory – 4 Credits Practical – 2 Credits	
7	Total Marks		Max. Marks : 25+75	Min. Marks : 33
Part B – Content of the Course				
No. of Lectures (in hours per week) : 2 Hours per week				
Total no. of Lectures: 60 Hrs.				
Unit	Topics			No. of Lectures
1	**Fundamentals of Computers:** Definition, Characteristics, Capabilities and limitations. Types of computers: Analog, Digital, Micro, Mini, Mainframe & super computers, Work station, server computers, generations of computers. Smart systems: definition, characteristics and applications. Definition embedded system, GIS, GPS, Cloud computing. Uses of computers in E-Governance and various public domains and services.			8
2	Block diagram of computer and its functional units. Concept of hardware, software and firmware. Types of software. **Input devices –** keyboard, scanner, mouse, light pen, bar code reader,			10

	OMR, OCR, MICR, Trach ball, joystick, touch screen camera, mic etc. **Output devices – Monitors –** monitors – classification of monitors based on technology – CRT & Flat panel, LCD, LED monitors, speakers, printers- dot matrix printer, ink jet printer, laser printer, 3D printers, Wi-Fi enabled printers, plotters and their types, LCD/LED Projectors. Computer memory and its types, storage devices: magnetic tapes, Floppy Disks, Hard disks, compact disc- CD-ROM, CD-RW, VCD, DVD, DVD-RW, USB drives, Blue ray disc, SD/MMC Memory Cards.	
3	**Fundamentals of digital electronics:**Data types, complements, fixed-point representation, floating-point representation, Binary and other codes, Error detection codes. **Logic Gates,** Boolean Algebra, map simplification, Combinational Circuits, Sequential circuits, simple combinational circuit design problems. **Combinational Circuits –** Adder – sub tractor, multiplexer, Demultiplexer, Decoders, Encoders. **Sequential Circuits –** Flip-Flops, Registers, counters.	**10**
4	**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, and assembly language. **Register Transfer and Micro operations:** Register transfer language, register transfer, Bus & memory transfer, arithmetic Micro-operation, logic micro-operations, shift Micro-operations.	**10**
5	**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 control – handling data hazards & control hazards.	**10**
6	**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 & its types, Auxiliary memory, cache memory, associative memory, interleaving, concept of virtual memory, Hardware support for memory management.	**10**
7	**Indian contribution to the field –**Contributions of reputed scientists of Indian origin like – Dr. VinodDham – Father on Intel Pentium Processor, Dr. Ajay Bhat – Co-inventor of USB technology, Dr. VinodKhosla Co-Founder of Sun Microsystems, Dr. Vijay P Bhatkar – Architect of India's national initiative in supercomputing, and many others. **Parallel Computing projects of India –** PARMA, ANUPAM,	**2**

	FLOSOLVER, CHIPPS etc. other relevant contributors and contributions.	

Part C- Learning Resources
Text Books, Reference Books, Other resources

Text Books:
- M. Morris Mano, "Computer System Architecture", PHI.
- Heuring Jordan, "Computer system Design & Architecture" (A.W.L.)
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:
- William Stalling, "Computer Organization & Architecture", Pearson Education Asia.
- V. Carl Hamacher, "Computer Organization", TMH
- Tannenbaum, "Structured Computer Organization", PHI.
- Er. Rajiv Chopra, Computer Architecture", Revised 3rd Edition, S. Chand & company Pvt. Ltd.

Suggested digital platform web links:
https://www.youtube.com/watch?v+=4TzMyXmzL8M
https://nptel.ac.in/courses/106/106/106106166
https://nptel.ac.in/courses/106/106/106106134

Suggested equivalent online courses:
https://nptel.ac.in/courses/106/105/106105163

Part D- Assessment and Evaluation			
Internal Assessment: **Continuous Comprehensive Evaluation (CCE) :** 25 Shall be based on allotted assignments and class tests. The marks shall be as follows:		**External assessment: University exam (UE): 75 marks** **Time: 02.00 Hours**	
Assessment and presentation of assignment	**04 Marks**	**Section (A):** Three Very Short Questions (50 Words Each) Nine MCQ Questions	03 x 03 = 09 OR 09 x 01 = 09 Marks
Class Test I **(Objective Questions)**	**5 Marks**	**Section (B):** Four Short Questions (200 Words Each)	04 x 09 = 36
Class Test I **(Descriptive Questions)**	**8 Marks**	**Section (C):** Two Long Questions (500 Words Each)	02 x 15 = 30
Total	**25 Marks**	**Total**	75 Marks
Any remarks / suggestions: Theoretical exposition should be accompanied by Discussions, Case-studies preferably with Indian Context, Presentations and Industry Based Assignments.			

Part A Introduction			
Program : Certificate	Class : BCA I Year	Year : 2021	Session : 2021-2022

1	Course Code	S1-BCAA1P	
2	Course Title	Computer Fundamentals, and Digital lab	
3	Course Type (Core Course/Elective/Generic Elective/Vocational)	Major – Paper I	
4	Pre-Requisite (if any)	Open for All	
5	Course Learning outcomes (CLO)	After the completion of this course, a successful student will be able to: - Familiarity with parts of the computer and peripheral devices used with computer. - Realization of the basic logic and universal gates. - Verify the behavior of logic gates using truth tables. - Implement Binary-to-Gray, Gray-to Binary code conversions. - Design half and full adder circuit using basic gates. - Design and construct flip flops and verify the excitation tables.	
6	Credit Value	Practical – 2 Credits	
7	Total Marks	Max. Marks : 25+75	Min. Marks : 33

Part B – Content of the Course		
No. of Lectures (in hours per week) : 1 Hours per week		
Total no. of Lectures: 30 Hrs.		

Unit	Topics	No. of Lectures

	I. Computer Fundamentals
	  a. Identify various parts of the computer by physical examination.
	  b. Identify various parts inside the CPU like motherboard, SMPS, ports buses, IC chips, Processor, HDD, and RAM etc.
	  c. Identify various I/O devices available in the lab physically.
	
	II. Digital Electronics
	  a. Verification and interpretation of truth table for AND, OR, NOT gates.
	  b. Verification and interpretation of truth table for NAND, NOR gates.
	  c. Verification and interpretation of truth table for Ex-OR, Ex-NOR gates.
	  d. Study of half adder using XOR and NAND gates and
		30 Hrs.

| | | verification of its operation.
e. Study of full adder using XOR and NAND gates and verification of its operation.
f. Study of half subtractor and verification of its operation.
g. Study of fullsubtractor and verification of its operation.
h. Realization of logic functions with the help of NAND-Universal gates.
i. Realization of logic functions with the help of NOR-Universal gates.
j. Verify the truth table of RS flip-flops using NAND and NOR gates.
k. Verify the truth table of JK flip-flops using NAND and NOR gates.
l. Verify the truth table of T and D flip-flops using NAND and NOR gates.
m. Implementation of 4xl multiplexer using logic gates.
n. Implementation of 1x4 demultiplexer using logic gates.
o. Verify Gray to Binary conversion using NAND gates only.
p. Verify Gray to Binary conversion using NAND gates only. | |

Part C- Learning Resources
Text Books, Reference Books, Other resources

Text Books:
- M. Morris Mano, "Computer System Architecture", PHI.
- Heuring Jordan, "Computer system Design & Architecture" (A.W.L.)
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:
- William Stalling, "Computer Organization & Architecture", Pearson Education Asia.
- V. Carl Hamacher, "Computer Organization", TMH
- Tannenbaum, "Structured Computer Organization", PHI.

Suggested digital platform web links:
https://de-iitr.vlabs.ac.in/
Suggested equivalent online courses:
https://nptel.ac.in/courses/106/105/106105163

Part D- Assessment and Evaluation			
Internal Assessment: **Continuous Comprehensive** **Evaluation (CCE) :** 25 Shall be based on allotted assignments and class tests. The marks shall be as follows:		**External assessment: University exam (UE):** **75 marks** **Time: 02.00 Hours**	
Hand-on Lab practice	**5 Marks**	**Practical record file**	10 Marks
Viva	**5 Marks**	**Viva Voce Practical**	15 Marks
Lab Test from Practical	**7 Marks**	**Table works/Exercise assigned (02) in**	40 Marks

		practical exam	
Assignments (Chats / model) / Technology Dissemination / Excursion / lab visit / industrial training	**8 Marks**	**Reports of excursion / lab visits / Industrial training / survey / collection / models**	10 Marks
Total Excursion / lab visit / Industrial Training is compulsory	**25 Marks**	**Total**	75 Marks

Program : Certificate	Class : BCA I Year	Year : 2021	Session : 2021-2022

1	**Course Code**	S1-BCAA2T	
2	**Course Title**	Programming Methodology & Data Structures	
3	**Course Type (Core Course/Elective/Generic Elective/Vocational)**	Major – Paper 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: • Develop simple algorithms and flow charts to solve a problem with programming using top down design principles. • Writing efficient and well-structured computer algorithms/ programs. • Learn to formulate iterative solutions and array processing algorithms for problems. • Use recursive techniques, pointers and searching methods in programming. • Will be familiar with fundamental data structures, their implementation: become accustomed to the description of algorithms in both functional and procedural styles. • Have knowledge of complexity of basic operations like insert, delete, and search on these data structures. • Possess ability to choose a data structure to suitably model any data used in computer applications. • Assess efficiency tradeoffs among different data structure implementations. • Implement and know the applications of algorithms for searching and sorting. • Know the contributions of Indians in the field of programming and data structures.	
6	**Credit Value**	**Theory – 4 Credits Practical – 2 Credits**	
7	**Total Marks**	Max. Marks : 25+75	Min. Marks : 33
Part B – Content of the Course			

No. of Lectures (in hours per week) : 2 Hours per week		
Total no. of Lectures: 60 Hrs.		
Unit	Topics	No. of Lectures
1	**Introduction to programming:**Program concept, characteristics of programming, stages in program development, algorithms, notations, design, flowcharts, types of programming methodologies. **Basic of C++ :** A brief history of C++ , application of C++, compiling & linking, tokens, keywords, identifiers & constants, Basic data types, user-define data types, symbolic constant, types compatibility, reference variables, operator in C++, scope resolution operator, member dereferencing operator, memory management operators, manipulators, types cast operator. **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.	8
2	**Classes & Objects:** A simple C++ program with class, defining member functions, making and outside function inline nesting of member functions, private member functions, arrays within a class, memory allocation for objects, object as function arguments, friend functions, virtual functions, returning objects, constant member functions, pointer to members, local classes. **Constructor & Destructor:** Constructor, Parameterized constructor, multiple constructor in a class, constructor with default arguments, dynamic initialization of objects, copy constructor, dynamic constructor and destructor.	10
3	**Inheritance:**Defining Derived classes, single inheritance, making a private member inheritable, multilevel inheritance, hierarchical inheritance, multiple inheritance, hybrid inheritance, 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.	8
4	**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-arrays and linked representations. **Stacks:** Operations, array and Linked implementations, application-infix to postfix conversion, infix to prefix conversion, postfix expression evaluation, recursion implementation. **Queues:** Definition, operation, array and linked implementations, circular Queue-insertion and deletion operations, dequeue (Double ended Queue). Priority Queue-implementation.	12
	Linked Lists: Singly linked lists, operations, concatenating, circularly	10

5	linked lists-operations for circularly linked lists, Doubly linked lists – operations, doubly circular linked list, header linked list. **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.	
6	**Graphs:** Graph ADT, graph representations, graph traversals, searching. **Hashing:** Introduction, hash tables, hash functions, overflow handling. **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.	10
7	**Indian contribution to the field:** Innovations in India, origin of Julia programming language, Indian engineers who designed new programming language, open source languages, Dr. Sartajsahni – Computer scientist – pioneer of data structures, other relevant contributors and contributions.	2

Part C- Learning Resources
Text Books, Reference Books, Other resources

Text Books:
- J.R. Hanly and E. B. Koffman, "Problem solving and program design in C". Pearson, 2015
- E. Balguruswamy, "C++", TMH Publication ISBN O-07-462038-X.
- HeabertShildt, "C++ the complete reference "TMH Publication ISBN 0-07-463880-7
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:
- R. Lafore, Object Oriented programming C++"
- N. Dale and C. Weems, "Programming and problem solving with C++: Brief edition", Jones & Bartlett learning.
- Adam Drozdek, "Data structures and algorithm in C++", Third edition Cengage Learning.
- SartajSahani, 'Data structures, algorithm and Application with C++", McGraw Hill.
- Robert L. Kruse, "Data structures and Program Design in C++", Pearson.
- D.S. Malik, "Data structures using in C++", Second edition, Cengage Leaning.
- M.A. Weiss, Data structures and algorithm analysis in C++", 2nd edition, Pearson.
- Lipschutz, " Schaum's Outline series Data Structures", Tata McGraw-Hill.

Suggested digital platform web links:
https://www.youtube.com/watch?v+=BCIS40yzssA
https://www.youtube.com/watch?v=vLnPwxZdW4Y&vi=en
https://www.youtube.com/watch?v=Umm1ZQ5ltZw

Suggested equivalent online courses:		
S.No.	Online Course	Duration	Platform
1	Programming in C++ https://nptel.ac.in/courses/106/105/106105151/	8 Weeks	**NPTEL**
2	Beginning C++ Programming–From Beginner to Beyond https://www.udemy.com/course/beginning-c-plus-programming/	Self paced	**Udemy**

Part D- Assessment and Evaluation			
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25 Shall be based on allotted assignments and class tests. The marks shall be as follows:		**External assessment: University exam (UE): 75 marks Time: 02.00 Hours**	
Assessment and presentation of assignment	**08 Marks**	**Section (A):** Three Very Short Questions (50 Words Each) Nine MCQ Questions	03 x 03 = 09
Class Test I **(Objective Questions)**	**4 Marks**		
Class Test II **(Descriptive Questions)**	**5 Marks**	**Section (B):** Four Short Questions (200 Words Each)	04 x 09 = 36
Class Test III **(Based on solving programming problems)**	**8 Marks**	**Section (C):** Two Long Questions (500 Words Each)	02 x 15 = 30
Total	**25 Marks**	**Total**	75 Marks
Any remarks / suggestions: Focus of the course/teaching should be on developing ability of the student in analyzing a problem, building the logic and efficient code for the problem.			

	Part A Introduction			
	Program : Certificate	**Class : BCA I Year**	**Year : 2021**	**Session : 2021-2022**
1	**Course Code**	S1-BCAA2P		
2	**Course Title**	Programming Methodology & Data Structure Lab		
3	**Course Type (Core Course/Elective/Generic Elective/Vocational)**	Major – Paper II		
4	**Pre-Requisite (if any)**	The 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: • Develop simple algorithms and flow charts to solve a problem with programming using top down design principles. • Writing efficient and well-structured computer algorithms/programs. • Learn to formulate iterative solutions and array processing algorithms for problems. • Use recursive techniques, pointers and searching methods in programming. • Process ability to choose a data structure to suitably model any data used in computer applications. • Implement and know the applications of algorithms for searching and sorting etc.		
6	**Credit Value**	**Practical – 2 Credits**		
7	**Total Marks**	Max. Marks : 25+75		Min. Marks : 33
	Part B – Content of the Course			
	No. of Lectures (in hours per week) : 1 Hours per week			
	Total no. of Lectures: 30 Hrs.			
Unit	**Suggestive list of Practical**			**No. of Lectures**
	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.			**30 Hrs.**

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.
21. Write a program to find largest element from an array.
22. Write a program to implement push and pop operations on a stack using array.
23. Write a program to perform insert and delete operations on a queue using array.
24. Write a program to linear search.
25. Write a program for Binary search.
26. Write a program for Bubble sort.
27. Write a program for Selection sort.
28. Write a program for quick sort.
29. Write a program for insertion sort.
30. Write a program for implement linked list.

Part C- Learning Resources
Text Books, Reference Books, Other resources

Text Books:
- J.R. Hanly and E. B. Koffman, "Problem solving and program design in C". Pearson, 2015
- E. Balguruswamy, "C++", TMH Publication ISBN O-07-462038-X.
- HeabertShildt, "C++ the complete reference "TMH Publication ISBN 0-07-463880-7
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:
- R. Lafore, Object Oriented programming C++"

- N. Dale and C. Weems, "Programming and problem solving with C++: Brief edition", Jones & Bartlett learning.
- Adam Drozdek, "Data structures and algorithm in C++", Third edition Cengage Learning.
- SartajSahani, 'Data structures, algorithm and Application with C++", McGraw Hill.
- Robert L. Kruse, "Data structures and Program Design in C++", Pearson.
- D.S. Malik, "Data structures using in C++", Second edition, Cengage Leaning.
- M.A. Weiss, Data structures and algorithm analysis in C++", 2nd edition, Pearson.
- Lipschutz, " Schaum's Outline series Data Structures", Tata McGraw-Hill.

Suggested digital platform web links:
https://www.youtube.com/watch?v+=BCIS40yzssA
https://www.youtube.com/watch?v=vLnPwxZdW4Y&vi=en
https://www.youtube.com/watch?v=Umm1ZQ5ltZw

Suggested equivalent online courses:

S. No.	Online Course	Duration	Platform
1	Programming in C++ https://nptel.ac.in/courses/106/105/106105151/	8 Weeks	**NPTEL**
2	Beginning C++ Programming–From Beginner to Beyond https://www.udemy.com/course/beginning-c-plus-programming/	Self-paced	**Udemy**

<div align="center">

Part D- Assessment and Evaluation

</div>

Internal Assessment: **Continuous Comprehensive Evaluation (CCE) :** 25 Shall be based on allotted assignments and class tests. The marks shall be as follows:		**External assessment: University exam (UE): 75 marks** **Time: 02.00 Hours**	
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Hand-on Lab practice	**5 Marks**	**Practical record file**	10 Marks
Viva	**5 Marks**	**Viva Voce Practical**	15 Marks
Viva	**5 Marks**	**Viva Voce Practical**	15 Marks
Lab Test from Practical	**7 Marks**	**Table works/Exercise assigned (02) in practical exam**	40 Marks
Assignments (Chats / model) / Technology Dissemination / Excursion / lab visit / industrial training	**8 Marks**	**Reports of excursion / lab visits / Industrial training / survey / collection / models**	10 Marks
Total **Excursion / lab visit / Industrial Training is compulsory**	**25 Marks**	**Total**	75 Marks