SYLLABUS
BACHELOR OF COMPUTER APPLICATIONS (Honours)

Four Year (3+1 Scheme) Undergraduate Programme

Programme Code: BCASSD

For

SESSION 2025-26

FIRST YEAR – FIRST SEMESTER

Code		Title of Paper	L	T	P	Credit	External Examination	Internal Assessment	Max. Marks
BCA101	CC	Mathematical Foundation to Computer Science - I	3	1	-	4	70	30	100
BCA102	CC	Digital Electronics	3	1	-	4	70	30	100
BCA103	SEC	Programming with C	3			3	70	30	100
BCA103P	SEC	Programming with C Lab	-	-	4	2	70	30	100
BCA104	MDE	Indian Knowledge System	3	-	-	3	70	30	100
BCA105	AEC	General English - I	2	-	-	2	35	15	50
BVAC1	VAC	Environment and Road Safety	2	-	-	2	35	15	50
BCA106 BCA106A	PBI	Punjabi (Compulsory)-I / Mudla Gyan-I	4	-	-	4	70	30	100
		Total				24	490	210	700

Break up of marks for the continuous assessment for Theory/Practical:

i	One Mid Semester Test	12 Marks
ii	Assignments/ Project/ Seminar	12 Marks
Iii	Attendance	6 Marks

FIRST YEAR – SECOND SEMESTER

Code		Title of Paper	L	T	P	Credit	External Examination	Internal Assessment	Max. Marks
BCA201	CC	Mathematical Foundation to Computer Science - II	3	1	-	4	70	30	100
BCA202	CC	Computer Architecture	3	1	-	4	70	30	100
BCA203	CC	Data Structures	3	1		4	70	30	100
BCA204	SEC	Object Oriented Programming with C++	3	-	-	3	70	30	100
BCA204P	SEC	Object Oriented Programming with C++ Lab	-	-	4	2	70	30	100
BCA205	AEC	General English - II	2	-	-	2	35	15	50
BVAC2	VAC	Drug Abuse	2	-	-	2	35	15	50
BCA206 BCA206A	PBI	Punjabi (Compulsory)-II / Mudla Gyan-II	4	-	-	4	70	30	100
		Total				25	490	210	700

Break up of marks for the continuous assessment for Theory/Practical:

I	One Mid Semester Test	12 Marks
Ii	Assignments/ Project/ Seminar	12 Marks
Iii	Attendance	6 Marks

BCA102: DIGITAL ELECTRONICS

Internal Assessment: 30*
University Examination: 70
Min Pass Marks: 35%

Maximum Marks: 100
Maximum Time: 3 Hrs
Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Performance in Mid-Semester Test	12
Assignment/Project/Seminar	12
Attendance	6

(A) INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three section A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer type questions of 2 marks each which will cover the entire syllabus and will carry 22 marks in all.

(B) INSTRUCTON FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A & B of the question paper and the entire section C.

Section A

Fundamental Concepts: Introduction to Analog and Digital Systems, Digital Signals, Basic Digital Circuits: AND, OR, NOT, NAND, NOR, XOR and NOR gates. Boolean algebra theorems, Characteristics of Digital IC.

Number Systems: Positional and Non-Positional number systems, Binary, Decimal, Octal and Hexadecimal, Base conversions, Binary arithmetic: Addition and Subtraction, 1's complement, 2's complement, subtraction using 1's complement and 2's complement.

Combinational Logic Design: SOP and POS Representation of Logic functions, K-Map representation and simplification up to 4 variable expressions, Don't care condition.

Section B

Multiplexers: 4X1, 8X1 and 16X1. De-multiplexers: 1 to 4, 1 to 8 and 1 to 16. BCD to Decimal decoder, Decimal to BCD encoder. Parity generator and Parity checker. Design of Half adder and Full adder

Flip-Flops: Introduction, Latch, Clocked S-R Flip Flop, Preset and Clear signals, D-Flip Flop, J-K Flip Flop, The race-around condition, Master Slave J-K Flip Flop, D-Flip-Flop, Excitation Tables of Flip Flops. Edge-Triggered Flip Flops.

A/D and D/A Converters: Introduction, Digital to Analog Converters: Weighted-Register D/A converter, R-2R Ladder D/A converter. Analog to Digital Converters: Quantization and encoding, Parallel-comparator A/D converter, Counting A/D converter.

Text/Reference Books:

1. Modern Digital Electronics by R. P. Jain, Fourth Edition, TMH
2. Digital Principles and Applications by Albert Paul Malvino and Donald P. Leach, Fourth Edition, TMH
3. Digital Electronics: An Introduction to Theory and Practice by William H Gothmann, 2nd Edition, PHI

BCA103: PROGRAMMING WITH C

Internal Assessment: 30* Maximum Marks: 100

University Examination: 70 Maximum Time: 3 Hrs

Min Pass Marks: 35% Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Performance in Mid-Semester Test	12
Assignment/Project/Seminar	12
Attendance	6

(A) INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three section A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer type questions of 2 marks each which will cover the entire syllabus and will carry 22 marks in all.

(B) INSTRUCTON FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A & B of the question paper and the entire section C.

Section A

Programming Process: Problem definition, Algorithm development, Flowchart, Coding, Compilation and debugging.

Basic structure of C program: History of C, Structure of a C program, Character set, Identifiers and keywords, constants, variables, data types.

Operators and expressions: Arithmetic, Unary, Logical, Relational operators, assignment operators, Conditional operators, Hierarchy of operations type conversion.

Control statements: branching statements (if, if else, switch), loop statements (for, while and do-while), jump statements (break, continue, goto), nested control structures.

Functions: Library functions and user defined functions, prototype, definition and call, formal and actual arguments, local and global variables, methods of parameter passing to functions, recursion.

I/O functions: formatted & unformatted console I/O functions.

Section B

Storage Classes: automatic, external, static and register variables.

Arrays: One dimensional and two dimensional arrays, Declaration, initialization, reading values into an array, displaying array contents

Strings: input/output of strings, string handling functions (strlen, strpy, strcmp, strcat & strrev), table of strings.

Structures and unions: using structures and unions, comparison of structure with arrays and union.

Pointers: pointer data type, pointer declaration, initialization, accessing values using pointers, pointers and arrays.

Introduction to Files in C: opening and closing files. Basic 1/0 operation on files.

Reference Books:

1. ਸੀ ਭਾਸ਼ਾ ਨਾਲ ਪ੍ਰੋਗਰਾਮਿੰਗ (Programming with C language) ਅਰਵਿੰਦਰ ਸਿੰਘ, ਜਗਰੂਪ ਕੌਰ Kalyani Publisher
2. E. Balagurusamy, Programming in C, Tata McGraw-Hill.
3. Kernighan and Ritchie, The C Programming Language, PHI.
4. Byron Gotfried, Programming in C.
5. Kamathane, Programming in C, Oxford University Press.

BCA103P: PROGRAMMING WITH C LAB

Internal Assessment: 30* Maximum Marks: 100

University Examination: 70 Maximum Time: 3 Hrs

Min Pass Marks: 35% Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Practical Work	25
Attendance	5

Division of marks for University Examination is as follows:

Lab Record	10
Viva-voce	20
Practical Work	40

The practical lab course will comprise of exercise to supplement what is learnt under Paper **BCA103: PROGRAMMING WITH C**. Students are required to develop the following programs with internal documentation:

1. Write a program to print the size of all the data types supported by C and its range.
2. Write a program to convert temperature from Fahrenheit to Celsius.
3. Write a program to find simple interest and compound interest.
4. Write a program to check whether the given number is an even number or not.
5. Write a program to accept three numbers and find the largest among them.
6. Write a program to count the different vowels in a line of text using switch.
7. Write a program to accept two numbers and perform various arithmetic operations (+, -, *, /) based on the symbol entered.
8. Write a program to find factorial of a number.
9. Write a program to check whether a number is prime or not.
10. Write a program to print all prime numbers between any 2 given limits.
11. Write a program to check whether a number is palindrome or not.
12. Write a program to print all the Armstrong numbers between any 2 given limits.
13. Write a program to find largest element in an array.
14. Write a program to find sum and average of numbers stored in an array.
15. Write a program to check whether a string is a Palindrome.
16. Write a program to perform matrix addition.
17. Write a program to perform matrix multiplication.
18. Write a program to find the roots of a quadratic equation using function.
19. Write a recursive program to find the factorial of a number.
20. Write a recursive program to find the nth Fibonacci number.
21. Create an employee structure and display the same.
22. Create a student database storing the roll no, name, class etc and sort by name.
23. Write a function to swap two numbers using pointers
24. Write a program to access an array of integers using pointers
25. Create a file and store some records in it. Display the contents of the same. Count numbers of characters, words and lines in the file.

BCA104: INDIAN KNOWLEDGE SYSTEM

Internal Assessment: 30* Maximum Marks: 100

University Examination: 70 Maximum Time: 3 Hrs

Min Pass Marks: 35% Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Performance in Mid-Semester Test	12
Assignment/Project/Seminar	12
Attendance	6

(A) INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three section A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer type questions of 2 marks each which will cover the entire syllabus and will carry 22 marks in all.

(B) INSTRUCTON FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A & B of the question paper and the entire section C.

Section A

Indian Knowledge System - An Introduction: Why do we need IKS? Organization of IKS, Historicity of IKS, Some salient aspects of IKS.

The Vedic Corpus: Introduction to Vedas A synopsis of the four Vedas, Sub-classification of Vedas, Messages in Vedas, Introduction to Vedangas,Prologue on Siksa and Vyakarana, Basics of Nirukta and Chandas, Introduction to Kalpa and

Jyotisa, Vedic Life: A Distinctive Features

Number Systems and Units of Measurement: Number systems in India - Historical evidence, Salient aspects of Indian Mathematics, Bhüta-Samkhy system, Katapayadi system, Measurements for time, distance, and weight, Pingala and the binary system

Mathematics: Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions, Algebra, Geometry, Trigonometry, Binary mathematics and combinatorial problems in Chandah

Sastra, Magic squares in India

Astronomy: Introduction to Indian astronomy, Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months, Pañcanga - The Indian calendar system, Astronomical Instruments (Yantras), Jantar Mantar of Raja Jai Singh Sawai.

Section B

Engineering and Technology: Metals and Metalworking: The rise and fall of a great Indian technology, Mining and ore extraction, Zinc extraction, Copper and it's alloys, Iron and steel in ancient India, Lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components, Other applications: Science and technology heritage of India,

Science and technology heritage: Literary Sources, Science and technology heritage: Physical structures, Science and technology heritage: Temples, Science and technology heritage: Watershed management, Dyes, arts and perfume production. Surgical-techniques, Shipbuilding, Status of Indigenous S & T

Town Planning and Architecture: Perspective of Arthasästra on town planning, Västu-sastra - The science of architecture, Eight limbs of Västu, Town planning, Temples in India: Marvellous stone architecture for eternity, Temple architecture in India, Iconography

Knowledge Framework and classifications: Indian scheme of knowledge, The knowledge triangle, Prameya – A vaisesikan approach to physical reality, Dravyas - the constituents of the physical reality, Attributes - the properties of substances and Action - the driver of conjunction and disjunction, Samanya, visesa, samavaya, Pramãna - the means of valid knowledge, Samsaya - ambiguities in existing knowledge, Framework for establishing valid knowledge, Deductive or inductive logic framework, Potential fallacies in the reasoning process, Siddhänta: established tenets in a field of study

Linguistics: Introduction to Linguistics, Astädhyayi, Phonetics, Word generation, Computational aspects, Mnemonics, Recursive operations, Rule based operations, Sentence formation, Verbs and prefixes, Role of Sanskrit in natural language processing.

References:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.
2. Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
3. Sampad and Vijay (2011). "The Wonder that is Sanskrit", Sri Aurobindo Society, Puducherry.
4. Bag, A.K. (1979). Mathematics in Ancient and Medieval India, Chaukhamba Orientalia, New Delhi.
5. Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
6. Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205-221.
7. Subbarayappa, B.V. and Sarma, K.V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
8. Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
9. Acarya, P.K. (1996). Indian Architecture, Munshiram Manoharlal Publishers, New Delhi.
10. Banerjea, P. (1916). Public Administration in Ancient India, Macmillan, London.
11. Kapoor Kapil, Singh Avadhesh (2021). "Indian Knowledge Systems Vol - I & II", Indian Institute of Advanced Study, Shimla, H.P.

BCA202: COMPUTER ARCHITECTURE

Internal Assessment: 30* Maximum Marks: 100

University Examination: 70 Maximum Time: 3 Hrs

Min Pass Marks: 35% Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Performance in Mid-Semester Test	12
Assignment/Project/Seminar	12
Attendance	6

(A) INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three section A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer type questions of 2 marks each which will cover the entire syllabus and will carry 22 marks in all.

(B) INSTRUCTON FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A & B of the question paper and the entire section C.

Section A

Computer System Organisation: CPU Organisation, Instruction Execution (instruction cycle, types of instructions), RISC v/s CISC, Design Principles for Modern Computers, Instruction level parallelism. Processor level parallelism.

Primary memory: Memory addresses, Byte Ordering, Error-correcting codes, Cache memory.

Secondary memory: Memory hierarchy, SCSI disk, RAID.

Instruction Set Architecture: Instruction formats, Expanding opcodes, types of addressing modes, data transfer and manipulation instructions, Program control (status-bit conditions, conditional branch instructions, program interrupt, types of interrupt).

Section B

Register Transfer Language: Register Transfer, Bus and memory transfer, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, Arithmetic logic sift unit

Micro-programmed control, control word, control memory (concepts only)

Input-output Organisation- 1/0 interfaces (1/O bus and interface modules, 1/0 versus memory bus, isolated versus memory-mapped 1/0).

Asynchronous Data transfer (strobe control, handshaking), modes of transfer (programmed I/O, interrupt-initiated I/0, software considerations, Direct memory access.

Text/Reference Books:

1. Jyotsna Sengupta, Fundamentals of Computer Organization and Architecture, NuTech Books, Deep and Deep Publications, New Delhi.
2. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India.
3. Andrew S. Tannenbaum, "Structured Computer Organisation" 4th Edition, Prentice Hall.
4. J.P.Hayes Tata McGraw-Hill, Computer Organization and Architecture TMH
5. William Stallings, "Computer System Architecture", PHI

BCA203: DATA STRUCTURES

Internal Assessment: 30*	Maximum Marks: 100
University Examination: 70	Maximum Time: 3 Hrs
Min Pass Marks: 35%	Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Performance in Mid-Semester Test	12
Assignment/Project/Seminar	12
Attendance	6

(A) INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three section A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer type questions of 2 marks each which will cover the entire syllabus and will carry 22 marks in all.

(B) INSTRUCTON FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A & B of the question paper and the entire section C.

Section A

Basic concepts and notations: Types of data structures, Data structure operations, Mathematical notations and functions, Algorithmic complexity, Big 'O' notation, Time and space trade off.

Arrays: Linear array, representation of array in memory, traversing linear array, insertion and deletion in an array, Two-dimensional array, row major and column major orders, sparse matrix.

Stacks: Representation of stacks in memory (linked and sequential), operations on stacks, Applications of stacks: string reversal, parentheses matching.

Queues: Representation of queues in memory (linked and sequential), operations on queues, insertion in rear, deletion from front.

Section B

Linked list: Representation of linked list using static and dynamic data structures, insertion and deletion of a node from linked list, searching in link list, searching in sorted link list.

Trees: Definition and basic concepts, linked representation and representation in contiguous storage, binary tree, binary tree traversal, Binary search tree, searching, insertion and deletion in binary search tree.

Searching and sorting algorithms: Linear and binary search, bubble sort, insertion sort, selection sort, quick sort, merge sort.

Text/Reference Books

1. Seymour Lipschutz, Theory and Practice of Data Structures, McGraw-Hill.
2. Vishal Goyal, Lalit Goyal, Pawan Kumar, A Simplified Approach to Data Structures, Shroff Publications.
3. Y. L. Tenenbaum, and A. J. Augenstein, Data Structures using C and C++, PHI.
4. Robert Sedgewick, Algorithms in C, Pearson Education.

BCA204: OBJECT ORIENTED PROGRAMMING WITH C++

Internal Assessment: 30*	Maximum Marks: 100
University Examination: 70	Maximum Time: 3 Hrs
Min Pass Marks: 35%	Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Performance in Mid-Semester Test	12
Assignment/Project/Seminar	12
Attendance	6

(A) INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three section A, B & C. Section A & B will have four questions from the respective section of the syllabus and will carry 12 marks each. Section C will have 11 short answer type questions of 2 marks each which will cover the entire syllabus and will carry 22 marks in all.

(B) INSTRUCTON FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A & B of the question paper and the entire section C.

Section A

Principles of Object Oriented Programming (OOP): Introduction to OOP, Difference between OOP and Procedure Oriented Programming;

Concepts: Object, Class, Encapsulation, Abstraction, Polymorphism and Inheritance, Applications of OOP.

Special operators: scope resolution operator, Member Dereferencing operators, Memory management operators, Manipulators and Type cast operator

Structure of a C++ Program and Classes and Objects: Class Declaration: Data Members, Member Functions, Private and Public members, Creating Objects, Accessing class data members, Accessing member functions;

Class Function Definition: Member Function definition inside the class declaration and outside the class declaration.

Friend function, inline function, Static members, Function Overloading, Arrays within a class. Arrays of Objects;

Objects as function arguments: Pass by value, Pass by reference, Pointers to Objects.

Constructors: Declaration and Definition, Types of Constructors (Default, Parameterized, Copy Constructors).

Destructors: Definition and use.

Operator Overloading & Type Conversion: Conversion from basic type to user-defined type, User-defined to basic type and one user-defined conversion to another user-defined type.

Section B

Inheritance: Extending Classes Concept of inheritance, Base class, Defining derived classes, Visibility modes: Public, Private, Protected; Types of Inheritance: Single inheritance: Privately derived, publicly derived; Making a protected member inheritable, multilevel inheritance, multiple Inheritance and ambiguity of multiple inheritance, Hierarchal Inheritance, Hybrid, Nesting of classes.

Polymorphism: Definition, Application and demonstration of Data Abstraction, Encapsulation and Polymorphism. Early Binding, Polymorphism with pointers, Virtual Functions, Late binding, pure virtual functions.

Exception Handling: Definition, Exception Handling Mechanism: Throwing mechanism and Catching Mechanism, Rethrowing an Exception.

File Processing: Opening and closing of file, Binary file operations.

References Books :

1. E. Balaguruswamy, 2008: Object Oriented Programming with C++
2. Robert Lafore,2003: Object Oriented Programming in Turbo C++, Galgotia Pubications
3. Salaria, R.S.: Object Oriented Programming Using C++, Khanna Book Publishing Co.(P.) Ltd., New Delhi

BCA204P: OBJECT ORIENTED PROGRAMMING WITH C++ LAB

Internal Assessment: 30* Maximum Marks: 100

University Examination: 70 Maximum Time: 3 Hrs

Min Pass Marks: 35% Lectures to be delivered: 45-55 Hrs

* Division of marks for Internal Assessment is as follows:

Practical Work	25
Attendance	5

Division of marks for University Examination is as follows:

Lab Record	10
Viva-voce	20
Practical Work	40

The practical lab course will comprise of exercise to supplement what is learnt under Paper **BCA204: OBJECT ORIENTED PROGRAMMING WITH C++**. Students are required to develop the following programs with internal documentation:

1. Create a class to store student information with data members as roll no, name, marks in 3 subjects total and average using constructor where ever required.
2. Write a program to implement various operators.
3. Write a program to implements 2-D Array.
4. Write a program to implement array of objects.
5. Write a program to implement const members and member functions.
6. Write a program to implement static data members and static member functions.
7. Write a program to implement Friend functions and Friend classes.
8. Write a program to implement function overloading.
9. Write a program to implement various types of constructors.
10. Write a program to implement Virtual destructors.
11. Write a program to implement dynamic memory allocation using new and delete operators
12. Write a program to implement various types of inheritance.
13. Write a program to implement role of constructor and destructor in inheritance.
14. Write a program to implement operator overloading.
15. Write a program to implement nesting classes.
16. Write a program to implement virtual function and abstract class concept.
17. Write a program to implement exception handling.
18. Write a program to read and write data from/in a file.
19. Develop an Object Oriented program in C++ to read emp name, emp code, designation, experience and age. Construct the database with suitable member functions for initializing and destroying the data using constructor and destructor.
20. Write a program in C++ to prepare mark sheet of an University exam by reading stuname, rollno, subname, subcode, internal marks, external marks. Design a base class consisting data members such as student name, roll no, sub name. Derived class consists data members such as sub code, internal marks, external marks, construct oops data to search for a record i.e. be printed.