

**SYLLABUS  
BACHELOR OF COMPUTER APPLICATIONS**

**Programme Code: BCASSD**

**For**

**SESSION 2025-26**

**SECOND YEAR – THIRD SEMESTER**

Code	Title of Paper	Credit	Hours per Week	External Examination	Internal Assessment	Max. Marks
BCA211	Punjabi (Compulsory)-III or	4	4	70	30	100
BMG211	Punjabi (Compulsory)-III (Mudla Gyan)*					
BCA212	English Communication Skills - I	4	4	70	30	100
BCA213T	Management Information System	4	4	70	30	100
BCA214T	Discrete Mathematics	4	4	70	30	100
BCA215T	Computer System Organization and Architecture	4	4	70	30	100
BCA216T	Object Oriented Programming using C++	4	4	70	30	100
BCA216P	Software Lab - IV (Object Oriented Programming using C++ Lab)	2	4	70	30	100
	Total	26	Total	490	210	700

*Note:*

- The break-up of marks for the internal assessment for theory/Practical except BCA212 will be as under:
  - One or two tests out of which minimum one best will be considered for assessment 20 Marks
  - Attendance 5 Marks
  - Class participation and behaviour 5 Marks
- The break-up of marks for the internal assessment for BCA212: English Communication Skills - I will be as under:
  - Formal assessment through Interview/Self Introduction Recitation etc. 15 Marks
  - Conversation Skills (particularly listening and speaking to be evaluated through oral examination) 5 Marks
  - Attendance 5 Marks
  - Class participation and behaviour 5 marks

*\*\*Only those students who have not studied Punjabi up to matriculation can opt for Punjabi Compulsory (Mudla Gyan). The code for the paper is same.*

## SECOND YEAR – FORTH SEMESTER

Code	Title of Paper	Credit	Hours per Week	External Examination	Internal Assessment	Max. Marks
BCA221 BMG221	Punjabi (Compulsory)-IV or Punjabi (Compulsory)-IV (Mudla Gyan) **	4	4	70	30	100
BCA222	English Communication Skills - II	4	4	70	30	100
BCA223T	Computer Networks	4	4	70	30	100
BCA224T	Computer Oriented Numerical and Statistical Methods	4	4	70	30	100
BCA225T	Relational Database Management Systems	4	4	70	30	100
BCA224P	Software Lab - V (Computer Oriented Numerical and Statistical Methods Lab)	2	4	70	30	100
BCA225P	Software Lab - VI (Relational Database Management Systems Lab)	2	4	70	30	100
	Total	24	Total	490	210	700

*Note:*

1. The break-up of marks for the internal assessment for theory/Practical except BCA222 will be as under:
  - i One or two tests out of which minimum one best will be considered for assessment 20 Marks
  - ii Attendance 5 Marks
  - iii Class participation and behaviour 5 Marks
2. The break-up of marks for the internal assessment for BCA222: English Communication Skills - II will be as under:
  - i Formal assessment through Interview/Self Introduction Recitation etc. 15 Marks
  - ii Conversation Skills (particularly listening and speaking to be evaluated through oral examination) 5 Marks
  - iii Attendance 5 Marks
  - iv Class participation and behaviour 5 marks

*\*\*Only those students who have not studied Punjabi up to matriculation can opt for Punjabi Compulsory (Mudla Gyan). The code for the paper is same.*

## BCA213T: Management Information Systems

Total Marks: 100  
Internal Assessment: 30  
Minimum Pass Marks: 35%

University Examination: 70  
Maximum Time: 3 Hrs.  
Lectures to be delivered: 45-55 Hrs.

### A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

### B) Instructions for candidates

1. Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.
2. Use of non-programmable scientific calculator is allowed.

**Course Objectives:** The aim of this course is:

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
- To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.
- To provide the theoretical models used in database management systems to answer business questions.

**Learning Outcomes:** Upon completion of this course, students will be able to:

- Relate the basic concepts and technologies used in the field of management information systems;
- Compare the processes of developing and implementing information systems.
- Outline the role of the ethical, social, and security issues of information systems.
- Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
- Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.

### SECTION-A

**Management Information system:** Meaning and definition, Role of information system, Nature and scope of MIS.

**Information and system concepts:** Definition and types of information, Information quality, dimensions of information, value of information, general model of human as an information processor. System related concepts, elements of a system, and types of system.

**Role and importance of Management:** Introduction, levels and functions of management.

Structure and classification of MIS, Components of MIS, Framework for understanding MIS: Robert Anthony's hierarchy of management activity, Information requirements and levels of management.

### SECTION-B

Decision making concept, types of decisions, methods of choosing among alternatives, Role of MIS in decision making. Simon's model of decision making, Structured and unstructured decisions.

**Development of MIS:** Stages in the development of MIS, System development approaches: Waterfall model, Prototyping, Iterative enhancement model, Spiral model.

**Applications of information systems in Functional areas:** Marketing MIS, Financial MIS, Production MIS, Personnel MIS.

**Decision Support Systems:** Definition and characteristics, MIS versus DSS, Tools and Models for decision support.

### Text/ Reference Books:

1. D.P. Goyal, Management Information Systems: Managerial Perspectives, Macmillan India Ltd.
2. Robert G. Murdick, Joel E. Ross, James R. Claggett, Information Systems for Modern Management, Prentice Hall of India Pvt. Ltd.
3. Gordon B. Davis, M.H. Olson, Management Information Systems: Conceptual Foundations, Structure & Development, McGraw-Hill Book Co.
4. W.S. Jawadekar, Management Information Systems, Tata McGraw-Hill Publishing Co.

## BCA215T: Computer System Organization and Architecture

Total Marks: 100  
Internal Assessment: 30  
Minimum Pass Marks: 35%

University Examination: 70  
Maximum Time: 3 Hrs.  
Lectures to be delivered: 45-55 Hrs.

### A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

### B) Instructions for candidates

1. Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C .
2. Use of non-programmable scientific calculator is allowed.

### Course Objective:

- To enable the students to learn the basic functions, principles and concepts of Computer Architecture.
- To learn the fundamental aspects of Computer Architecture and design.
- To focus on processor design, control unit design techniques.
- To study on I/O interfacing.

**Learning outcome:** On successful completion of the course the students should have

- Understood Computer Architecture.
- Understood I/O, Registers and memory.
- Understood processor design, control unit design.
- Understood I/O interfacing

## 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 shift unit

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

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

**Asynchronous Data transfer** (strobe control, handshaking), modes of transfer (programmed I/O, interrupt-initiated I/O, 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

## BCA216T :Object Oriented Programming using C++

Total Marks: 100  
Internal Assessment: 30  
Minimum Pass Marks: 35%

University Examination: 70  
Maximum Time: 3 Hrs.  
Lectures to be delivered: 45-55 Hrs.

### A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

### B) Instructions for candidates

1. Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C.
2. Use of non-programmable scientific calculator is allowed.

### Course Objective

- To familiarize with Object Oriented concepts
- To develop the skills of programming in C++
- To understand the difference between object oriented and procedure oriented programming.

### Learning Outcome

- An understanding of the principles behind the object oriented development process.
- Competence in the use of object oriented programming language in the development of small to medium sized application programs

### SECTION-A

**Evolution of OOP:** Procedure Oriented Programming, OOP Paradigm, Advantages and disadvantages of OOP over its predecessor paradigms.

**Characteristics of Object Oriented Programming:** Abstraction, Encapsulation, Data hiding, Inheritance, Polymorphism, code Extensibility and Reusability, User defined Data Types.

**Introduction to C++:** Identifier and keywords, Constants, Operators

**Pointers:** Pointer Operations, Pointer Arithmetic, Pointers and Arrays, Multiple indirections, Pointer to functions.

**Function:** Prototyping, Definition and Call, Scope Rules, Parameter Passing Value, by address and by reference, Functions returning references, Const Functions, recursion, function overloading, Default Arguments, Const Arguments.

**Classes, Objects and Members:** Class Declaration and Class Definition, Defining member functions, Defining Object, making functions inline, Members access control, Nested Classes, This Pointer.

### SECTION-B

Object as function arguments, array of objects, functions returning objects, const members and member functions. Static data members and static member functions, Friend functions and Friend classes.

**Constructors:** Properties, types of constructors (Default, parameterized and copy), Dynamic constructors, Multiple constructors in classes.

**Destructors:** Properties, Virtual destructors, Destroying objects, Rules for constructors and destructors, Array of objects.

Dynamic memory allocation using new and delete operators.

**Inheritance:** Defining derived classes, inheriting private members, single inheritance, types of derivation, function, function redefining, constructors in derived class.

**Types of inheritance:** Single, Multiple, Multi-level and Hybrid,

**Types of base classes:** Direct, Indirect, Virtual, Abstract, Code Reusability.

**Polymorphism:** Methods of achieving polymorphic behavior. Polymorphism with pointers, virtual functions, late binding, pure virtual functions and abstract base class. Difference between function overloading, redefining and overriding.

**Operator overloading:** Overloading binary operator, overloading unary operators, rules for operator overloading, operator overloading using friend function. Function overloading, early binding.

**Open/ Close Files commands. Read/write operations on files.**

### Text/ Reference Books:

1. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw-Hill.
2. Deitel and Deitel, "C++ How to Program", Pearson Education.
3. Herbert Schildt, The Complete Reference C++, Tata McGraw-Hill.
4. Deitel and Deitel, C++ How to program, Pearson Education.
5. Robert Lafore, Object Oriented Programming in Turbo C++, Galgotia Publications.

6. Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley Publication Co.
7. Stanley B. Lippman, Josée Lajoie, C++. Primer; Pearson Education.
8. E. Balagurusamy, Object-Oriented Programming with C++ , Tata McGraw-Hill.
9. D. Ravichandran, Programming with C++, Tata McGraw-Hill Publishing Company Ltd.

**BCA216P : Software Lab - IV (Object Oriented Programming using C++ Lab) (Based on Paper BCA216T: Object Oriented Programming using C++)**

Total Marks: 100\*

Internal Assessment: 30

Minimum Pass Marks: 35%

\*The breakup of marks for the practical will be as under:

University Examination: 70

Maximum Time: 3 Hrs.

Practical sessions: 45-55 Hrs.

i.	Internal Assessment	30 marks
ii.	Viva-voce (External Evaluation)	30 marks
iii.	Lab Record, Program Development and Execution (External Evaluation)	40 marks

This laboratory course will comprise of exercises to supplement what is learnt under paper **BCA216T: Object Oriented Programming using C++**.

Students are required to develop the following programs in C++ language 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 various types of constructors.
9. Write a program to implement Virtual destructors.
10. Write a program to implement Dynamic memory allocation using new and delete operators.
11. Write a program to read an array and display an array using dynamic memory allocation.
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 virtual function and abstract class concept.
15. Write a program to create memory space for a class object using new operator and to destroy it using delete
16. 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 and dynamic memory allocation operators new and delete.
17. 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.

## **BCA223T: Computer Networks**

Total Marks: 100  
Internal Assessment: 30  
Minimum Pass Marks: 35%

University Examination: 70  
Maximum Time: 3 Hrs.  
Lectures to be delivered: 45-55 Hrs.

### **A) Instructions for paper-setter**

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

### **B) Instructions for candidates**

1. Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C .
2. Use of non-programmable scientific calculator is allowed.

### **Course Objectives**

- Become familiar with the basics of computer networks
- Become familiar with network architectures
- Become familiar with fundamental protocols
- Become familiar with basic network computing techniques

### **Learning Outcomes**

Upon completion of this module, students will be able to:

- Have a good understanding of the OSI Reference Model and in particular have a good knowledge of Layers 1-
- Analyze the requirements for a given organizational structure and select the most
- Appropriate networking architecture and technologies

### **SECTION-A**

Introduction to Computer networks, Applications, Network hardware and Software (protocol hierarchies, design issues for layers, interfaces and services: connection oriented and connection less), Network structure and architecture- point to point, multicast, broadcast, Classification of networks-LAN, MAN and WAN. Reference models, the OSI reference model, TCP / IP reference model. Comparison between OSI and TCP / IP models. Data Link Layer: Design issues, Services to network layer, Framing, Error control, Flow control, Elementary data link protocols- unrestricted simplex protocol, simplex stop and wait protocol, simplex protocol for a noisy channel.

### **SECTION-B**

Network layer: Design issues, Services to the transport layer, Routing algorithms- Static/ non-adaptive and dynamic/adaptive algorithms. Congestion control algorithms - the leaky bucket algorithm, the token bucket algorithm.

Transport layer, design issues, connection management-addressing, establishing and releasing connection, transport layer protocols- TCP, UDP.

Application layer: The DNS Name Space, Electronic Mail, The World Wide Web, Network security: Introduction to cryptography, substitution ciphers, transposition ciphers, one-time pads, two fundamental cryptographic principles, public- key algorithms (RSA, other Public-key algorithms), digital signatures (symmetric-key signatures, public key-signatures, message digests).

### **Text / Reference Books:**

1. B Forouzan, Introduction to data communication and networking
2. A S Tanenbaum, Computer Networks.



## BCA225T: Relational Database Management Systems

Total Marks: 100  
Internal Assessment: 30  
Minimum Pass Marks: 35%

University Examination: 70  
Maximum Time: 3 Hrs.  
Lectures to be delivered: 45-55 Hrs.

### A) Instructions for paper-setter

The question paper will consist of three sections A, B & C. Sections A & B will have four questions from the respective sections of the syllabus and will carry 30% marks each. Section C will have 6-12 short answer type questions which will cover the entire syllabus uniformly and will carry 40% marks in all.

### B) Instructions for candidates

1. Candidates are required to attempt two questions each from sections A & B of the question paper and the entire section C .
2. Use of non-programmable scientific calculator is allowed.

### Course Objective:

- To give fundamental knowledge database and management system.
- To explain the basic concepts of architecture of database.
- To make the learners acquainted with the use of data management issues.

### Learning Outcome:

- Understanding the core terms, concepts, and tools of relational database management systems.
- Understanding database design and logic development for database programming.
- Apply SQL or Relational Algebra operations to find solutions for a given application
- Apply normalization techniques to improve database design

## SECTION-A

**Database Management Systems:** Definition, Characteristics, Advantages of Using DBMS Approach and disadvantages of traditional file environment systems, Three Schema Architecture, Data Independence - Physical and Logical data Independence, Database Administrators and its responsibilities.

**Introduction to ER Model:** Weak Entity Sets, Strong Entity Sets, mapping cardinalities, generalization, specialization, aggregation.

**Relational Database [RDBMS]:** The Relational Database Model, Concepts and Terminology, Characteristics of Relations, CODD's 12 rules for a fully RDBMS. Constraints: Integrity Constraints- Entity, Domain and Referential Integrity constraints, Business Rules, Keys - Super Keys, Candidate Keys, Primary Keys, Secondary Keys and Foreign Keys.

**Relational Algebra:** Basic Operations, Additional Operations, Example Queries.

**Normalization:** Functional Dependency, Full Functional Dependency, Partial Dependency, Transitive Dependency, Normal Forms.

## SECTION-B

**Transaction Management:** Transaction Concept, ACID Properties, Transaction States. Database Concurrency: Problems of Concurrent databases, Serializability and Recoverability, Concurrency Control Methods - Two Phase Locking,

**Timestamping. Database Recovery:** Recovery Concepts, Recovery Techniques-Deferred update, Immediate Update, Shadow Paging.

**Introduction to Oracle:** Oracle as client/server architecture, getting started, creating, modifying, and dropping databases.

**Tables** - Inserting, updating, deleting data from databases, SELECT statement, Data constraints (Null values, Default values, primary, unique and foreign key concepts), Queries for Relational Algebra.

Computing expressions, renaming columns, logical operators, range searching, pattern matching, Oracle functions, grouping data from tables in SQL, manipulating dates.

**Working with SQL:** triggers, use of data base triggers, types of triggers, how to apply database triggers, BEFORE vs. AFTER triggers, combinations, syntax for creating and dropping triggers.

### Text/ Reference Books:

1. B.P. Desai, "Database management system" BPB publications, New Delhi
2. C.J. Date, "An Introduction to Data Base Systems", Narosa Publishers
3. Jeffrey D. Ullman, "Principles of Database Systems", Galgotia Pub.
4. D. Kroenke, "Database Processing", Galgotia Publications.
5. Henry F. Korth, "Database System Concepts", McGraw Hill. Inc.
6. Naveen Prakash, "Introduction to Database Management", TMH

**BCA224P : Software Lab - V (Computer Oriented Numerical and Statistical Methods Lab)**  
**(Based on paper BCA224T: Computer Oriented Numerical and Statistical Methods)**

Total Marks: 100\*

Internal Assessment: 30

Minimum Pass Marks: 35%

\*The breakup of marks for the practical will be as under:

University Examination: 70

Maximum Time: 3 Hrs.

Practical sessions: 45-55 Hrs.

i.	Internal Assessment	30 marks
ii.	Viva-voce (External Evaluation)	30 marks
iii.	Lab Record, Program Development and Execution (External Evaluation)	40 marks

This laboratory course will comprise of exercises to supplement what is learnt under paper BCA224T: Computer Oriented Numerical and Statistical Methods.

Students are required to develop the following programs in C/C++ language with internal documentation:

1. Write a program to compute the mean and weighted mean of raw data.
2. Write a program to compute the mean and weighted mean of discrete series (x, f).
3. Write a program to compute the mean and weighted mean of continuous series.
4. Write a program to compute the mode and median of raw data.
5. Write a program to compute the median of discrete series (x, f).
6. Write a program to compute the median of continuous series.
7. Write a program to compute the mode of discrete series (x, f).
8. Write a program to compute the mode of continuous series.
9. Write a program to compute the standard deviation and variance of discrete series.
10. Write a program to compute the standard deviation and variance of continuous series.
11. Write a program to compute the correlation using Karl Pearson's Correlation
12. Write a program to compute the regression coefficients.
13. Write a program for Bisection method.
14. Write a program for Regula-falsi method.
15. Write a program for Secant method.
16. Write a program for Newton-Raphson method.
17. Write a program for Gauss-Elimination method.
18. Write a program for Lahrage's Interpolation method.
19. Write a program for Newton-Interpolation method.

**BCA225P: Software Lab – VI (Relational Database Management Systems Lab)**  
**(based on paper BCA225T: Relational Database Management Systems)**

Total Marks: 100\*

Internal Assessment: 30

Minimum Pass Marks: 35%

\*The breakup of marks for the practical will be as under:

University Examination: 70

Maximum Time: 3 Hrs.

Practical sessions: 45-55 Hrs.

i.	Internal Assessment	30 marks
ii.	Viva-voce (External Evaluation)	30 marks
iii.	Lab Record, Program Development and Execution (External Evaluation)	40 marks

This laboratory course will comprise of exercises to supplement what is learnt under paper BCA-225T: Relational Database Management System with Oracle.

Students are required to practice writing SQL statements for

1. Creating the Table
2. Querying the record using order by clause
3. Querying the record using group by clause
4. Querying the record using multiple conditions
5. Create Synonyms
6. Create Sequences
7. Create Views
8. Create Indexes
9. Create triggers
10. Create cursors for procedures