



## Syllabus of BCA Third Semester Course

The course will consist of Five Theory Papers of 80 marks each and one Practical Paper of 100 marks for which there will be University examinations. Other than the internal evaluation for each Theory Paper which will be of 20 marks and will be evaluated on the basis of classroom performance and internal examination.

The students will be required to answer Five Questions out of which one will be objective and compulsory, where the paper consists of more than one group the students, will be required to answer at least one question from each group.

### BCA – 301: OOPs with C++

**Getting Started:** Object-Oriented Programming Concept, Different Paradigm in OOP, and Program Structure in C++.

**Overloading and Information Hiding:** Function Overloading, Information Hiding, Friend More on Information Hiding.

**Memory Management in C++ :** Introduction, Constructor – Automatic Initialization of Objects, Dynamic Memory Management, Default Constructor, Overloading Constructor, Copy Constructor, Constructor and Information Hiding, Destructor – Automatic Cleanup of an Object.

**Inheritance:** Inheritance – Data and Code Sharing, Class Derivation, Ambiguity in Class Member Access, Virtual Base Class – A Remedy, Class Initialization in Inheritance, Arguments for the Base Class.

**Binding and Polymorphism:** Bindings in C++, Polymorphism.

**Generic Facility:** Concepts of Generic Facility, Generic Function, Overloading a generic Function, Generic Classes.

**Exception Handling:** Basics of Exception Handling, Exception Handling Mechanism, Throwing and Catching Exceptions, Specifying Exceptions.

**File Handling in C++:** Concept of Stream in C++, File Positioning Functions, Error Handling During File Operation.

***Bibliography and References:***

1. D. Samanta, *Object-Oriented Programming with C++ and Java*, PHI.

**BCA – 302: OOPs with Java**

**Fundamentals of Java:** Java Programming Paradigm, Advantages of Java, Tools Available for Java Programming.

**Programming in Java:** Building Java Applications, Building Java Applets, Differences between Applet and Application.

**Object-Oriented Mechanism in java:** Class Definitions in Java, Constructors, Inheritance, Polymorphism in Java, Access Specification in Java.

**Interfaces and Packages in Java:** Interfaces in Java, Packages in Java.

**Exception Handling in Java:** Built-in Classes for Exception Handling in Java, Mechanism of Exception Handling in Java, Error Handling Exception classes.

**Threads and Multithreads in Java:** Basics of a Thread, Synchronization and Inter-Thread Communication, Thread Groups and Daemon.

**Application Development in Java:** Designing GUI with Components and Layout Managers, Event Handling, Drawing Methods for Graphics Objects.

**Java I/O and Networking:** Java File I/O, Networking in Java.

**Java Multimedia:** Multimedia Basics in Java, Web Page in Java.

**The Java Applet Package:** Class Applet, Interface Applet Context, Interface Applet Stub, Interface Audio Clip.

**The Java Language (Lang) Package:** Class Boolean, Class Character, Class Class, Class Class Loader, Class Compiler, Class Double, Class Float, Class Integer, Class Long, Class Math, Class Number, Class Object, Class Process, Class Runtime, Class Security Manager, Class String, Class StringBuffer, Class System, Class Thread, Class Thread Group, Class Throwable, Interface Cloneable, Interface Runnable, Class Arithmetic Exception, Class Array Index Out Of Bounds Exception, Class Array Store Exception, Class Class Cast Exception, Class Class Not Found Exception, Class Clone Not Supported Exception, Class Exception, Class Illegal Access Exception, Class Illegal Argument Exception, Class Illegal Monitor State Exception, Class Illegal Thread state Exception, Class Index Out of Bounds Exception, Class Instantiation Exception, Class Interrupted Exception, Class Negative Array Size Exception, Class No Such Method Exception, Class Null Pointer Exception, Class Number Format Exception, Class RuntimeException, Class Security Exception, Class String Index Out of Bounds Exception, Class Abstract Method Error, Class Class Circularity Error, Class Class Format Error, Class Error, Class Illegal Access Error, Class Incompatible Class Change Error, Class Instantiation Error, Class Internal Error, Class Linkage Error, Class No Class Def Found Error, Class No Such Field Error,

Class No Such Method Error, Class Out of Memory Error, Class Stack Overflow Error, Class Thread Death, Class Unknown Error, Class Unspecified Link Error, Class Verify Error, Class Virtual Machine Error.

**The Java Utility (util) Package :** Class BitSet, Class Date, Class Dictionary, Class Hashtable, Class Observable, Class Properties, Class Random, Class Stack, Class String Tokenizer, Class Vector, Interface Enumeration, Interface Observer, Class Empty Stack Exception, Class No Such Element Exception.

**The Abstract Window Toolkit (AWT) Package :** Class Border Layout, Class Button, Class Canvas, Class Card layout, Class Checkbox, Class Checkbox Group, Class Checkbox Menu Item, Class Choice, Class Color, Class Component, Class Container, Class Dialog, Class Dimension, Class Event, Class File Dialog, Class Flow Layout, Class Font, Class Font Matrices, Class Frame, Class Graphics, Class Grid Bag Constraints, Class Grid Bag Layout, Class Grid Layout, Class Image, Class Insets, Class Label, Class List, Class Media Tracker, Class Menu, Class Menu Bar, Class Menu Component, Class Menu Item, Class Panel, Class Point, Class Polygon, Class Rectangle, Class Scrollbar, Class Text Area, Class Text Component, Class Text Field, Class Toolkit, Class Windows, Interface layout Manager, Interface Menu Container, Class AWT Exception, Class AWT Error.

**The AWT Image Package:** Class Color Model, Class Crop Image Filter, Class Direct Color Model, Class Filtered Image Source, Class Image Filter, Class Index Color Model, Class Memory Image Source, Class Pixel Grabber, Class RGB Image Filter, Interface Image Consumer, Interface Image Observer, Interface Image Producer.

**The AWT Peer Package :** Interface Button Peer, Interface Canvas Peer, Interface Checkbox Menu Item Peer, Interface Checkbox Peer, Interface Choice Peer, Interface Component Peer, Interface Container Peer, Interface Dialog Peer, Interface File Dialog Peer, Interface Frame Peer, Interface Label Peer, Interface List Peer, Interface Menu Bar Peer, Interface Menu Component Peer, Interface Menu Item Peer, Interface Menu Peer, Interface Panel Peer, Interface Scrollbar Peer, Interface Text Area Peer, Interface Text Component Peer, Interface Text Field Peer, Interface Windows Peer.

**The Java I/O Package:** Class Buffered Input Stream, Class Buffered Output Stream, Class Byte Array Input Stream, Class Byte Array Output Stream, Class Data Input Stream, Class Data Output Stream, Class File, Class File Descriptor, Class File Input Stream, Class File Output Stream, Class Filter Input Stream, Class Filter Output Stream, Class Input Stream, Class Line Number Input Stream, Class Output Stream, Class Piped Input Stream, Class Piped Output Stream, Class Print Stream, Class Pushback Input Stream, Class Random Access File, Class Sequence Input Stream, Class Stream Tokenizer, Class String Buffer Input Stream, Interface Data Input, Interface Data Output, Interface Filename Filter, Class EOF Exception, Class File Not Found Exception, Class IO Exception, Class Interrupted IO Exception, Class UTF Data Format Exception.

**The Java Networking (net) Package:** Class Content Handler, Class Datagram Packet, Class Datagram Socket, Class Inet Address, Class Server Socket, Class Socket, Class Socket Impl, Class URL, Class URL Connection, Class URL Encoder, Class URL Stream Handler, Interface Content Handler Factory, Interface URL Stream Handler Factory, Class Malformed URL Exception, Class Socket Exception, Class Unknown Host Exception, Class Unknown Service Exception.

***Bibliography and References:***

1. D. Samanta, *Object-Oriented Programming with C++ and Java*, PHI.

**BCA – 303: Computer Organization & Architecture**

**Introduction:** Organization and Architecture, Structure and Function, Why Study Computer Organization Architecture.

**Computer Evolution and Performance :** A Brief History of Computers, Designing for Performance, Pentium and PowerPC Evolution, Recommended Reading and Web Sites, Key Terms, Review Questions, and Problems.

**A Top-Level View of Computer Function and Interconnection:** Computer Components, Computer Function, Interconnection Structures, Bus Interconnection, PCI, Recommended Reading and Web Sites.

**Cache Memory:** Computer Memory System, Cache Memory Principles, Elements of Cache Design, Pentium4 and PowerPC Cache Organizations, Recommended Reading.

**Internal Memory:** Semiconductor Main Memory, Error Correction, Advance DRAM Organization, Recommended Reading and Web Sites.

**External Memory:** Magnetic Disk, RAID, Optical Memory, Magnetic Tape, Recommended Reading and Web Sites.

**Input /Output:** External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct memory Access, I/O Channels and Processors, The External Interface – Fire Wire and InfiniBand, Recommended Reading and Web Sites.

**Operating System Support:** Operating System Overview, Scheduling, Memory Management, Pentium II and PowerPC Memory Management, Recommended Reading and Web Sites.

**Computer Arithmetic :** The Arithmetic and Logic unit, Integer Representation, Integer Arithmetic, Floating Point Representation, Floating-Point Arithmetic, Recommended Reading and Web Sites.

**Instruction Sets – Characteristics and Functions:** Machine Instruction Characteristics, Types of Operands, Pentium and PowerPC Data Types, Types of Operations, Pentium and PowerPC Operation Types, Assembly Language, Recommended Reading.

**Instruction Sets – Addressing Modes and Formats:** Addressing, Pentium and PowerPC Addressing Modes, Instructions Formats, Pentium and PowerPC Instruction Formats, Recommended Reading.



**Processor Structure and Function:** Processor Organization, Register Organization, Instruction Cycle, Instruction Pipelining, The Pentium Processor, The PowerPC Processor, Recommended Reading.

**Reduced Instruction Set Computer:** Instruction Execution Characteristics, The Use of a Large Register File, Compiler-Based Register Optimization, Reduced Instruction Set Architecture, Risk Pipelining, MIPS R4000, SPARC, RISC Versus CISC Controversy, Recommended Reading.

**Instruction-Level Parallelism and Superscalar Processor:** Overview, Design Issues, Pentium, PowerPC, Recommended Reading.

**The IA-64 Architecture :** Motivation, general Organization, Prediction, Speculation, and Software Pipelining, IA64 Instruction Set Architecture, Itanium Organization, Recommended Reading and Web Sites.

**Control Unit Operation:** Micro-Operations, Control of the Processor, Hardwired Implementations, Recommended Reading.

**Microprogrammed Control:** Basic Concepts, Microinstruction Sequencing, Microinstruction Execution, Ti 8800, Recommended Reading.

**Parallel Processing:** Multiple Processor Organizations, Symmetric Multiprocessors, Cache Coherence and the MESI Protocol, Multithreading and Chip Multiprocessors, Clusters, Nonuniform Memory, vector Computation, Recommended Reading and Web Sites.

**Number System:** The Decimal System, The Binary System, Converting between Binary and Decimal, hexadecimal Notation.

**Digital Logic:** Boolean algebra, Gates, Combinational Circuits, Recommended Reading and Web Sites.

#### ***Bibliography and References:***

1. William Stalling, *Computer Organization and Architecture*, Pearson Education.

## **BCA – 304: Database Management System**

**Introduction:** Concept of System, Types of Decisions – Decision Based on the Levels of the Organization, Decisions Based on the Structuredness; Information System – Components of Information System; Classification of Information System – Management Information System (IMS), Decision Support Systems (DSS), Expert System (ES); Conventional File Processing System – Example of Conventional File Processing System, Drawbacks of Conventional File Processing System; Database System – Definition of Database System, Advantages of Database System, Components of Database Management System, Economic Justification of Database Approach.

**Database Concepts :** Data, Information, Metadata, Terminologies of a File, Association between Fields, Association between Files (Record Types) – One-to-One Association, Oneto-Many Association, Many-toMany Association, Multiple Association, One-to-One Conditional Association, Recursive Association; File Organization – Terminologies of Storage Area, Sequential File Organization, Indexed Sequential File Organization.

**Data Structure :** Location Methods – Address Sequential Data Direct Placement, Address Sequential Data Indirect Placement, Pointer Sequential Connection with Data Direct Placement, Pointer Sequential Connection with Data Indirect Placement; Types of Pointer – Physical Address Pointer, Relative Address Pointer, Logical Key Pointer; Inter Record Data Structure – Stack Data Structure, Queue Data Structure, Sorted List Data Structure, Ring Data Structure, Inverted List Data Structure, Multi-List Data Structure, Tree Data Structure.

**Data Models:** Data Model, Classification of Data Model – Hierarchical Data Model, Network Data Model, Relational Data Model; Entity Relationship Model.

**Database Design:** Steps of Database Design – Requirement Analysis, Design of Conceptual Data Model, Design of Internal Model/Implementation Design, Design of Physical Data Model; Normalization, Case Problem – Normalization of Invoice Report, Normalization of Reorder Report, View Integration, Design of Conceptual Data Model; Data Volume and Usage Analysis – Data Volume Analysis, Usage Analysis; Integrated Case Study – Database Design for Academic Institution – Normalization of Reports, View Integration, Design of Conceptual Data Model, Preliminary Map and Logical Access Maps to Print the Report.

**Implementation Design:** Implementation Design, Guidelines for Mapping Conceptual Data Model into a Desired Logical Data Model – Mapping Conceptual Data Model into Relational Data Model, Mapping Conceptual Data Model into Network Data Model, Mapping Conceptual Data Model into Hierarchical Data Model; Problem Design Guideline – Database Action Diagram (DAD), Example of Database Action Diagram (DAD).

**Hierarchical Database Management Systems:** Information Management System (IMS) – IMS Database Description (DBD), IMS Data Manipulation (DL/I); PC-Focus – PC-Focus Database Description, PC-Focus Data Manipulation.

**Network Database Management Systems:** Integrated Database Management System (IDMS) – Data Description Language (DDL), Data Manipulation Language (DML) of IDMS.

**Relational Database Management Systems:** Relational Algebra, Relational Calculus Commands; Relational Database Languages, Interactive SQL – Interactive SQL DDL, Interactive SQL DML.

**Database Operations and Maintenance:** Database Administration (DBA), Security Mechanisms – User with Password and Complete Authorization, User with Password and Limited Authorization, Encryption; Concurrency Control – Problem of Concurrent Access, Resource Locking, Deadlock/Deadly Embrace; Database Recovery – Restore/Return, Backward Recovery, Forwarded Recovery.

**Database Design for Students Fee Collection System of Global Institute Technology:** Case Description, Normalization of Reports, View Integration, Design of Conceptual Data Model, LAM for Different Reports.

**Database Design for Stores Operations of Devi Engineering Works:** Case Description, Normalization of Reports, View Integration, Design of Conceptual Data Model, LAM for Different Reports.

***Bibliography and References:***

1. R. Pannerselvam, *Database Management System*, PHI.

## BCA – 305: Computer Graphics

**Applications:** Presentation Graphics, Education and Training, Entertainment, CAD for Architecture, Mechanical, Aeronautical and Automobile Industry, Other Areas: Simulation, Animation and Video Games.

**Graphical Devices:** Display, Hardcopy Devices, Input Devices.

**Drawing Geometry:** Mathematics for Computer Graphics, Line Drawing and 2D Transformation.

**Conics and Curves:** Bresenham's Circle Drawing Algorithm, Generation of Ellipse, Curve Drawing.

**Graphical Operations:** Clipping, Filling.

**3D Graphics:** Transformations, Parallel Projection, Perspective Projection, Hidden Surface Removal.

**Illumination and Shading:** Illumination, Shading.

**Tweening and Morphing:** What is Tweening? Morphing: The Wrap and the Dissolve.

**Graphic Standards:** Introduction to GKS Primitives, MS-Windows, AutoCAD.

**Multimedia :** Concepts of HyperText/Hypermedia, Multimedia Applications, Multimedia Authoring, Multimedia Hardware, Images, Bitmaps, Windows Paintbrush, Languages of Sound: Digital sound, Playing, A Few Currently Available Multimedia Software's, Virtual Reality.

***Bibliography and References:***

1. D. P. Mukherjee, *Fundamental of Computer Graphics and Multimedia*, PHI.

## BCA – 306: Practical

Practical based on the topics covered in the semester.

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