


## Syllabus of BCA Part II 2022-23 Onwards

### BCA Part - II 2023-24 Onwards

Code	Subject	Course	Hours / Week	Max. Marks
<b>Theory</b>				
BCA-201	Object Oriented Programming Through C++	CCC	4	100
BCA-202	Database Management Systems	CCC	4	100
BCA-203	Software Engineering	CCC	4	100
BCA-204	Data Structures and Algorithms	CCC	4	100
BCA-205	Cloud Computing	CCC	4	100
	Elective-I	ECC	4	100
<b>Practical</b>				
BCA-207	OOP Lab	CCC	3	100
BCA-208	DBMS Lab	CCC	3	100
BCA-209	Data Structures Lab (Using C/C++)	CCC	3	100
BCA-210	Elective-II Lab	ECC	3	100
<b>Elective Group-I (Any One)</b>				
BCA-A01	.NET Programming With C#	ECC	4	100
BCA-A02	PHP Programming	ECC	4	100
BCA-A03	Data Science	ECC	4	100
<b>Elective Group-II (Any One)</b>				
BCA-B01	.NET Lab	ECC	3	100
BCA-B02	PHP Lab	ECC	3	100
BCA-B03	Data Science Lab	ECC	3	100

  
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# BCA-201 : Object Oriented Programming Through C++

Question Paper pattern for Main University Examination

Max Marks: 100

**Part – I (very short answer)** consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

**Part – II (short answer)** consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.

**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

## UNIT – I

**Introduction to Object Oriented Concepts:** Evolution of OOP, OOP Paradigm, advantages of OOP, comparison between functional programming and OOP approach, characteristics of object oriented language – objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading.

## UNIT – II

**Introduction to C++:** C++ tokens, data types, C++ operators, type conversion, variable declaration, arrays, statements, expressions, conditional statements, Jumping statements, loops, functions, pointers, structures.

## UNIT – III

**Classes and Objects:** Classes, objects, defining member functions, arrays of class objects, pointers and classes, passing objects, constructors, types of constructors, destructors, this pointer, access specifiers, friend functions, inline functions.

## Unit – IV

**Inheritance:** Introduction, Importance of Inheritance, types of inheritance, Constructor and Destructor in derived classes.

**Polymorphism:** Function overloading, operator overloading, virtual functions, pure virtual functions

## Unit – V

**File Management:** Handling Data files (sequential and random), Opening and closing of files, stream state member functions, Operations on Files. Templates, Exception Handling.

### Recommended Books:

1. Deitel HM & Deitel JP; C/C++ How to program; 5<sup>th</sup> Edn; Pearson Pub.
2. Balagurusamy ; Object Oriented Programming in C++; 4<sup>th</sup> Edition TMH.
3. Venugopal, Rajkumar; Mastering C++; Tata Mcgrow Hill,.
4. Kanetkar Y.: LET US C++; BPB;
5. Byron Gottfried; Programming with C;TMH;

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# BCA-202 : Data base Management Systems

Question Paper pattern for Main University Examination

Max Marks: 100

**Part – I (very short answer)** consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

**Part – II (short answer)** consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.

**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

## UNIT- I

**Database System Concepts & Architecture:** Overview of DBMS, Basic DBMS terminology, data base system v/s file system, Advantages and dis-advantages of DBMS. Coded rules, data independence. Architecture of a DBMS, Schemas, Instances, Database Languages, Database Administrator, Data Models.

## UNIT- II

**Data Modeling:** Data modeling using the Entity Relationship Model: ER model concepts. notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation.

**Relational Model :** Concepts, Constraints, Languages, Relational database design by ER & EER mapping, Relational algebra relational calculus. Relational Algebra, Fundamental operations of Relational Algebra.

## UNIT –III

**Database Design:** Functional dependencies, loss less decomposition, Normalization : 1-NF, 2-NF,3-NF and BCNF.

**Transaction Management :** Transactions: Concepts, ACID Properties, States Of Transaction, Serializaibility, Isolation, Checkpoints, Deadlock Handling.

## UNIT- IV

**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, insert, update and delete operations, Joins, Unions, Intersection, Minus in SQL.

## UNIT- V

**Recovery System & Security :** Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Shadow Paging, Failure with Loss of Non-Volatile Storage, Introduction to Security & Authorization.

**Recommended Books:**

1. Korth H F and Silberschatz A, System Concepts, Sixth Edition; McGraw Hill, 2010
2. Leon, and Leon, SQL Tata McGraw Hill Pub. Co. Ltd.
3. Ivan Bayross; SQL/PL 4<sup>th</sup> Edn: BPB, 2009
4. Navathe S.B. Elmasri R.; Fundamentals of Database Systems, Fifth Edition, Pearson 2011.
5. Ramakrishnan and Gharke, Database Management Systems, 3<sup>rd</sup> Ed, Tata McGraw Hill, 2007.
6. Singh S.K.; Database Systems; I Edition; Pearson, 2006.

**BCA-203 : Software Engineering**

Question Paper pattern for Main University Examination

Max Marks: 100

**Part – I (very short answer)** consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

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**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

**Unit-I**

**Software Engineering Fundamentals:** Software, Problem Domain, Software Engineering Challenges, Software Processes (processes, projects & products, component).

**Software Development Process Models:** Waterfall Model, Prototyping, Iterative Enhancement Model, Spiral Model. Introduction to Agile Model: Principles, Steps. Various Agile Process Models.

**Software Requirement Analysis & Specification:** Need, Characteristics & Components. Introduction to Requirements Modeling: Data Flow Diagram and Use Cases.

**Unit-II**

**Introduction to Metrics:** Function Point, Line of Code (LOC) and KLOC.

**Software Project Planning:** Cost Estimation- Uncertainties in Cost Estimation, Building Cost Estimation Models, On Size Estimation, COCOMO Model. **Project Scheduling:** Average Duration Estimation, Project Scheduling & Milestones. Quality Assurance Plans: Verification & Validation, Inspection & Reviews.

**Unit-III**

**Design Engineering:** Design Process & Design Quality, Design Concepts (abstraction, architecture, patterns, modularity, information hiding, functional independence, refinement, refactoring, and design classes), The Design Model (data design elements, architectural design elements, interface design elements, component-level design elements, deployment-level design elements).

## Unit-IV

**Testing Strategies & Tactics:** A strategic approach to software testing, Strategic issues, Software testing fundamentals, Test characteristics, Test Strategies for conventional software: Unit Testing, Integration testing, Validation Testing, System testing, Black-Box testing, White Box testing.

## Unit-V

**Risk Management:** Overview, Assessment, Control.

**Software Reliability:** Measures of Reliability & Availability, Software Safety.

**Maintenance and Reengineering:** Introduction to: Software Maintenance, Software Supportability, Reengineering, Reverse Engineering, Restructuring, and Forward Engineering.

### Reference /Text Books

1. Pressman, Roger (2001) Software Engineering; A Practitioner's Approach, 8<sup>th</sup> ed. M Graw-Hill, 2014.
2. Sommerville Ian; Software Engineering, 9<sup>th</sup> Ed. Pearson Education, 2014
3. Jalote, Pankaj (7) An integrated Approach to Software Engineering 2<sup>nd</sup> Ed.
4. James Rumbaugh. Micheal Blaha, "Object oriented Modeling and Design with UML", 2<sup>nd</sup> Edition, 2007.
5. Simon Bennett, Steve McRobb and Ray Farmer, " Object-Oriented Systems Analysis and Design Using UML" 4<sup>th</sup> Edition, McGraw Hill Education, 2010

## BCA 204: Data Structures and Algorithms

Question Paper pattern for Main University Examination

Max Marks: 100

**Part – I (very short answer)** consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

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**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

## UNIT – I

**Introduction to Algorithm Design:** Algorithm, its characteristics, efficiency of algorithms, analyzing Algorithms and problems.

**Linear Structure:** Arrays, records, stack, operation on stack, implementation of stack as an array, queue, types of queues, operations on queue, implementation of queue.

## UNIT – II

**Linked Structure :** List representation, Polish notations, operations on linked list - get node and free node operation, implementing the list operation, inserting into an ordered linked list, deleting, circular linked list, doubly linked list.

## UNIT – III

**Tree Structure :** Concept and terminology, Types of trees, Binary search tree, inserting, deleting and searching into binary search tree, implementing the insert, search and delete algorithms, tree traversals , Huffman's algorithm.

## UNIT – IV

**Graph Structure :** Graph representation - Adjacency matrix, adjacency list, Warshall's algorithm , adjacency multilist representation. Orthogonal representation of graph . Graph traversals - BFS and DFS. Shortest path, all pairs of shortest paths, transitive closure.

## UNIT – V

**Searching and sorting :** Searching - sequential searching, binary searching, hashing.

**Sorting** - selection sort, bubble sort, quick sort, heap sort, merge sort, and insertion sort, efficiency considerations.

### *Recommended reference books*

1. S. Lioschutz: Data Structures, Mc Graw Hill International Edition.
2. A.V. Aho., J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms, Pearson Education Asia.
3. A. Michael Berman: Data Structures via C++, Oxford University Press.
4. Sara Baase and Allen Van Gelder: Computer Algorithms, Pearson Education Asia.

## BCA-205: Cloud Computing

Question Paper pattern for Main University Examination

Max Marks: 100

**Part – I (very short answer)** consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

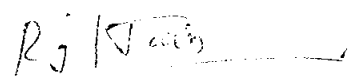
**Part – II (short answer)** consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.

**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

### Unit-I

**Introduction of Cloud Computing:** Definition, Historical Developments, Enabling Technology, Vision, Essential Characteristics of Cloud Computing , Components of Cloud Computing. Challenges and Approaches of Migration into Cloud, Cloud Applications: Applications – Health care, CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming. Banefits: For the Market, Enterprise, End user and Individuals.

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## Unit-II

**Cloud Computing Architecture :** Introduction, Cloud Reference Model, Architecture. Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service. Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds. Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards. Scalability and Fault Tolerance. Parallel and distributed Computing-MapReduce. . Hadoop, High level Language for Cloud, Service Oriented Computing.

## Unit-III

**Virtualization:** Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Virtualization: of CPU, Memory, I/O Devices, Server , Desktop, Network, and data-center. Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V, KVM, Xen.

## Unit-IV

**Introduction of Cloud security services,** Design Principles, Policy Implementation. Cloud Computing Security Challenges, Cloud Computing Security Architecture. Cloud Security Tools and technologies to secure the data in Private and Public Cloud Architecture. Security Concerns, Legal issues and Aspects, Multi-tenancy issues. **Risk area of Cloud computing, Data Security in Cloud:** Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management.

## Unit-V

**Cloud Platforms in Industry:** Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google AppEngine- Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure- Azure Core Concepts, SQL **Azure.** Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing. CRM and ERP, Social networking.

### Recommended Books:

1. Cloud Computing ,Principle and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley-2016
2. Kumar Saurabh, "Cloud Computing" , Wiley Pub 2016
3. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola. S.Thamarai Selvi from TMH 2013.
4. Distributed and Cloud Computing, Kai Hawang , GeoffreyC.Fox, Jack J. Dongarra Pub: Elsevier, 2013
5. Krutz , Vines, "Cloud Security " , Wiley Pub,2010
6. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub,2009
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer,2010

**Practical:**

**BCA-207 : OOP Lab**

Practical Lab Exercises based on Theory Paper BCA 201.

**BCA-208 : DBMS Lab**

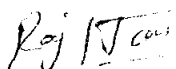
Practical Lab Exercises based on Theory Paper BCA 202.

**BCA-209 : Data Structures Lab ( Using C/C++)**

Practical Lab Exercises based on Theory Paper BCA 204.

**BCA-\*\*\* : Elective-II lab**

Practical Lab Exercises based on Elective –I Theory Paper.

  
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## Elective Theory papers for Elective Group-I of BCA Part-II

### BCA-A01: .NET Programming With C#

Question Paper pattern for Main University Examination

Max Marks: 100

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**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

#### Unit-I

**Introduction to .Net framework:** Managed Code and the CLR Intermediate Language. Metadata and JIT Compilation Automatic Memory Management  
The Framework Class Library: .Net objects- ASP .NET, NET web services, Windows Forms.

**Elements :** Variable and constants data types, declaration. Operators, types precedence. Expressions Program flow, Decision statements, if then if. Then.else.select.case, Loop statements while and while, do.loop. for next for each.next

#### Unit-II

**Types:** Value data types Structures, Enumerations, Reference data types, arrays.

**Windows Programming:** Creating windows forms windows controls, Button, Check box, Combo box, Label, List box Radio Button, Text box, Events, Click, close deactivate. Load, mousemove, mousedown, mouseup.

**Menus and Dialog Boxes :** Creating menus, menu items, context menu, Using dialog boxes, show dialog() method.

#### Unit – III

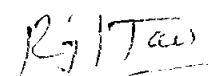
**ADO.NET :** Architecture of ADO.NET, ADO.NET providers, Connection, Command, Data Adapter, Dataset, Connecting to Data Source, Accessing Data with Data set and Data reader, Create an ADO.NET application, Using Stored Procedures.

#### Unit-IV

**ASP.NET Features:** Application of States and Structure; Change the Home Directory in IIS- Add a Virtual Directory in IIS- Set a Default Document for IIS – Change Log File Properties for IIS-Stop, Start, or Pause a Web Site.

#### Unit-V

**Creating Web Controls:** Web Controls, HTML Controls, Using Internist Control, Using Input Validation Controls, Selecting Controls for Applications, Data Controls and Adding web controls to a page.

  
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**Creating Web Forms:** Server Controls, Types of Server Controls, Adding ASP.NET Code to a page.

**Web Services and WCF :** Web Services protocol and standards – WSDL Documents- Visual Studio.NET Architecture of WCF, WCF Client

**Recommended Books :**

1. Mathew Mac Donald: Beginning ASP.NET 4.0 in C# 2010, 3<sup>rd</sup> Edition, A Pres.
2. Bill Evjen Scott Hanselman, Devin Rader: Professional ASP.NET4, 2010, Willey.
3. George Shepherd: Microsoft ASP.NET Step by step, 2010 Microsoft Press.
4. Imar Spaanjaars: Beginning ASP.NET 4: in C# and VB (Wrox Programming to Programmer) , 2010 Wiely Publishing.
5. Steven Holzner; ASP.NET 4.0 (Cover C# & VB ) Black Book; Dreamtech Press.
6. Steven Holzner; .NET Programming Black Book; Dreamtech Press.

## **BCA-A02: PHP Programming**

**Question Paper pattern for Main University Examination**

*Max Marks: 100*

**Part – I (very short answer)** consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

**Part – II (short answer)** consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.

**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

### **UNIT-I**

**Introduction to PHP:** Installation of PHP and MySQL, PHP configuration in IIS & Apache Web Server. Features of PHP, Writing PHP, Parsing PHP code, Embedding PHP and HTML Executing PHP and viewing in Browser.

### **Unit - II**

**Control Structures:** Data types, Operators, PHP variables: static and global variables. Comments in PHP, Control Structures, Condition statements, If...Else, Switch, ? operator. Loops, While, Break Statement Continue. Do...While, For, For each, Exit, Die, Return. Arrays: Numeric, Associative and Multidimensional Arrays

### **UNIT-III**

**Strings:** Creating and accessing String, Searching & Replacing String, Formatting String. String Related Library function, Pattern matching, Replacing text, Splitting a string with a Regular Expression

**Functions:** Defining a Function, Calling a Function, Parameter passing, Returning value from function

## UNIT-IV

**Form Data Handling:** \$\_GET, \$\_POST, \$\_REQUEST Variables, Cookies handling, Session Management

**Exception Handling:** Understanding Exception and error, Try, catch, throw

## UNIT-V

**File Handling:** Opening and closing a file, Copying, renaming and deleting a file

**Database Handling:** Connection with MySql Database or ODBC, Performing basic database, operation (Insert, Delete, Update, Select, Truncate Alias, Order By), Setting query parameter.

## References

1. PHP, The CompleteReference, Steven Holzner, TMH
2. Beginning PHP 5.3, Matt Doyle, John Wiley & Sons
3. Core PHP Programming Leon Atkinson Pearson publishers
4. Beginning PHP 5.0 Database Christopher Scollo, Harish.Rawat, Deepak Thomas, Wrox Press

## BCA-A03: Data Science

Question Paper pattern for Main University Examination

Max Marks: 100

**Part – I (very short answer)** consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

**Part – II (short answer)** consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.

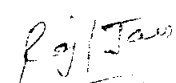
**Part – III (Long answer)** consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

## Unit-I

**Introduction to Data Science :** Concept of Data Science, Need for Data Science. Components of Data Science, Big data, Facets of data: Structured data, Unstructured data. Machine-generated data, Graph-based or network data, Audio, image and video. Streaming data, The need for Business Analytics, Data Science Life Cycle, Applications of data science.

## Unit-II

**Data Science Process :** Overview of data science process, setting the research goal. Retrieving data, Cleansing, integrating and transforming data, Exploratory data analysis. Data Modeling, Presentation and automation

  
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### Unit-III

**Data Analytics:** Types of Analytics, Data Analytics Lifecycle: Overview - Discovery - Data Preparation - Model Planning - Model Building, Regression analysis, Classification techniques, Clustering, Association rules analysis.

### Unit-IV


**Statistics :** Basic terminologies, Population, Sample, Parameter, Estimate, Estimator. Sampling distribution, Standard Error, Properties of Good Estimator, Measures of Centers, Measures of Spread, Probability, Normal Distribution, Binary Distribution. Hypothesis Testing ,Chi-Square Test.

### Unit-V

**Data Science Tools and Algorithms :** Basic Data Science languages- R, Python. Knowledge of Excel, SQL Database, Introduction to Weka, Regression Algorithms - Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

#### Recommended Books :

1. Samuel Burns, "Fundamentals of Data Science: Take the first Step to Become a Data Scientist" , Amazon KDP Printing and Publishing, First Edition, 2019
2. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly. 2014.

  
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