

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF NATURAL SCIENCES

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B.Sc.(General) Curriculum
(Computer Science Core Papers
Under CBCS)

Revised Curriculum
For Academic Session 2016-17
onwards

w.e.f. 2016

Approved and Recommended by BoS dated 16.05.2016

DEPARTMENT OF COMPUTER SCIENCE

Details of the Core Courses

B.Sc. (General) CBCS

Semester	Course Code	Course Title	L-T-P	Credits	Marks
I	BCS 1.1	Digital Logic	3-1-0	4	100
II	BCS 2.1	Programming and Problem Solving Using C	3-0-2	4	100(Theory) + 50(Lab)
III	BCS 3.1	Object Oriented Programming using C++	3-0-2	4	100(Theory) + 50(Lab)
	BCS 3.2	Data Structures	3-0-2	4	100(Theory) + 50(Lab)
IV	BCS 4.1	Database Management System	3-0-2	4	100(Theory) + 50(Lab)
	BCS4.2	Applied Operating System	4-0-0	4	100
V	BCS 5.1	Computer Networks	4-0-0	4	100
	BCS5.2	Visual Programming	3-0-2	4	100(Theory) + 50(Lab)
VI	BCS6.1	Multimedia Applications	3-0-2	4	100(Theory) + 50(Lab)

DETAILED SYLLABI

BCS 1.1: DIGITAL LOGIC

UNIT –WISE SYLLABUS

- 1 **Data Representation:** Number Systems - Binary, Octal, Decimal, and Hexa-Decimal; Base Conversions; Binary Arithmetic; Complements: (r-1)'s Complement, r's Complement, Subtraction using Complements; Integer Representation, Floating-point Representation; Binary Codes for Decimal Digits: BCD Code, Excess-3 Code, 84-2-1 Code, 2421 Code, Error Detection Code; Character Representation – ASCII, EBCDIC.
- 2 **Boolean Algebra, and Logic Gates:** Boolean Algebra, Huntington's Postulate, Switching Algebra, Basic Theorems and Properties of Boolean Algebra; Boolean Functions: Basic Definition, Literals, Minimization of Boolean Functions by Algebraic Manipulation, Complement of a Boolean Function; Canonical and Standard Forms: Minterms and Maxterms, Conversion Between Canonical and Standard Forms of a Boolean Function; Boolean Function Simplification using k-Map; Digital Logic Gates: Basic Gates – AND, OR, NOT; Universal Gates – NAND, NOR; Other Gates – XOR, XNOR, AND-OR-INVERT, and OR-AND-INVERT.
- 3 **Combinational Logic Circuit:** Overview of Combinational Logic Circuit; Design of Some Standard Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Code Conversion; Binary Adder, BCD Adder, Decoders, Encoder, Multiplexers, De-multiplexer.
- 4 **Sequential Logic Circuit:** Overview of Sequential logic Circuits, Flip-Flops, Categories of Flip-Flop – RS, JK, T, and D Flip Flops, Registers and Counters.

Text Books

- 1 M. Morris Mano: Digital Logic and Computer Design, Prentice Hall of India
- 2 V. Rajaraman & T. Radhakrishnan: An Introduction to Digital Computer Design, PHI.

BCS 2.1: Programming and Problem Solving Using C

UNIT –WISE SYLLABUS

- 1 **Fundamental of Problem Solving:** Introduction, problem-solving aspects, top-down design, implementation of algorithm, Flow chart, program verification.
- 2 **Fundamental Concepts in C :** History Perspective, Character set, Identifiers and Keywords, Data Types, Constants, Variables and basic structure of C programming, Declarations, storage classes, Operators & Expressions, Library functions, Statements, Symbolic Constants, Preprocessor directives. I/O Functions- getchar(), putchar(), scanf(), printf(), gets(), puts() , Control Statements if-else, while, do-while, goto, for statements nested control structures, switch, break, continue statements comma operator.
- 3 **Functions, Arrays and Pointers:** Function prototypes, Standard function ,user define function, passing arguments to a function by value, recursion, storage classes, automatic, External, static, register variables in single file environment; Defining - processing array, passing arrays to functions, Introduction to multidimensional arrays, arrays and strings. Pointers: Declarations, Referencing and de-referencing, pass pointers to functions, pointer to array, Operations on File using pointers. Concept of Dynamic Allocation of Memory, Structures and Unions, Defining and processing a structure.
- 4 **Structure, Union, Enumeration and Files:** Structure Declaration and Initialization; Accessing Structure Members, Structure Assignments; Array of Structures and Arrays within Structures, Nested Structures; Structure as Function Arguments; Structure Pointer; Unions; Difference between Structure and Union; Bit-Fields; Introduction to File; Text and Binary Files; Defining, Opening and Closing Files; I/O Operations on Files, Error Handling During I/O Operations, Random Access to Files, Command Line Arguments.

Text Books

- 1 Programming in C by E Balagurusamy, 5 ed, 2011.
- 2 Deitel & Deitel: C – How to Program, 3rd Ed., Pearson Education, 2001.

BCS 2.1 : LAB (C)

UNIT –WISE SYLLABUS

- 1 Implementation of swapping of 2, 3, and n integer variables.
- 2 Implementation of simple problem based on simple decisions.
- 3 Implementation of counting, factorial, sin, square root, Fibonacci series, reversing digits of an integer, sum of digits of integer.
- 4 Implementation of base conversions, greatest common divisor, smallest divisor of an integer, prime number generator, generation of pseudo-random number.
- 5 Implementation of the array counting, finding the max and min number in a set.
- 6 Implementations of 2 searching and 5 sorting algorithms.
- 7 Implementation of the 5 string handling functions using array.
- 8 Implementation of the 7 string handling functions using pointers.
- 9 Implementation of problems on structure and union.
- 10 Implementation of file handling problems.

BCS 3.1: Objected Oriented Programming using C++

UNIT –WISE SYLLABUS

- 1 **Introduction to OOP and C++:** Concepts of procedure oriented and structured programming; OOP paradigm; basic concepts of OOP, its benefits and application; Introduction to C++, applications, simple programs, program structure, IDE of Turbo C++; tokens, expressions and control structures; dynamic initialization of variables, operators, scope resolution operator, type casting.
- 2 **Classes, objects, constructors and destructors:** C structures, specifying a class, defining member functions, making an outside function inline and nesting of member functions, private member functions, arrays within a class, static data members and member functions, arrays of objects, objects as function arguments, returning objects as function arguments, friendly functions; constructors, parameterized constructors, destructors.
- 3 **Operator overloading and Inheritance:** Defining operator overloading, overloading unary and binary operators, rules for overloading operators; defining derived classes, types of inheritance, single, multilevel, multiple, hierarchical and hybrid inheritance, virtual bases classes, this pointer, virtual functions, pure virtual functions.
- 4 **Working with files:** Classes for file stream operators, opening and closing a file, file pointers and their manipulations, sequential input and output operations, error handling during file operators.

Text Books

- 1 E. Balagurusamy, Object Oriented Programming with C++, TMH, 2008.
- 2 Deitel and Deitel, C++ How to program, PHI, 4th Ed, 2003

BCS 3.1: LAB (C++)

UNIT –WISE SYLLABUS

- 1 Implementation of simple classes like Rectangle, Circle, Sphere, Triangle etc.
- 2 Implementation of some complex classes like Matrix, Complex Number, Vector, Decimal etc.
- 3 Implementation of Matrix, Complex number, Vector etc. classes with function overloading and constructor functions.
- 4 Implementation of some classes with operator over loadings.
- 5 Implementation of some classes like Square Matrix, Box etc. with the help of inheritance.
- 6 Implementation of generic classes like Stack, Queue etc.
- 7 Implementation of some simple classes with function overriding.
- 8 Implementation of some classes with << and >> operator over loading.
- 9 Problems based on simple file handling.
- 10 Creation of student information system or inventory control system (construction of classes, implementing inheritance, overloaded functions, storing records to a file, fetching file records).

BCS 3.2: Data Structures

UNIT –WISE SYLLABUS

- 1 **Introduction to Data structures:** Data Types, ADT and data structures, Array as an Abstract Data Type (ADT); One Dimensional Array; Multi Dimensional Array; Matrix Representation using 2D Arrays – Row-major Order, Column-major Order; Special Matrices: Diagonal, Tri-diagonal, Lower Triangular and Upper Triangular Matrices; Sparse Matrices: Representation and Transpose; Addition of Sparse Matrices, Sorting and searching Techniques.
- 2 **Linked List, Stack, and Queue:** Single Linked List; Static Representation of Linked List; Dynamic Representation of Linked List; Operations on Single Linked List – Creating, Traversing, Insertion, Deletion, Copy; Merging, Searching; Dynamic Storage Representation, Application: Radix sorts, Sparse Matrix, Polynomial. Stacks and Queues: Introduction to Stacks; Array Representation of Stack; Linked Representation of Stack; Operations on Stacks; Applications of Stack – Infix Expression to Postfix Conversion, Evaluation of Postfix Expression, Recursive functions Implementations, Introduction to Queues; Array Representation of Queue; Linked Representation of Queue; Applications of Queue.
- 3 **Trees:** Basic Concepts of Tree; Binary Trees; Types of Binary Tree; Properties of Binary Trees; Representation of Binary Trees: Array-Based Representation and Linked Representation; Operations on Binary Tree, Binary Search Tree (BST), Operations in BST: Insertion, Deletion, Traversing.
- 4 **Graph:** Basic Concepts Related to Graph; Difference between Tree and Graph; Properties of Graph; Graph Representations: Adjacency Matrix, Linked Adjacency Lists; Weighted Graph Representations; Graph Traversing Methods: Breadth-First Traversal and Depth-First Traversal; Applications of Graph.

Text Books

- 1 D. Samanta: Classic Data Structure, PHI
- 2 A. S. Tenenbaum, Y. Langsam, Moshe J. Augenstein: Data Structures using C/C++, PHI, 2nd Ed, 2006
- 3 1. Robert Kruse, C.L.Tondo, Bruce Leung: Data structures & Program Design in C, Pearson, 2007

BCS 3.2: LAB (DS with C/C++)

UNIT –WISE SYLLABUS

- 1 Implementation of Array, UpperTriangular Matrix, Diagonal Matrix classes.
- 2 Implementation of Single Linked list classes.
- 3 Implementation of radix sort using object of Linked list classes.
- 4 Implementation of generic Stack class using arrays and linkedlist.
- 5 Implementation of Queue and Circular queue classes using arrays and pointers.
- 6 Evaluation of postfix expression using Stack.
- 7 Conversion of infix to postfix using Stack.
- 8 Implementation of Binary Tree class using array.
- 9 Implementation of Binary Search Tree class using linked.
- 10 Implementation Graph classes.

BCS4.1: Database Management System

UNIT –WISE SYLLABUS

- 1 **Databases and Database Users:** Introduction, An Example, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS.
- 2 **Database System Concepts and Architecture:** Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.
- 3 **Data Modeling Using the Entity-Relationship (ER) Model:** Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher Than Two.
- 4 **The Relational Data Model and Relational Database Constraints:** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations. The Relational Algebra: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Text Books

- 1 Navathe, Fundamentals of Database Systems Concept, Addison-Wesley, 5/E, 2009.
- 2 *SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross, BPB publication, 3rd ed, 2010.

BCS 4.1: LAB (ORACLE)

- 1 Implementation of DDL statements to create and manage tables.
- 2 Implementation of retrieving data using the SQL SELECT statement.
- 3 Implementation of data manipulation and storage; conversion functions & conditional expressions; aggregated data using group functions.
- 4 Implementation of display data from multiple tables; usage of sub queries to solve queries.
- 5 Implementation of writing executable statements in PL/SQL and control structures.
- 6 Problems on creation of forms with different controls, Decisions, conditions & Exception Handling.
- 7 Implementation of single and multiple validations; menus and submenus for program controls; List boxes, combo boxes and different types of loops; arrays and select case structure for multiple decisions; storing and retrieving data in files and other operations on files.

BCS4.2: Applied Operating Systems

- 1 **Fundamental Concepts:** Operating System, OS Generations; Types of Operating System; Simple Batch Systems, Multiprogrammed batched systems, Time sharing systems, Parallel, Distributed and real time Systems; Operating System Operations; Process Management; Memory Management; Storage Management; Protection and Security; Special-Purpose Systems.
- 2 **System Structures:** Computer System Operations, I/O Structure, Storage Structure, Storage Hierarchy, Hardware Protection, General System Architecture. Operating System Components, . Operating System Services, Systems calls, System Programs, System structures; System Boot.
- 3 **Managing the System:** Process concept, Operations on processes, Process Scheduling, Cooperating Processes, Inter Process Communication; Memory Management: Logical physical address space , Swapping, Paging and Segmentation.
- 4 **Windows and Linux:** Basic commands of Windows and Linux operational Environments; Hands-on Exercise and Case studies of Windows and Linux.

Text Books

- 1 Silberschatz, Galvin and Gagne, Operating System Concept, John Willey, 8th Edition (2009).
- 2 Guide to Operating System by Michael Palmer, Thomson Learning, 2007

BCS5.1: Computer Networks

UNIT –WISE SYLLABUS

- 1 **Introduction to Networks standards & Model:** Introduction to Computer Networks; Communication Media and Nodes; Workstations; Hosts and Servers; Packets, Frames, and Cells; Networking Capabilities; Peer-to-Peer Networking and Workgroups; Networking with Servers; Client-Server Networking; Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Network (WAN), Enterprise Network; Networking Standards and their Types; ISO-OSI Model; TCP/IP Model.
- 2 **Topologies, Communication Media and Network Transport Systems:** Network Topologies, Communication Media, Communication Media Costs and Considerations; Ethernet and the IEEE 802.3 Standards, Token Ring and the IEEE 802.5 Standards
- 3 **High Speed Network Transport and Devices for Network Connectivity:** WAN and Enterprise Network Communications; Fast Ethernet; FDDI; X.25, ISDN, Frame Relay; Multistation Access Units (MAU); Multiplexers, Repeaters, Bridges, Routers, Hubs, Gateways ; ATM Switches, VLANs, Routing: IP Protocol; IP Addresses; Subnets; Subnet Mask.
- 4 **Introduction to Internet:** Domain Name System (DNS); Name Servers, Electronic Mail – Architecture and Services, User Agent, Message Formats, Simple Mail Transfer Protocol (SMTP), POP3; FTP, TELNET, World Wide Web and Hyper Text Transfer Protocol, Network Management.

Text Books

- 1 Andrew S. Tanenbaum, Computer Networks, 4th Ed., Pearson Education, 2005.
- 2 William Stallings, Data and Computer Communications, 5th Ed., PHI, 2007

BCS5.2: Visual Programming

UNIT –WISE SYLLABUS

- 1 **VB.NET Fundamentals:** Windows Applications; Programming Languages: Procedural, Event Driven, Object Oriented and Visual Paradigms; Object Model and MS-Visual Studio; Writing VB Projects; Programming VB vs other Projects; Visual Studio Environment; Typical Errors and Visual Studio Help Features.
- 2 **Controls, Declarations and Calculation:** Controls and their Importance; Multiple Controls: selection, Properties, Alignments etc; Designing GUI: Events, KAK, Defaults, Tab orders and Yool-tips; Coding for Controls and Programming; Data, Variables and Constants; Calculations; Formatting; Handling Exceptions; and Ménage Boxes.
- 3 **Decisions, Conditions, Subroutines ,List, Loops and Printing:** Conditions; If and nested IF statements; Radio Buttons and Text Boxes; Enhancing Message Boxes; Input Vilifications and VB-Based Provisions; Calling Event Procedures; and Debugging VB Projects; Minus and Common Dialog Boxes; Creating Context Minus; and Writing General Sub-procedures and Functions; List Boxes and Combo Boxes; Do/Loops; for/next loops; Selection of Entries and Printing; Programming Example; Arrays; Case Structure, Sharing Event Procedures, 1-Dim Arrays, for/Next Statements; Structures; Accumulators; Table Looking; List Boxes with Arrays; Multi-Dimensional Arrays; and a Programming example.
- 4 **Data Storage and Retrievals:** DB Files; File vs Arrays, DB terminology and XML data; Using ADO.NET and VB; Creating DB Applications; Using Data-Bound Labels; Populating Combo Boxes with Data; Making DB objects Portable; Updating Data Sets; and Programming example. Date File and Project Files; Data File Terminology, Using Streams and File Handling, Using the File Common Dialog Boxes; Saving Contents of List Boxes.

Text Books

- 1 Bradley et al.: Programming with VB.NET, McGraw Hill, 2006.
- 2 Deitel & Deitel: VB.NET – How to Program? 2ed, GadPilan, 2002.

BCS 5.2: LAB (VB.NET)

UNIT –WISE SYLLABUS

- 1 Problems on creation of forms with different controls, Decisions, conditions & Exception Handling.
- 2 Implementation of single and multiple validations; menus and submenus for program controls;
- 3 List boxes, combo boxes and different types of loops;
- 4 Arrays and select case structure for multiple decisions;
- 5 Storing and retrieving data in files and other operations on files.

BCS 6.1: MULTIMEDIA APPLICATIONS

UNIT –WISE SYLLABUS

- 1 **Multimedia Definitions, Introduction, skills and Hardware:** Basic Concepts, Multimedia Storage Devices, Multimedia Highway, Multimedia Applications; Stages of Multimedia projects; Team for Multimedia Development; Macintosh Versus Windows, Networking Macintosh and Windows computers, connections, Memory and Storage Devices, Input Devices.
- 2 **Multimedia Text and Sound:** Text-Power and Meaning, Fonts and Faces, Using Text in Multimedia; Computers and Text, Font Editing and Design Tools, Hypermedia and Hypertext; Sound-Power of Sound, Multimedia Systems Sound, Digital Audio, Making MIDI Audio, Audio File Formats, MIDI vs Digital Audio, Sound in Multimedia Applications, Music CDs and Audio Production Guidelines.
- 3 **Multimedia Images, Animation and Video:** Still Images and Vector Graphic, Bitmaps, Vector Drawings, 3-D Drawing and Rendering, Color and Image File Formats; Animation-Power, Principles, Techniques, File Formats, Developing Animation; Video-Using Video, Working of Videos, Analog Standards, NTSC, PAL, SECAM and ATSC DTV; Digital Display Standards; Digital Video, Video recording etc; Shooting, Editing Video; Storyboarding, Platform, Lighting, Chroma Keys etc; and Optimizing Video File Storages.
- 4 **Multimedia Authoring and Basic software Tools:** Instant Multimedia, types of Authoring Tools, Card-and page-Based Authoring Tools, Icon-and Object based Authoring Tools, Time-Based authoring Tools, Cross-Platform Authoring Notes; Text and Word processing Tools, OCR software, Painting and Drawing Tools, 3-D modeling and Animation Tools, Image Editing Tools, Animation, Video, and Digital Movie Tools.

Text Books

- 1 T. Vaughn: Multimedia – Making it Work, Tata McGraw Hill, 2010
- 2 Li and M. S. Drew, Fundamentals of Multimedia, PE, 2005

BCS 6.1:LAB (Dreamweaver +MX Flash)

UNIT –WISE SYLLABUS

- 1 Home page design with text, graphics & flashing objects.
- 2 Converting bitmaps to symbols and using guide layers; Bitmap masking, Gradient color fill, Text shape, Movie clip, Button inside movie clip.
- 3 Spot light animation, Motion create motion twin, Text masking with pencil.
- 4 Animation Pre-process: script writing, story boarding, and character development; Designing expressive, versatile characters, invent creative animated transitions, and explore the relationship between sound and image.
