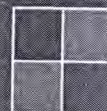2012

# B. Sc. (Pass) Curriculum
(Semester System-Computer Science Component)

## Department of Computer Science

## Faculty of Natural Science

Jamia Millia Islamia, New Delhi, India

Recommended (BOS, April 04, 2012) – Confirmed (BOD, May 14, 2012)

# DEPARTMENT OF COMPUTER SCIENCE

## B. Sc. (Pass) Program Structure: Computer Science Component
### (Credit-Based Semester System)

| Semester | Course Code | Course Title | Periods/ Week | Credits | Total Credits |
|----------|-------------|--------------|---------------|---------|---------------|
| I | BCS 1.1 | Computer Fundamentals | 3 | 3 | |
| | BCS 1.2 | Algorithmic Problem Solving | 3 | 3 | 8 |
| | BCS 1.3 | Lab-I (MS-Office) | 4 | 2 | |
| II | BCS 2.1 | Information Systems | 3 | 3 | |
| | BCS 2.2 | Programming with C | 3 | 3 | 8 |
| | BCS 2.3 | Lab-II (C) | 4 | 2 | |
| III | BCS 3.1 | Object Oriented Programming | 3 | 3 | |
| | BCS 3.2 | Applied Operating Systems | 3 | 3 | 8 |
| | BCS 3.3 | Lab-III ( C++) | 4 | 2 | |
| IV | BCS 4.1 | Data Structures | 3 | 3 | |
| | BCS 4.2 | Network Technologies | 3 | 3 | 8 |
| | BCS 4.3 | Lab-IV (DS with C++) | 4 | 2 | |
| V | BCS 5.1 | Database Management System | 3 | 3 | |
| | BCS 5.2 | Visual Programming | 3 | 3 | 8 |
| | BCS 5.3 | Lab-V (Oracle+VB.NET) | 4 | 2 | |
| VI | BCS 6.1 | Multimedia Applications | 3 | 3 | |
| | BCS 6.2 | Website Design and Management | 3 | 3 | 8 |
| | BCS 6.3 | Lab-VI (Dreamweaver & MX Flash ) | 4 | 2 | |
| | | | | Total Credits | 48 |

# DETAILED SYLLABI

## BCS 1.1: COMPUTER FUNDAMENTALS

1. **Computers and Data Representation Systems:** Layers of A Computing Systems; Abstraction; History of Computing Hardware and Software; Computers as a Tool & a Discipline; Ethical Issues, Digital Divide. Binary Values and Number Systems; Numbers and Computing; Positional Systems; Binary, Octal and Hexadecimal System; Arithmetic in Order Bases; Power of 2 Number Systems; Conversion from Base 10 to Other Bases; Binary Values and Computers. Data and Computers; Analog and Digital Data; Various Representations of Data.

2. **Digital Circuit Organization:** Computers and Electricity; Logic Gates; Combinatorial circuits; Adders and Multiplexers; Circuit as Memory; ICs; CPU Chips. Computer Components; Von Neumann Architecture; the Fetch-Execute Cycle; Non-Von-Neumann Architectures. I/O Devices; Memory Hierarchy: Registers, Cache, ROM, RAM, and their Relative Characteristics.

3. **Programming Languages:** Levels of Abstraction; Machine Language; Assembly Language; Pseudo-Operations; Low Level & HLL ; Decision Making; Abstraction, Translation Process; Compilers;; Interpreters; Programming Language Paradigms; Functionality of Imperative Languages; Input-Output Structures; Control Structures; OO Languages, Data Types.

4. **Data and Information Management:** Data vs Information; File Systems; File Types; File Operations and Directories. IS and Technologies; Spreadsheets; Spreadsheet Formulas; Circular References; Spreadsheet Analysis,; Database Management System; The Relational Model; Relationships; Structured Query Language; Information Security; Confidentiality, Integrity and Availability; Cryptography and Encryption Techniques.

### *Text Resources*
1. Dale & Lewis: Computer Science Illuminated, 3$^{rd}$ ed, Narosa Publishing House, 2007
2. Understanding Computers, D. Morley and C. S. Paker, 11$^{th}$ Ed , Thomson, 2012

## BCS 1.2: ALGORITHMIC PROBLEM SOLVING

1. **Fundamental of algorithms:** Introduction, problem-solving aspects, top-down design, implementation of algorithm, program verification, efficiency and analysis of algorithms; some fundamental algorithms – swapping, counting, factorial, sine function, Fibonacci series, base conversions, etc.

2. **Factoring methods and array techniques:** Square root computation, smallest divisor of an integer, greatest common divisors of two integers, generating prime numbers, computation of prime factors, generation of pseudo-random numbers etc.; introduction to arrays, array order reversal, array counting, finding the maximum number in a set, removal of duplicates from the ordered array.

3. **Merging, sorting and searching:** Introduction, two-way merge, sorting by selection, sorting by exchange, sorting by insertion and sorting by partitioning; searching techniques, binary search and hash searching.

4. **Text processing and recursive algorithms:** Text line length adjustment, left and right justification, key searching in text, linear pattern search; introduction to recursion, recursive algorithms, binary tree traversal, tower of Hanoi problem.

### *Text Resources*
1. R.G. Dromey, How to solve it by Computers, 5$^{th}$ Ed. Pearson Education, 2007.
2. Deitel and Deitel, C - How to program, Pearson Education. 3$^{rd}$ Ed, 2001

## BCS 1.3: LAB-I (MS-OFFICE)

- Creation of cover letter/resume with photograph, tabular data, bullets & numbers, etc.
- Creation of an attractive flyer with title, picture and borders
- Preparation of a short document of an article with necessary contents and formatting.
- Problems based on mail merge
- Preparation of annual sales analysis worksheet using MS-Excel.
- Preparation of balance sheet / salary calculator / mark sheet calculator using MS-Excel
- Application of various plotting tools for the analysis of data
- Problems based on what-if analysis, data filtering and charting
- Preparation of presentation as per the specification given by the teacher using PowerPoint
- Project based on presentation of contents with necessary formatting, graphs, animations, transitions, audios, videos using PowerPoint

## BCS 2.1: INFORMATION SYSTEMS

1. **Introduction to IS:** Information Technology Revolution; Dual nature of Information Systems; Future of IS Function within the firm; IS for Competitive Advantage, Making and Presenting the Business case for a System, Competitive Advantage in Being at the Cutting Edge.

2. **Telecommunications and the Internet:** Role of Telecommunications and Networks in organizations; Evolution of Computer Networking: PBX, LAN, WAN, PAN, Evolution of Internet and WWW, TCP/IP, DNS, WWW Architectures and application.

3. **E-Commerce:** Internet and WWW capabilities, Electronic Commerce defined, Electronic Commerce business strategies, Business-to-Business Electronic Commerce, Career Implications, The formula for electronic Commerce Success

4. **IS Development and Acquisition:** Need for structured Systems Development, Steps in the system Development Process, approaches to designing and building systems, Need for Alternatives to Building Systems Yourself, Common Alternatives to in-House Systems Development, IS Ethics, Computer Crime and Security.

**\*Text resources\***
1. Leonard Jesup, Joseph Valacich, Information Systems Today; PHI, 3003
2. Alter Steven: Information Systems – The Foundations of E-Business, 4th Ed, PE.2002

## BCS 2.2: PROGRAMMING WITH C

1. **Fundamental Concepts :** 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.

2. **Input/Output Functions and Flow Controls:** getchar(), putchar(), scanf(), printf(), gets(), puts() functions 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 Resources\***
1. Programming in C by E Balagurusamy, 5 ed, 2011.
2. Deitel & Deitel: C – How to Program, 3rd Ed., Pearson Education, 2001

## BCS 2.3 : LAB-II (C)

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

## BCS 3.1: OBJECTED ORIENTED PROGRAMMING

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 Resources\***
1. E. Balagrurusamy, Object Oriented Programming with C++, TMH, 2008
2. Deitel and Deitel, C++ How to program, PHI, 4th Ed, 2003

## BCS 3.2 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 Resources\***
1. Silberschatz, Galvin and Gagne, Operating System Concept, John Willey, 8th Edition (2009).
2. Guide to Operating System by Michael Palmer, Thomson Learning,2007

## BCS 3.3: LAB-III (C++)

- Implementation of simple classes like Rectangle, Circle, Sphere, Triangle etc.
- Implementation of some complex classes like Matrix, Complex Number, Vector, Decimal etc.
- Implementation of Matrix, Complex number, Vector etc. classes with function overloading and constructor functions.
- Implementation of some classes with operator over loadings.
- Implementation of some classes like Square Matrix, Box etc. with the help of inheritance.
- Implementation of generic classes like Stack, Queue etc.
- Implementation of some simple classes with function overriding.
- Implementation of some classes with << and >> operator over loading.
- Problems based on simple file handling.
- 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 4.1 Data Structures

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:** 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. 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, Introduction to Queues; Array Representation of Queue; Linked Representation of Queue; Applications of Queue.

3. **Tables, Information Retrieval & Trees:** Introductions; Rectangular Arrays; Tables of Various Shapes; Tables: A New abstract Data type; Application: Radix sorts; Hashing. 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.

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 Resources*

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

## BCS 4.2 Network Technologies

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 Male Transfer Protocol (SMTP), POP3; FTP, TELNET, World Wide Web and Hyper Text Transfer Protocol, Network Management.

### *Text Resources*

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

## BCS 4.3: LAB-IV (DS with C++)

- Implantation of Array, UpperTrangular Matrix , Diagonal Matrix  classes.
- Implementation of Single Linked list classes.
- Implementation of doubly Linked list classes.
- Implementation of generic Stack class using arrays and pointers.
- Implementation of Queue and Circular queue classes using arrays and pointers.
- Evaluation of postfix expression using Stack.
- Conversion of infix to postfix using Stack.
- Implementation of Binary Tree class using array.
- Implementation of Binary Search Tree class using linked.
- Implementation Graph classes.

## BCS 5.1: Database Management System

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 resources*

1   B. 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 5.2: Visual Programming

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 1F 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 resources*

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

## LAB-V (BCS 5.3: ORACLE +VB.NET)

+ Implementation of DDL statements to create and manage tables.
+ Implementation of retrieving data using the SQL SELECT statement.
  Implementation of data manipulation and storage; conversion functions & conditional expressions; aggregated data using group functions.
+ Implementation of display data from multiple tables; usage of sub queries to solve queries.
+ Implementation of writing executable statements in PL/SQL and control structures.
+ Problems on creation of forms with different controls, Decisions, conditions & Exception Handling.
+ 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.

## BCS 6.1: MULTIMEDIA APPLICATIONS

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 Resources*

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

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## BCS 6.2: WEBSITE DESIGN AND MANAGEMENT

1. **Web basics and overview:** Introduction to networking, the Internet, domain name system, the Web, content type, Web hosting, domain registration, what are name servers, web development process, dynamic generation of web pages, protocols – HTTP, FTP and SMTP.

2. **Creating web pages (XHTML):** HTML basics, elements and entities, history of HTML, XHTML syntax, core attributes, heading, paragraphs, controlling presentation styles, colors, text fonts, lists, hyperlinks, images, image maps, tables, head elements, frames, forms and introduction to CSS.

3. **Web design basics:** What is design, design and perception, brief history of design on the Web, elements of design, unity and variety, emphasis, focal point and hierarchy, contrast, visual balance, layout overview, Website architecture, information architecture, Types of web editors, WYSIWYG editors.

4. **Client-side scripting (JavaScript) and Web servers:** Embedding JavaScript in a webpage, rollovers, preloading images, making comparisons, built-in functions, matching patterns, JavaScript objects, Windows, creating user interactions, a conversion calculator, form checking, testing and debugging; *Introduction to Web servers* – IIS; HTTP request types, client-side versus server-side scripting.

### *Text Resources*

1. Wang and Katila, An introduction to Web design + programming, Cengage Learning, 2008
2. Deitel, Internet and world wide Web: How to program, PHI, 2nd ed, 2002.

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## BCS 6.3:LAB-V (Dreamweaver +MX Flash)

+ Creation of web pages with some specific requirements
+ Creation of a home page for any website with images, tabular data, menus, links, etc.
+ Creation of login screens with necessary labels, text boxes, check boxes and buttons
+ Creation of frame-based web pages
+ Problems based on cascading style sheets (CSS)
+ Creation of GUI-based calculators using JavaScript
+ Home page design with text, graphics & flashing objects.
+ Converting bitmaps to symbols and using guide layers; Bitmap masking, Gradient color fill, Text shape, Movie clip, Button inside movie clip
+ Spot light animation, Motion create motion twin, Text masking with pencil
+ 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