

Syllabus for Computer Applications

B.Sc. & B.A Programme under **Choice Based Credit System**

Code	Course Title	Course Type	HpW	Credits
SEMESTER – I				
BS106	Programming in C	DSC-3A	4T+2P=6	4 + 1 =5
SEMESTER – II				
BS206	Programming in C++	DSC-3B	4T+2P=6	4 + 1 =5
SEMESTER – III				
BS301	SEC	SEC-1	2T	2
BS306	Relational Database Management Systems	DSC-3C	4T+2P=6	4 + 1 =5
SEMESTER – IV				
BS401	SEC	SEC-2	2T	2
BS406	Computer Networks	DSC-3D	4T+2P=6	4 + 1 =5
SEMESTER – V				
BS501	Information Technologies –1	GE-1	2	2
BS502	SEC	SEC-3	2	2
BS505	Multimedia Systems	DSC-3E	3T+2P=5	3 + 1 =4
BS506	Elective-A: Web Technologies	DSE-1E	3T+2P=5	3 + 1 =4
	Elective-B: Visual Programming	DSE-2E		
SEMESTER – VI				
BS601	Information Technologies –2	GE-2	2T	2
BS602	SEC	SEC-4	2T	2
BS605	Mobile Applications	DSC-3F	3T+2P=5	3 + 1 =4
BS606	Elective-A: PHP Programming	DSE-1F	3T+2P=5	3 + 1 =4
	Elective-B: Information Security and Cyber Laws	DSE-2F		
Total Number of Credits				48

Theory: 4 credits and Practical: 1 credit
Theory: 4 Hours/Week and Practical: 2 Hours/Week

Unit – I

Computer Fundamentals: Introduction of Computers, Classification of Computers, Anatomy of a Computer, Memory Hierarchy, Introduction to OS, Operational Overview of a CPU.

Program fundamentals: Generation and Classification of Programming Languages, Compiling, Interpreting, Loading, Linking of a Program, Developing Program, Software Development.

Algorithms: Definitions, Different Ways of Stating Algorithms (Step-form, Pseudo-code, Flowchart), Strategy for Designing Algorithms, Structured Programming Concept.

Basics of C: Overview of C, Developing Programs in C, Parts of Simple C Program, Structure of a C Program, Comments, Program Statements, C Tokens, Keywords, Identifiers, Data Types, Variables, Constants, Operators and Expressions, Expression Evaluation–precedence and associativity, Type Conversions.

Unit – II

Input-Output: Non-formatted and Formatted Input and Output Functions, Escape Sequences,

Control Statements: Selection Statements – if, if-else, nested if, nested if-else, comma operator, conditional operator, switch; Iterative Statements – while, for, do-while; Special Control Statement – goto, break, continue, return, exit.

Arrays and Strings: One and Two Dimensional Arrays, Character Arrays, Functions from ctype.h, string.h.

Unit – III

Functions: Concept of Function, Using Functions, Call-by-Value Vs Call-by-reference, Passing Arrays to Functions, Scope of Variables, Storage Classes, Inline Functions, and Recursion.

Pointers: Introduction, Address of Operator (&), Pointer, Uses of Pointers, Arrays and Pointers, Pointers and Strings, Dynamic Memory Allocation.

Unit – IV

User-defined Data Types: Declaring a Structure (Union) and its members, Initialization Structure (Union), Accessing members of a Structure (Union), Structures Vs Unions, Enumeration Types.

Files: Introduction, Using Files, Working with Text Files and Binary Files, Other File Management Functions.

Text Pradip Dey, Manas Ghosh, *Computer Fundamentals and Programming in C (2e)*

References

1. Ivor Horton, *Beginning C*
2. Herbert Schildt, *The Complete Reference C*
3. Paul Deitel, Harvey Deitel, *C How To Program*
4. Byron S. Gottfried, *Theory and Problems of Programming with C*
5. Brian W. Kernighan, Dennis M. Ritchie, *The C Programming Language*
6. B. A. Forouzan, R. F. Gilberg, *A Structured Programming Approach Using C*

106

C Lab

Practical: 2 Hours/Week

Credit: 1

1. Write a program to find the largest two numbers using if and conditional operator.
2. Write a program to calculate arithmetic operations of two numbers using switch.
3. Write a program to print the reverse of a given number.
4. Write a program to print whether the given number is a prime or not.
5. Write a program to find largest and smallest elements in a given list of numbers.
6. Write a program to find the sum of two matrices.
7. Write a program to find the product of two matrices.
8. Write a program to print the reverse of a given string.
9. Write a program to find the factorial of a positive integer using iteration and recursion.
10. Write a program to find the GCD of two positive integers using iteration and recursion.
11. Write a program to demonstrate the call by value and the call by reference concepts.
12. Write a program to illustrate the use of Enumeration data type.
13. Write a program to illustrate the use of structure concept.
14. Write a program to illustrate the use of union concept.
15. Write a program to write content into a file and display contents of a file
16. Write a program to copy content of one file into another file and display the content of new file.

Note:

1. Write the Pseudo code and draw Flow Chart for the above programs.
2. Recommended to use Open Source Software: GCC on Linux; DevC++ (or) CodeBlocks on Windows 10.

Theory: 4 credits and Practical: 1 credit
Theory: 4 Hours/Week and Practical: 2 Hours/Week

Unit – I

Introduction to C++: Applications, Example Programs, Tokens, Data Types, Variables, Operators, Expressions, Control Structures, Arrays, Strings, Pointers.

Functions: Introduction, Prototype, Passing Data by Value, Reference Variables, Using Reference Variables as Parameters, Inline Functions, Default Arguments, Overloading Functions, Passing Arrays to Functions.

Unit – II

Object Oriented Programming: Procedural Programming Vs Object-Oriented Programming, Terminology, Benefits, Languages, and Applications.

Classes: Introduction, Defining an Instance of a Class, Why Have Private Members? Separating Class Specification from Implementation, Inline Member Functions, Constructors, Passing Arguments to Constructors, Destructors, Overloading Constructors, Private Member Functions, Instance and Static Members, Friends of Classes, Member-wise Assignment, Copy Constructors, Operator Overloading.

Unit – III

Inheritance: Introduction, Protected Members and Class Access, Base Class Access Specification, Constructors and Destructors in Base and Derived Classes, Redefining Base Class Functions, Polymorphism and Virtual Member Functions, Abstract Base Classes and Pure Virtual Functions, Multiple Inheritance.

C++ Streams: Stream Classes, Unformatted I/O Operations, Formatted I/O Operations.

Unit – IV

Exceptions: Introduction, Throwing an Exception, Handling an Exception, Object-Oriented Exception Handling with Classes, Multiple Exceptions, Extracting Data from the Exception Class, Re-throwing an Exception.

Templates: Function Templates–Introduction, Function Templates with Multiple Type, Overloading with Function Templates, Class Templates – Introduction, Defining Objects of the Class Template, Class Templates and Inheritance.

Text Tony Gaddis, *Starting out with C++: from control structures through objects (7e)*

References

1. B. Lippman, *C++ Primer*
2. Bruce Eckel, *Thinking in C++*
3. K.R. Venugopal, *Mastering C++*
4. Herbert Schildt, *C++: The Complete Reference*
5. Bjarne Stroustrup, *The C++ Programming Language*
6. Sourav Sahay, *Object Oriented Programming with C++*

206

C++ Lab

Practical: 2 Hours/Week

Credit: 1

1. Write a program to print the sum of digits of a given number
2. Write a program to check whether the given number is Armstrong or not
3. Write a program to check whether the given string is Palindrome or not
4. Write a program to read the student name, roll no, marks and display the same using class and object.
5. Write a program to find area of a rectangle, circle, and square using class and object.
6. Write a program to implement inline function inside and outside of a class for
 - a. Finding the area of a square
 - b. Finding the area of a cube
7. Write a program to implement friend function and friend class
8. Write a program to implement constructor and destructor with in a class.
9. Write a program to demonstrate hierarchical inheritance.
10. Write a program to demonstrate multiple inheritances.
11. Write a program to demonstrate the constructor overloading.
12. Write a program to demonstrate static polymorphism.
13. Write a program to demonstrate dynamic polymorphism.
14. Write a program to implement polymorphism using pure virtual functions.
15. Write a program to demonstrate the function templates and class templates.
16. Write a program to demonstrate exception handling using try, catch, and finally.

Note: Recommended to use Open Source Software: GCC on Linux; DevC++ (or) CodeBlocks on Windows 10.

MOOCs (Massive Online Open Courses) Free Resources

E-Learning:

- NPTEL :nptel.ac.in [Core Subjects Certification]
- C++ INSTITUTE :cppinstitute.org [C++ Certification]
- ORACLEEDUCATION :education.oracle.com [Java, DBMS Certification]
- BIG DATA UNIVERSITY :bigdatauniversity.com [Big Data Certification]
- COURSERA :coursera.org [Core Subjects Certification]
- CODEACADEMY :codecademy.com [Coding Certification]
- KHANACADEMY :khanacademy.org [Core Subjects Certification]
- PIXAR IN A BOX :khanacademy.org/partner-content/pixar
- VIDEOLECTURES :videlectures.net
- YOUTUBEEDU :plus.google.com/+YouTubeEDU/posts
- DISNEY RESEARCH :disneyresearch.com
- ALISON :alison.com [Core Subjects Certification]
- INTERNET ARCHIVE :archive.org

Freeware:

- SCILAB : scilab.org [MatLab Equivalent]
- GEOGEBRA :geogebra.org [Software for Class Room Teaching]

Search Engine:

- WOLFRAM ALPHA :wolframalpha.com [Computing Engine]
- CITSEER :citseerx.ist.psu.edu [Searching Research Articles]
- DOAJ :doaj.org [Open Access to Journals]

DSC–3C

Relational Database Management Systems

BS306

Theory	4 Hours/Week	4 credits
Practical	2 Hours/Week	1 credit

Unit – I

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMSs, The Three-Level ANSI-SPARC Architecture, Database Languages, Data Models, Functions of a DBMS, Components of a DBMS.
 Relational Model: Introduction, Terminology, Integrity Constraints, Views.

Unit – II

SQL: Introduction, Data Manipulation–Simple Queries, Sorting Results, Using the SQL Aggregate Functions, Grouping Results, Sub-queries, ANY and ALL, Multi-table Queries, EXISTS and NOT EXIST, Combining Result Tables, Database Updates.
 SQL: The ISO SQL Data Types, Integrity Enhancement Feature–Domain Constraints, Entity Integrity, Referential Integrity, General Constraints, Data Definition–Creating a Database, Creating a Table, Changing a Table Definition, Removing a Table, Creating an Index, Removing an Index, Views–Creating a View, Removing a View, View Resolution, Restrictions on Views, View Updatability, WITH CHECK OPTION, Advantages and Disadvantages of Views, View Materialization, Transactions.

Unit – III

Advanced SQL: The SQL Programming Language–Declarations, Assignments, Control Statements, Exceptions, Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers, Recursion.
 Entity–Relationship Modeling: Entity Types, Relationship Types, Attributes, Keys, Strong and Weak Entity Types, Attributes on Relationships, Structural Constraints, Problems with ER Models–Fan Traps, Chasm Traps.
 Enhanced Entity–Relationship Modeling: Specialization/Generalization, Aggregation, Composition.

Unit – IV

Functional–Dependencies: Anomalies, Partial Functional Dependency, Transitive Functional Dependency.
 Normalization: The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, Functional Dependencies in brief, The Process of Normalization, 1NF, 2NF, 3NF, BCNF. The Database Design Methodology for Relational Databases (Appendix–D).
 Transaction Management: Transaction Support–Properties of Transactions, Database Architecture, Concurrency Control–The Need for Concurrency Control, Serializability and Recoverability, Locking Methods, Deadlock, Time Stamping Methods.

Text

Thomas M. Connolly, Carolyn E. Begg, *Database Systems–A Practical Approach to Design, Implementation, and Management (6e)*

References

Sharon Allen, Evan Terry, *Beginning Relational Data Modeling*
 Jeffrey A. Hoffer, V. Ramesh, Heikki Topi, *Modern Database Management*
 Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*
 Ramez Elmasri, Shamkant B. Navathe, *Fundamentals of Database Systems*
 Abraham Silberschatz, Henry F. Korth, S. Sudarshan, *Database System Concepts*
 Carlos Coronel, Steven Morris, Peter Rob, *Database Systems: Design, Implementation, and Management*

Relational Database Management Systems Lab**BS306****Practical**

2 Hours/Week

1 credit

Consider the relational schema for part of the **DreamHome** case study is:

Branch (branchNo, street, city, postcode)

Staff (staffNo, fName, IName, position, sex, DOB, salary, branchNo)

PropertyForRent (propertyNo, street, city, postcode, type, rooms, rent, ownerNo, staffNo, branchNo)

Client (clientNo, fName, IName, telNo, prefType, maxRent, eMail)

PrivateOwner (ownerNo, fName, IName, address, telNo, eMail, password)

Viewing (clientNo, propertyNo, viewDate, comment)

Registration (clientNo, branchNo, staffNo, dateJoined)

1. Create a database with name "DreamHome" and now create all the tables listed above with constraints.
2. Insert a new row into the table supplying data for all columns.
3. Modify data in the database using UPDATE
4. Delete data from the database using DELETE
5. Changing a table definition using ALTER
6. Removing a table using DROP
7. Removing rows in table using TRUNCATE
8. Create an index and removing an index
9. Practice other standard SQL commands for creating, modifying, displaying data of tables.
10. List full details of all staff.
11. List all staff with a salary greater than £10000.
12. List the property numbers of all properties that have been viewed.
13. Produce a list of salaries for all staff, showing only the staffNo, fName, IName, and salary details.
14. List all cities where there is either a branch office or a property for rent.
15. List all cities where there is a branch office but no properties for rent.
16. List all cities where there is both a branch office and at least one property for rent.
17. List the names and comments of all clients who have viewed a property for rent.
18. Produce a status report on property viewings.
19. List complete details of all staff who work at the branch in Glasgow.
20. List the addresses of all branch offices in London or Glasgow
21. List all staff with a salary between £20,000 and £30,000.
22. Identify all clients who have viewed all properties with three rooms.
23. How many properties cost more than £350 per month to rent?
24. How many different properties were viewed in May 2013?
25. Find the total number of Managers and the sum of their salaries.
26. Find the minimum, maximum, and average staff salary.
27. Find the number of staff working in each branch and the sum of their salaries.
28. List all managers and supervisors.
29. Find all owners with the string 'Glasgow' in their address.
30. List the details of all viewings on property PG4 where a comment has not been supplied.
31. Produce a list of salaries for all staff, arranged in descending order of salary.
32. Produce an abbreviated list of properties arranged in order of property type.
33. Find the number of staff working in each branch and the sum of their salaries.
34. For each branch office with more than one member of staff, find the number of staff working in each branch and the sum of their salaries.
35. List the staff who work in the branch at '163 Main St'.
36. List all staff whose salary is greater than the average salary, and show by how much their salary is greater than the average.
37. List the properties that are handled by staff who work in the branch at '163 Main St'.
38. Find all staff whose salary is larger than the salary of at least one member of staff at branch B003.
39. Find all staff whose salary is larger than the salary of every member of staff at branch B003
40. List the names of all clients who have viewed a property, along with any comments supplied.
41. For each branch office, list the staff numbers and names of staff who manage properties and the properties that they manage.
42. For each branch, list the staff numbers and names of staff who manage properties, including the city in which the branch is located and the properties that the staff manage.
43. Find the number of properties handled by each staff member, along with the branch number of the

member of staff.

44. List all branch offices and any properties that are in the same city.
45. List all properties and any branch offices that are in the same city.
46. List the branch offices and properties that are in the same city along with any unmatched branches or properties.
47. Find all staff who work in a London branch office.
48. Construct a list of all cities where there is either a branch office or a property.
49. Construct a list of all cities where there is both a branch office and a property.
50. Create a view so that the manager at branch B003 can see the details only for staff who work in his or her branch office.
51. Create a view of the staff details at branch B003 that excludes salary information, so that only managers can access the salary details for staff who work at their branch.
52. Create a view of staff who manage properties for rent, which includes the branch number they work at, their staff number, and the number of properties they manage.
53. Removing a view using DROP VIEW
54. Give the user with authorization identifier Manager all privileges on the Staff table.
55. Give users Personnel and Director the privileges SELECT and UPDATE on column salary of the Staff table.
56. Revoke the privilege SELECT on the Branch table from all users.
57. Revoke all privileges you have given to Director on the Staff table.
58. Demonstrate exceptions in PL/SQL
59. Demonstrate cursors in PL/SQL
60. Write PL/SQL queries to create procedures.
61. Write PL/SQL queries to create functions.
62. Write PL/SQL queries to create package.
63. Write PL/SQL queries to create triggers.
64. Write PL/SQL queries using recursion.

Consider the relational schema for part of the **Hotel** case study is:

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

65. Create a database with name "Hotel" and now create all the tables listed above with constraints.
66. Insert a new row into the table supplying data for all columns.
67. Modify data in the database using UPDATE
68. Delete data from the database using DELETE
69. Changing a table definition using ALTER
70. Removing a table using DROP
71. Removing rows in table using TRUNCATE
72. Practice other standard SQL commands for creating, modifying, displaying data of tables.
73. List full details of all hotels.
74. List full details of all hotels in London.
75. List the names and addresses of all guests living in London, alphabetically ordered by name.
76. List all double or family rooms with a price below £40.00 per night, in ascending order of price.
77. List the bookings for which no dateTo has been specified.
78. How many hotels are there?
79. What is the average price of a room?
80. What is the total revenue per night from all double rooms?
81. How many different guests have made bookings for August?
82. List the price and type of all rooms at the Grosvenor Hotel.
83. List all guests currently staying at the Grosvenor Hotel.
84. List the details of all rooms at the Grosvenor Hotel, including the name of the guest staying in the room, if the room is occupied.
85. What is the total income from bookings for the Grosvenor Hotel today?
86. List the rooms that are currently unoccupied at the Grosvenor Hotel.
87. What is the lost income from unoccupied rooms at the Grosvenor Hotel?
88. List the number of rooms in each hotel.
89. List the number of rooms in each hotel in London.
90. What is the average number of bookings for each hotel in August?
91. What is the most commonly booked room type for each hotel in London?
92. What is the lost income from unoccupied rooms at each hotel today?
93. Insert rows into each of these tables.

94. Update the price of all rooms by 5%.
95. Investigate the SQL dialect on any DBMS that you are currently using. Determine the system's compliance with the DML statements of the ISO standard. Investigate the functionality of any extensions that the DBMS supports. Are there any functions not supported?
96. Demonstrate that queries written using the UNION operator can be rewritten using the OR operator to produce the same result.
97. Apply the syntax for inserting data into a table.
98. Create a view containing the cheapest hotels in the world.
99. Create the Hotel table using the integrity enhancement features of SQL.
100. Create a database trigger for the following situations:
 - (a) The price of all double rooms must be greater than £100.
 - (b) The price of double rooms must be greater than the price of the highest single room.
 - (c) A booking cannot be for a hotel room that is already booked for any of the specified dates.
 - (d) A guest cannot make two bookings with overlapping dates.
 - (e) Maintain an audit table with the names and addresses of all guests who make bookings for hotels in London (do not store duplicate guest details).

Note: Recommended to use open source database software like [MySQL](#), [MongoDB](#), [PostgreSQL](#), etc...

In practical examination, students have to

- Create database
- Create tables with their integrity constraints.
- Insert the data into tables and then execute the queries.
- Answer any **six** queries from **ten** queries given by the examiner.

DSC–3D**Computer Networks****BS406**

Theory	3 Hours/Week	3 credits
Practical	2 Hours/Week	1 credit

Unit – I

Introduction: Computer-System Architecture, Computing Environments.
 Operating-System Structures: Operating-System Services, User Interface for Operating-System, System Calls, Types of System Calls, Operating System Structure.
 Process Concept, CPU Scheduling Concepts, Scheduling Criteria, Overview of Main Memory, Virtual Memory, Mass-Storage Structure, File Systems and File System Implementation.

Unit – II

Introduction: Data Communication Components, Line Configuration, Topologies, Transmission Mode, Categories of Networks, ISO Reference Model–Layered Architecture, TCP/IP Reference Model.
 Transmission Media: Guided Media–Twisted Pair Cable, Coaxial Cable, Optical Fiber, Unguided Media–Satellite Communication, and Cellular Telephony.

Unit – III

Data Link Layer: Error Detection–VRC, LRC, CRC, Checksum, Error Correction–Hamming Code, Burst Error Correction, Line Discipline–ENQ/ACK, Poll/Select, Flow Control–Stop-and-Wait, Sliding Window, Error Control–Stop-and-Wait ARQ, Sliding Window ARQ Go-Back-n ARQ, Selective-Reject ARQ.
 Local Area Networks: Introduction to IEEE 802, Ethernet-CSMA/CD, Implementation, Token Ring,-Token Passing, Implementation. Overview of Multiplexing and Switching.

Unit – IV

Networking and Internetworking Devices: Repeaters, Bridges, Routers, Gateways, Brouters, Switches, Distance Vector Routing Algorithm. Transport Layer: Duties of Transport Layer, Connection.
 Upper OSI Layers; Session Layer, Presentation Layer, Application Layer.

Text

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Concepts (9e)*
 Behrouz A. Forouzan, *Data Communication and Networking (2e Update)*

References

Andrew S. Tanenbaum, *Modern Operating Systems*
 Dhananjay M. Dhandhere, *Operating Systems – A Concept Based Approach*
 S.S. Shinde, *Computer Networks*
 William Stallings, *Data and Computer Communications*
 Andrew S. Tanenbaum, David J Wetherall, *Computer Networks*
 Behrouz A Forouzan, Firouz Mosharraf, *Computer Networks A Top-Down Approach*
 James F. Kurose, Keith W. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*

Computer Networks Lab

BS406

Practical

2 Hours/Week

1 credit

- 1 Use vi editor to create different files, writing data into files, modifying data in files.
- 2 Use different types of Unix commands on the files created in first program.
- 3 Write shell programs using 'case', 'then' and 'if' & 'else' statements.
- 4 Write shell programs using while, do-while and for loop statements.
- 5 Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number.
- 6 Write a shell script that takes a command-line argument and reports on whether it is directory, a file, or something else.
- 7 Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
- 8 Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
- 9 Write a program to create a socket and implement connect function.
- 10 Write a program to display hello world using signals.
- 11 Write a program to implement the sliding window protocol.
- 12 Write a program to implement listener and talker.
- 13 Write a program to implement TCP echo using client-server program
- 14 Write a program to implement UDP echo using client-server program.
- 15 Write a TCP client-server program to convert a given string into reverse.
- 16 Write a UDP client-server program to convert a given string into reverse.

Note: Recommended to use Open Source Software like Fedora, Ubuntu, CentOS, etc...

Write above program using C language on Unix/Linux Systems.

GE-1

Information Technologies – 1

BS501

Theory

2 Hours/Week

2 credits

Unit – I

Introduction to Computers: What is a Computer? Characteristics of Computers, Generations of Computers, Classification of Computers, Basic Computer Organization, Applications of Computers.

Input and Output Devices: Input Devices, Output Devices, Soft Copy Devices, Hard Copy Devices.

Computer Memory and Processors: introduction, Memory Hierarchy, Processor Registers, Cache Memory, Primary Memory, Secondary Storage Devices, Hard Disks, Optical Drives, USB Flash Drives, Memory Cards.

Unit – II

Computer Software: Introduction, Classification of Computer Software, System Software, Applications Software, Firmware, Middleware, Acquiring Computer Software.

Operating Systems: Introduction, Evolution of OS, Process Management, Memory Management, File Management, Device Management, Security Management, Command Interpreter, Windows, Linux.

Text Reema Thareja, *Fundamentals of Computers*

References P. K. sinha, *Computer Fundamentals*

Anita Goel, *Computer Fundamentals*

V. Rajaraman, *Fundamentals of Computers*

E. Balagurusamy, *Fundamentals of Computers*

J. Glenn Brookshear, Dennis Brylow, *Computer Science An Overview*

Note: Student friendly video lecturers pertaining to this course are available at <http://spoken-tutorial.org/>

Teachers are advised to teach this courses in the computer lab itself, so that the interested students may derive some time to perform few programs their own.

DSC–3E

Multimedia Systems

BS505

Theory	3 Hours/Week	3 credits
Practical	2 Hours/Week	1 credit

Unit – I

Multimedia: Introduction, Definitions, Where to Use Multimedia- Multimedia in Business, Schools, Home, Public Places, Virtual Reality; Delivering Multimedia.

Text: Meaning, Fonts and Faces, Using Text in Multimedia, Computers and Text, Font Editing and Design Tools, Hypermedia and Hypertext.

Images: Before You Start to Create, Making Still Images, Color.

Unit – II

Sound: The Power of Sound, Digital Audio, MIDI Audio, MIDI vs. Digital Audio, Multimedia System Sounds, Audio File Formats. Adding Sound to Your Multimedia Project.

Animation: The Power of Motion, Principles of Animation, Animation by Computer, Making Animations.

Video: Using Video, How Video Works and Is Displayed, Digital Video Containers, Obtaining Video Clips, Shooting and Editing Video.

Unit – III

Making Multimedia: The Stages of a Multimedia Project, the Intangibles, Hardware, Software, Authoring Systems.

The Internet and Multimedia: Internet History, Internetworking, Multimedia on the Web.

Designing for the World Wide Web: Developing for the Web, Text for the Web, Images for the Web, Sound for the Web, Animation for the Web, Video for the Web.

Text Tay Vaughan, *Multimedia: Making it work (8e)*

References Keyes, *Multimedia Handbook*

K. Andleigh, K. Thakkar, *Multimedia System Design*

Ralf Steinmetz, Klara Naharstedt, *Multimedia: Computing, Communications Applications*

Student friendly video lecturers pertaining to this course are available at <http://spoken-tutorial.org/>

Multimedia Systems Lab

BS505

Practical

2 Hours/Week

1 credit

Implement the followings using Blender -

- 1 Create an animation using the tools panel and the properties panel to draw the following – Line, oval, circle, pencil, brush, lasso tool etc...
- 2 Create an animation using the tools panel and the properties panel to draw the following – rectangle, square, triangle, diamond, octagon etc...
- 3 Create an animation using text tool to set the font, size, color etc.
- 4 Create an animation using free transform tool that should use followings- Move Objects, Skew Objects, Stretch Objects, Rotate Objects, Stretch Objects while maintaining proportion, Rotate Objects after relocating the center dot
- 5 Create an animation using layers having following features- Insert layer, Delete layer, Guide layer, Mask layer.
- 6 Modify the document (changing background color etc.)using the following tools Eraser tool, Hand tool, Ink bottle tool, Zoom tool, Paint Bucket tool, Eyedropper tool
- 7 Create an animation for bus car race in which both starts from the same point and car wins the race.
- 8 Create an animation for bus car race in which both starts from the same point and bus wins the race.
- 9 Create an animation in which text Hello gets converted into GoodBye (using motion/shape tweening).
- 10 Create an animation in which text gets converted into digits (like hello is 85121215).
- 11 Create an animation having five images having fade-in fade-out effect.
- 12 Create an scene to show the sunrise (using multiple layers and motion tweening)
- 13 Create an scene to show the sunset (using multiple layers and motion tweening)
- 14 Create an animation to show the ripple effect.
- 15 Create an animation (using Shape tweening and shape hints) for transforming one shape into another.
- 16 Create an animation for bouncing ball (you may use motion guide layer).

Note: Practical exercises based on concepts listed in theory using Presentation tools in office automation tool/ GIMP/Blender / Audacity/ Animation Tools/ Image Editors/ Video Editors.

DSE-1E**Web Technologies****BS506**

Theory	3 Hours/Week	3 credits
Practical	2 Hours/Week	1 credit

Unit – I

Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups
 Links and Navigation: Basic Links, Creating Links with the <a> Element, Advanced E- mail Links.
 Images, Audio, and Video: Adding Images Using the Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages.
 Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables
 Forms: Introducing Forms, Form Controls, Sending Form Data to the Server
 Frames: Introducing Frameset, <frame> Element, Creating Links Between Frames, Setting a Default Target Frame Using <base> Element, Nested Framesets, Inline or Floating Frames with <iframe>.

Unit – II

Cascading Style Sheets: Introducing CSS, Where you can Add CSS Rules.
 CSS Properties: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model.
 More Cascading Style Sheets: Links, Lists, Tables, Outlines, The :focus and :activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout with CSS
 Page Layout: Understating the Site’s Audience, Page Size, Designing Pages, Coding your Design, Developing for Mobile Devices.
 Design Issues: Typography, Navigation, Tables, Forms.

Unit – III

Learning JavaScript: How to Add Script to Your Pages, the Document Object Model, Variables, Operators, Functions, Control Statements, Looping, Events, Built- In Objects,
 Working with JavaScript: Practical Tips for Writing Scripts, Form Validation, Form Enhancements, JavaScript Libraries.
 Putting Your site on the web: Meta tags, Testing your site, Talking the Leap to Live, Telling the World about your site, Understanding your visitors.

Text Jon Duckett, *Beginning HTML, XHTML, CSS and JavaScript*

References Chris Bates, *Web Programming*
 M. Srinivasan, *Web Technology: Theory and Practice*
 Achyut S. Godbole, Atul Kahate, *Web Technologies*
 Kogent Learning Solutions Inc, *Web Technologies Black Book*
 Ralph Moseley and M. T. Savaliya, *Developing Web Applications*
 P.J. Deitel & H.M. Deitel, *Internet and World Wide Web How to program*

Web Technologies Lab**BS506****Practical**

2 Hours/Week

1 credit

- 1 a. Write a HTML program using basic text formatting tags, <h1>, <p>,
, <pre>.
b. Write a HTML page for Example Cafe using above text formatting tags.
- 2 a. Write a HTML program using presentational element tags , <i>, , <sup>, <sub>, <big>, <small>, <hr>
b. Write a HTML program using phrase element tags <blockquote>, <cite>, <abbr>, <acronym>, <code>, <address>
- 3 a. Write a HTML program using different list types.
b. Write a HTML page that displays ingredients and instructions to prepare a recipe.
- 4 a. Write a HTML program using grouping elements <div> and .
b. Write a HTML Menu page for Example cafe site.
- 5 a. Write a HTML program using images, audios, videos.
b. Write a HTML program to create your time table.
- 6 Write a HTML program to create a form using text inputs, password inputs, multiple line text input, buttons, check boxes, radio buttons, select boxes, file select boxes.
- 7 Write a HTML program to create a frames and links between frames.
- 8 Write a HTML program to create different types of style sheets.
- 9 Write a HTML program to create CSS on links, lists, tables and generated content.
- 10 Write a HTML program to create your college web site using multi column layouts.
- 11 Write a HTML program to create your college web site using for mobile device.
- 12 Write a HTML program to create login form and verify username and password using DOM
- 13 a. Write a JavaScript program to calculate area of rectangle using function.
b. Write a JavaScript program to wish good morning, good afternoon, good evening depending on the current time.
- 14 a. Write a JavaScript program using switch case?
b. Write a JavaScript program to print multiplication table of given number using loop.
- 15 a. Write a JavaScript programs using any 5 events.
b. Write a JavaScript program using JavaScript built in objects.
- 16 Write a JavaScript program to create registration form and validate all fields using form validation

DSE–2E**Visual Programming****BS506**

Theory	3 Hours/Week	3 credits
Practical	2 Hours/Week	1 credit

Unit – I

Introduction to VB: Writing windows application with VB, Programming languages -procedural, object oriented, event driven; VB Environment, Writing first VB project, compiling, debugging, and running the programs.

Controls : Introduction to controls textboxes, frames, check boxes, option buttons, images, setting borders and styles, the shape control, the line control, working with multiple controls and their properties, designing the user interface, keyboard access, tab controls, default & cancel property, coding for controls.

Variables, constants, and Calculation: Data types, naming rules and conversion, constants-named and intrinsic, declaring variables, scope of variables, val function, arithmetic operations, formatting data Counting and accumulating Sums.

Unit – II

Decisions and Conditions : If statement, Conditions-comparing numeric variables and constants, comparing strings, compound conditions (and, or, not), nested if statements, using if statements with option buttons & check boxes, displaying message in message box, input validation. Calling event procedures, debugging VB projects, Debugging Step-by-Step Tutorial.

Modular programming: Menus, using common dialog box, writing general procedure. Forms Handling : Multiple forms, creating, adding, removing forms, hide, show method, load, unload statement, me keyword, referring to objects on a different forms, Variables and constants in Multiple-Forms.

Iteration Handling: Lists Boxes and Combo Boxes, Do/loops, for/next loops, using msgbox function, using string function.

Unit – III

Arrays: control Arrays, the case structure, single-dimension arrays, for Each/Next statement, table lookup, using list boxes with array, multidimensional arrays.

Database Connectivity: VB and database, using the data control, viewing a database file- step-by-step, Navigating the Database in code, using list boxes and comboboxes as data-bound controls, adding a lookup table and navigation-stepby-step, updating a database file, Recordsets, working with database fields, creating a new Dynaset.

Advanced topics in VB: ActiveX controls, Dynamic link libraries (DLL), Multiple Document interface (MDI).

Text

Julia Case Bradley, Anita C. Millspaugh, *Programming in Visual Basic 6.0 (TMHE 2000–14th Reprint 2004)*

References

Diane Zak, *Programming with Microsoft Visual Basic 2012*

Tony Gaddis, Kip Irvine, *Starting Out With Visual Basic 2012*

Visual Programming Lab

BS506

Practical

2 Hours/Week

1 credit

- 1 Write a program to print a table of numbers from 5 to 15 and their squares and cubes.
- 2 Write a program to print the largest of three numbers.
- 3 Write a program to print the factorial of a number.
- 4 Write a program to print the GCD of any two positive integers.
- 5 Write a program to print the given number in reverse order of digits.
- 6 Write a program to print the given number is prime or not.
- 7 Create an application that prompts the user to enter today's sales for five stores. The program should then display a simple bar graph comparing each store's sales.
- 8 Create an application that allows the user to enter each month's amount of rainfall and calculates the total and average rainfall for a year.
- 9 Write code that declares a string array with three elements and then stores your first, middle, and last names in the array's elements.
- 10 Enter a list of positive numbers terminated by zero. Find the sum and average of these numbers.
- 11 A person deposits Rs. 1000 in a fixed account yielding 5% interest. Complete the amount in the account at the end of each year for n years.
- 12 Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.
- 13 Read n numbers. Count the number of negative numbers, positive numbers and zeroes in the list. (Use arrays.)
- 14 Read a single dimension array. Find the sum and average of these numbers.
- 15 Read a two dimension array. Find the sum of two 2D Array.

Create a database Employee and Make a form to allow data entry to Employee Form with the following command buttons:

Employee Form

16	Employee Name: <input style="width: 90%;" type="text"/>								
	Employee Id: <input style="width: 90%;" type="text"/>								
	Date of Joining: <input style="width: 90%;" type="text"/>								
	Designation: <input style="width: 90%;" type="text"/>								
	Department: <input style="width: 90%;" type="text"/>								
	Address: <input style="width: 90%;" type="text"/>								
	Basic Pay: <input style="width: 90%;" type="text"/>								
<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 5px 15px;">PREV</td> <td style="padding: 5px 15px;">NEXT</td> <td style="padding: 5px 15px;">FIRST</td> <td style="padding: 5px 15px;">LAST</td> <td style="padding: 5px 15px;">ADD</td> <td style="padding: 5px 15px;">SAVE</td> <td style="padding: 5px 15px;">DELETE</td> <td style="padding: 5px 15px;">CANCEL</td> </tr> </table>		PREV	NEXT	FIRST	LAST	ADD	SAVE	DELETE	CANCEL
PREV	NEXT	FIRST	LAST	ADD	SAVE	DELETE	CANCEL		

GE-2

Information Technologies – 2

BS601

Theory

2 Hours/Week

2 credits

Unit – I

Introduction to Algorithms and Programming Languages: Algorithm, Control Structures, Flowcharts, Pseudo code, Programming Languages, Generations of Programming Languages.

Database Systems: File Oriented Approach, Database Oriented Approach, Database Views, Three-Schema Architecture, Database Models, Components of DBMS, Introduction of SQL Queries.

Unit – II

Computer Networks: Introduction, Connection Media, Data Transmission Mode, Data Multiplexing, Data Switching, Network Topologies, Types of Networks, Networking Devices, OSI Model.

The Internet: Internet Services, Types of Internet Connections, Internet Security.

Emerging Computer Technologies: Distributed Networking, Peer-to-peer Computing, Grid Computing, Cloud Computing, Utility Computing, OnDemand Computing, Wireless Network, Bluetooth, Artificial Intelligence.

Text Reema Thareja, *Fundamentals of Computers*

References P. K. sinha, *Computer Fundamentals*
Anita Goel, *Computer Fundamentals*
V. Rajaraman, *Fundamentals of Computers*
E. Balagurusamy, *Fundamentals of Computers*
J. Glenn Brookshear, Dennis Brylow, *Computer Science An Overview*

Note: Student friendly video lecturers pertaining to this course are available at <http://spoken-tutorial.org/>
Teachers are advised to teach this courses in the computer lab itself, so that the interested students may derive some time to perform few programs their own.

DSC–3F**Mobile Applications****BS605**

Theory	3 Hours/Week	3 credits
Practical	2 Hours/Week	1 credit

Unit – I

Introduction to Programming and App Inventor: Introduction, What Is a Computer Program? Introducing App Inventor, Getting Hands-On with App, Tutorial 1-1,1-2,1-3,1-4 Working with Media: Displaying Images, Tutorial 2-1,2-2,2-3,Duplicating Blocks and Using Dropdowns, Sounds, Color Blocks, Layout Components, Tutorial 2-7 Input, Variables, and Calculations: The Text Box Component, Performing Calculations, Tutorial 3-1, 3-2 ,Storing Data with Variables Tutorial 3-3, Creating Blocks with Type blocking, Math Functions.

Unit – II

Decision Blocks and Boolean: Introduction to Decision Blocks, Relational Operators and the if Block, Tutorial 4-1, The if then else Block Tutorial 4-2, A First Look At Comparing Strings, Logical Operators, Tutorial 4-4, Nested Decision Blocks, Tutorial 4-5 The if then else if Block, The Screen's Initialize Event, The ListPickerComponent, The CheckBox Component, Repetition Blocks, Times, and Dates: The Notifier Component, The while Loop, Tutorial 5-1, The for each Loop Tutorial 5-2, The Clock Component, The DatePicker Component Procedures and Functions.

Unit – III

Lists -Graphics and Animation: The Canvas Component, Tutorial 9-1, The Ball and ImageSprite Component, Tutorial 9-2, 9-3,Using the Clock Component to Create AnimationsWorking with Text: Concatenating Strings, Comparing Strings, Trimming a String, Converting Case, Finding a Substring Tutorial 10-3,Replacing a Substring , Extracting a Substring, Splitting a Substring Text to Speech and Text Messaging.

Text Tony Gaddis, Rebecca Halsey, *Starting Out with App Inventor for Android (1e)*

References Mark L. Murphy, *Beginning Android*
 J.F. DiMarzio, *Android – A Programmer's Guide*
 W Frank Ableson, Robi Sen, Chris King, *Android in Action*
 Lucas Jordan, Pieter Greyling, *Practical Android Projects*
<http://appinventor.mit.edu/>

Mobile Applications Lab

BS605

Practical

2 Hours/Week

1 credit

- 1 Create the Screen for the Hello World App
- 2 Develop a mobile app to Create Good Morning Translator App
- 3 Design a mobile app to change the Screen's Background Image
- 4 Create a mobile app for layout components and Color Blocks
- 5 Design the mobile app for the Kilometer Converter
- 6 Create mobile app to calculate Test Average
- 7 Develop a mobile app to demonstrate Range Checker
- 8 Develop a mobile app for Grader App
- 9 Design a mobile app to demonstrate checkbox components
- 10 Demonstrate a mobile app for while loop
- 11 Design a mobile app to Calculate Sum of Consecutive Numbers
- 12 Design a mobile app to create Lights
- 13 Design a mobile app to demonstrate lists
- 14 Design a mobile app to validate an Email Address
- 15 Design a mobile app to display images of all states and union territories in India
- 16 Design a mobile app of your college having college information, features, events and placements

DSE-1F**PHP Programming****BS606**

Theory	3 Hours/Week	3 credits
Practical	2 Hours/Week	1 credit

Unit – I

Introducing PHP – What is PHP? Why use PHP? Evolution of PHP, Installing PHP, Other ways to run PHP, Creating your first script. PHP Language Basics – Using variables, Understanding Data Types, Operators and Expressions, Constants. Decisions and Loops – Making Decisions, Doing Repetitive Tasks with Looping, Mixing Decisions and Looping with HTML. Strings – Creating and Accessing Strings, Searching Strings, Replacing Text with Strings, Dealing with Upper and Lowercase, Formatting Strings. Arrays – Creating Arrays, Accessing Array Elements, Looping Through Arrays with for-each, Working with Multidimensional Arrays, Manipulating Arrays.

Unit – II

Functions – What is a Function? Why Functions are useful? Calling Functions, Working with Variable Functions, Writing your own Functions, Working with References, Writing Recursive Functions. Objects – Introduction OOP Concepts, Creating Classes and Objects in PHP, Creating and using Properties, Working with Methods, Object Overloading with `_get()`, `_set()` and `_call()`, Using Inheritance to Extend Power of Objects, Constructors and Destructors, Automatically Loading Class Files, Storing as Strings. Handling HTML Forms with PHP – How HTML form works, Capturing Form Data with PHP, Dealing with Multi-Value Fields, Generating Web Forms with PHP, Storing PHP Variables in Forms, Creating File Upload Forms, Redirecting After a Form Submission.

Unit – III

Working with Files and Directories - Getting Information on Files, Opening and Closing Files, Reading and Writing to Files, Copying, Renaming, and Deleting Files, Working with Directories. Introducing Databases and SQL – Deciding How to Store Data, Understanding Relational Databases, Setting Up MySQL, A Quick Play with MySQL, Connecting MySQL from PHP. Retrieving Data from MySQL with PHP – Retrieving Data with SELECT, Creating a Member Record Viewer. Manipulating MySQL Data with PHP – Inserting, Updating, and Deleting Records.

Text Matt Doyle, *Beginning PHP 5.3* (Wrox – Wiley Publishing)

References Ellie Quigley, *PHP and MySQL by Example*
 Joel Murach, Ray Harris, *Murach's PHP and MySQL*
 Brett McLaughlin, *PHP & MySQL: The Missing Manual*
 Luke Welling, Laura Thomson, *PHP and MySQL Web Development*
 W. Jason Gilmore, *Beginning PHP and MySQL From Novice to Professional*
 Andrew Curioso, Ronald Bradford, Patrick Galbraith, *Expert PHP and MySQL*

PHP Programming**BS606****Practical**

2 Hours/Week

1 credit

- 1 a) Write a PHP script to find the factorial of a given number.
b) Write a PHP script to find the sum of digits of a given number.
- 2 a) Write a PHP script to find whether the given number is a prime or not.
b) Write a PHP script to demonstrate the use of break, continue statements using nested loops.
- 3 a) Write a PHP script to display the Fibonacci sequence with HTML page.
b) Write a PHP script to create a chess board.
- 4 a) Write a PHP script using built-in string function like strpos(), strpos(), substr_count(), etc...
b) Write a PHP script to transform a string to uppercase, lowercase letters, make a string's first character uppercase.
- 5 a) Write a PHP script that inserts a new item in an array in any position.
b) Write a PHP function to check whether all array values are strings or not.
- 6 a) Write a PHP script to count number of elements in an array and display a range of array elements.
b) Write a PHP script to sort a multi-dimensional array set by a specific key.
- 7 a) Write a PHP script using a function to display the entered string in reverse.
b) Write a PHP script using function for sorting words in a block of text by length.
- 8 a) Write a PHP script for creating the Fibonacci sequence with recursive function.
b) Write a PHP script using pass by value and pass by reference mechanisms in passing arguments to functions.
- 9 a) Write a PHP script to demonstrate the defining and using object properties.
b) Write a PHP script to demonstrate the inheritance.
- 10 a) Write a PHP script to demonstrate the object overloading with _get(), _set(), and _call().
b) Write a PHP script to demonstrate the overloading property accesses with _get() and _set().
- 11 a) Write a PHP script to demonstrate the method overloading and method overriding mechanisms.
b) Write a PHP script to demonstrate the use of final classes and final methods.
- 12 a) Write a PHP script to demonstrate the use interfaces.
b) Write a PHP script using constructors and destructors.
- 13 Write a PHP application to handling HTML forms with PHP script.
- 14 a) Write a PHP script to create a file, write data into file and display the file's data.
b) Write a PHP script to check and change file permissions, copying, renaming and deleting files.
- 15 a) Write a PHP application for connecting to MySQL and reading data from database table.
b) Write a PHP application for inserting, updating, deleting records in the database table.
- 16 Write a PHP application for student registration form.

DSE-2F

Information Security and Cyber Laws

BS606

Theory	3 Hours/Week	3 credits
Practical	2 Hours/Week	1 credit

Unit – I

Introduction to Information Systems and Security – Information Systems, Types of IS, Development of IS, Introduction to Information Security, Need for Information Security, Threats to Information Systems, Information Assurance, Cyber Security.

Introduction to Application Security and Counter Measures – Introduction to Application Security, Data Security Considerations, Security Technologies, Security Threats, Security Threats to E-Commerce.

Unit – II

E-Cash and Electronic Payment System, Credit/Debit/Smart Cards, Digital Signature, Cryptography and Encryption.

Introduction to Security Measures – Secure Information System Development, Application Development Security, Information Security Governance and Risk Management, Security Architecture and Design, Security Issues in Hardware, Data Storage, and Downloadable Devices, Physical Security of IT Assets, Backup Security Measures.

Unit – III

Introduction to Security Policies and Cyber Laws – Need for an Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual-Property- Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License.

Text

Dr. Surya Prakash T, Ritendra G, Praveen Kumar S, KLSI, *Introduction to information security and cyber laws (Dreamtech Publication)*

References

Anderson, Ross, *Security Engineering*

G.R.F. Snyder, T. Pardoe, *Network Security*

Mark Stamp, *Information Security: Principles and Practice*

A. Basta, W.Halton, *Computer Security: Concepts, Issues and Implementation*

Mark S. Merkow, Jim Breithaupt, *Information Security: Principles and Practice*

Information Security and Cyber Laws Lab

BS606

Practical

2 Hours/Week

1 credit

- 1 Demonstrate the use of Network tools: ping, ipconfig, ifconfig etc...
- 2 Demonstrate the use of Network tools: tracert, arp, netstat, whois etc...
- 3 Use of Password cracking tools: John the Ripper, Ophcrack.
Verify the strength of passwords using these tools.
- 4 Write a program for performing encryption and decryption operations of Caesar cipher.
- 5 Write a program for performing encryption and decryption operations of Rail cipher.
- 6 Write a program for performing encryption and decryption operations of Monoalphabetic cipher.
- 7 Write a program for performing encryption and decryption operations of Playfair cipher.
- 8 Write a program for performing encryption and decryption operations using Transposition technique.
- 9 Use nmap to analyze a remote machine.
- 10 Use zenmap to analyze a remote machine.
- 11 Use Burp proxy to capture and modify the message.
- 12 Demonstrate sending of a protected word document.
- 13 Demonstrate sending of a digitally signed document.
- 14 Demonstrate sending of a protected worksheet.
- 15 Demonstrate use of steganography tools.
- 16 Demonstrate use of gpg utility for signing and encrypting purposes.

MOOCs [Massive Online Open Courses] Free Resources

E-Learning:

- NPTEL :nptel.ac.in [Core Subjects Certification]
- C++ INSTITUTE :cppinstitute.org [C++ Certification]
- ORACLEEDUCATION :education.oracle.com [Java, DBMS Certification]
- BIG DATA UNIVERSITY :bigdatauniversity.com [Big Data Certification]
- COURSERA :coursera.org [Core Subjects Certification]
- CODEACADEMY :codecademy.com [Coding Certification]
- KHANACADEMY :khanacademy.org [Core Subjects Certification]
- PIXAR IN A BOX :khanacademy.org/partner-content/pixar
- VIDEOLECTURES :videlectures.net
- YOUTUBEEDU :plus.google.com/+YouTubeEDU/posts
- DISNEY RESEARCH :disneyresearch.com
- ALISON :alison.com [Core Subjects Certification]
- INTERNET ARCHIVE :archive.org

Freeware:

- SCILAB : scilab.org [MatLab Equivalent]
- GEOGEBRA :geogebra.org [Software for Class Room Teaching]

Search Engine:

- WOLFRAM ALPHA :wolframalpha.com [Computing Engine]
- CITESEER :citeseerx.ist.psu.edu [Searching Research Articles]
- DOAJ :doaj.org [Open Access to Journals]