# Bachelor of Computer Applications

## (CHOICE BASED CREDIT SYSTEM)

Submitted to

**Gauhati University**

**By**
**Department of Computer Science**
**Gauhati University,**
**Guwahati-781014**
**May 2019**

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses.

## 1. Types of courses in CHOICE BASED CREDIT SYSTEM (CBCS)

**1.1 Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

**1.2 Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

**1.2.1 Discipline Specific Elective (DSE) Course:** Elective courses offered by the main discipline/subject of study are referred to as Discipline Specific Electives.

**1.2.2 Project work/Dissertation** is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A candidate studies such a course on his own with an advisory support by a teacher/faculty member. The work done will have to be submitted in writing as a dissertation.

**1.2.3 Generic Elective (GE) Course:** Elective courses that are generic or interdisciplinary by nature are called Generic Electives. Students will have to choose one elective each in the first four semesters from the lists GE1 to GE4 given in this syllabus.

**1.3 Ability Enhancement Courses (AEC)**
The Ability Enhancement (AE) Courses are the course that leads to Knowledge enhancement. These are of two types.

**1.3.1 AE Compulsory Course (AECC):** Environmental Studies, English Communication/MIL Communication.

**1.3.2 AE Elective Course (AEEC):** AEEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc. These courses are to be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.

## 2. BACHELOR OF COMPUTER APPLICATIONS Programme Details

### 2.1. Programme Objectives:

Students who choose BCA Programme, develop the ability to think critically, logically, analytically and to use and apply current technical concepts and practices in the core development of solutions in the form of Information technology.

The knowledge and skills gained with a degree in Computer Science prepare graduates for a broad range of jobs in education, research, government sector, business sector and industry.

The program covers the various essential concepts in Computer Science. The course lays a structured foundation of Computer fundamentals, Numerical methods, Data structure, Algorithm and Complexity analysis, Software Engineering, Programming Concepts in various languages(C, C++, Java etc.), Computer Networking, System Administration, Operating System, Computer Architecture, Microprocessor, Web technology, Computer Graphics and Database management system etc.

An exceptionally broad range of topics covering current trends and technologies in computer science: Advanced web technology, Mobile application, Animation, Data mining etc. Also, to carry out the hand on sessions in Computer lab using various Programming languages and tools to have a deep conceptual understanding of the topics to widen the horizon of students' self-experience.

## 2.2. Programme Learning Outcomes:
 The completion of the BCA Programme shall enable a student to:

i) To communicate technical information both orally and in writing
ii) Apply the knowledge gained in core courses to a broad range of advanced topics in computer science, to learn and develop sophisticated technical products independently.
iii) To design, implement, and evaluate computer-based system, process, component, or program to meet desired needs by critical understanding, analysis and synthesis
iv) Identify applications of Computer Science in other fields in the real world to enhance the career prospects
v) Realize the requirement of lifelong learning through continued education and research.
vi) Use the concepts of best practices and standards to develop user interactive and abstract application
vii) Understand the professional, ethical, legal, security, social issues and responsibilities


## 2.3. Programme Structure:

The BCA programme is a three-year course divided into six-semesters. A student is required to complete 148 credits for the completion of course and the award of degree.

|  |  | **Semester** | **Semester** |
|---|---|---|---|
| **Part – I** | First Year | Semester I : 22 | Semester II : 22 |
| **Part – II** | Second Year | Semester III: 28 | Semester IV: 28 |
| **Part – III** | Third Year | Semester V:24 | Semester VI:24 |

**2.4 Eligibility**: The candidate must have passed Higher Secondary or equivalent level examination from Science/Commerce/Arts Stream. Students who have passed the Higher Secondary examination with either Mathematics or Computer Science as one of the subjects obtaining minimum pass mark in the subject should be given preference at the time of admission. Students completing Diploma in CSE/IT from AICTE recognized institutes are also eligible for taking admission. The Colleges may have their own cut-off marks which they found to be reasonable for them and/or hold admission test for the final selection of candidates. Colleges may offer bridge course in Mathematics for admitted students who did not have Mathematics at the HS level.

**2.5. Programme Implementation Requirement:**

The BCA programme is a three-year course divided into six-semesters. For proper implementation of the UGCBCS programme the following infrastructure are necessary:

a)   Sufficient lab facilities with computers and software
b)   At least 7 full time faculties.

**2.6. Instruction for questions paper setter:**

Question Paper setter should set from the prescribed text books, mentioned in the syllabus.

# 3. Credit allocation (BCA course)

| Course | *Credits | |
|---|---|---|
| | Theory+Practical | Theory+Tutorial |
| I Core Course (6 credits) | | |
| (14 papers) | 14X4=56 | 14x5=70 |
| Core Course Practical / Tutorial* (14 Papers) | 14x2=28 | 14x1=14 |
| I.             Elective Course (6 credits) (8 Papers) | | |
| A.1. Discipline Specific Elective(4 Papers) | 4x4=16 | 4x5=20 |
| A.2. Discipline Specific Elective Practical/ Tutorial* (4 Papers) | $4\times2 = 8$ | $4\times1 = 4$ |
| B.1. Generic Elective/ Interdisciplinary (4 Papers) | 4x4=16 | 4x5=20 |
| B.2. Generic Elective Practical/ Tutorial* (4 Papers) | 4x2=8 | 4x1=4 |
| Optional dissertation or project work in place of one Discipline Specific Elective paper (6 credits) in $5^{th}$ semester | | |
| 1.Ability Enhancement Compulsory Courses (AECC) (2 Papers of 4 credit each) | 2x4=4 | 2x4=8 |
| Environmental Science | | |
| English Communication | | |
| 2. Skill Enhancement Courses (SEC) (Minimum 2) (2 Papers of 4 credit each) | 2x4=8 | 2x4=8 |
| Total credit | 148 | 148 |

*Wherever there is practical, there will be no tutorial and vice-versa

# CBCS Course Structure for BCA Programme

## SEMESTER WISE PLACEMENT OF THE COURSES

| Semester | CORE COURSE (14) | Ability Enhancement Compulsory Course (AECC) (2) | Skill Enhancement Course (SEC) (2) | Elective: Discipline Specific (DSE) (4) | Elective: Generic (GE) (4) |
|---|---|---|---|---|---|
| I | BCA-HC-1016 Introduction to C programming | ENG-AE-1014 | | | Any course from the list GE-1 |
| | BCA-HC-1026 Computer Fundamentals & ICT Hardware | | | | |
| II | BCA-HC-2016 Mathematics –I | ENV-AE-2014 | | | Any course from the list GE-2 |
| | BCA-HC-2026 Digital Logic Fundamentals | | | | |
| III | BCA-HC-3016 Software Engineering | | SEC -1 | | Any course from the list GE-3 |
| | BCA-HC-3026 Data Structure and Algorithms | | | | |
| | BCA-HC-3036 Database Management System | | | | |
| IV | BCA-HC-4016 Computer Organization and Architecture | | SEC -2 | | Any course from the list GE-4 |
| | BCA-HC-4026 Mathematics-II | | | | |
| | BCA-HC-4036 Object Oriented Programming in C++ | | | | |
| V | BCA-HC-5016 Java Programming | | | DSE-1 | |
| | BCA-HC-5026 Operating System | | | DSE -2 | |
| VI | BCA-HC-6016 System Administration using Linux | | | DSE -3 | |
| | C14: BCA-HC-6026 Computer Networks | | | DSE -4 | |

Paper Code: CIT-HC-1016: Means: CIT (Subject code), HC (Course type: Honours Core), 1(Semester), 01(first paper of the semester), 6(credit).

## Skill Enhancement Course (SEC)

**SEC 1 (choose one)**
   (i)   BCA-SE-3014: Web Technology
   (ii)  BCA-SE-3024:  Programming with C#
   (iii) BCA-SE-3034: Open Source Software

**SEC 2 (choose one)**

   (i)   BCA-SE-4014: Animation
   (ii)  BCA-SE-4024: Mobile Applications
   (iii) BCA-SE-4034: Advanced Web Technology

## Discipline Specific Electives (DSE)

**DSE-1**
   (i)   BCA-HE-5016: Project Work / Dissertation (Credit: 6)

**DSE-2 (choose any One)**
   (i)   BCA-HE-5026:Data Mining & Warehousing
   (ii)  BCA-HE-5036: Computer Oriented Numerical Methods and statistical Techniques
   (iii) BCA-HE-5046: Programming in Python

**DSE-3 (choose any One)**
   (i)   BCA-HE-6016: Automata Theory and Languages
   (ii)  BCA-HE-6026: Optimization Techniques
   (iii) BCA-HE-6036: Multimedia and Applications

**DSE-4 (choose any One)**
   (i)   BCA-HE-6046: Distributed System
   (ii)  BCA-HE-6056: Microprocessor and Assembly Language Programming
   (iii) BCA-HE-6066: Artificial Intelligence

## Generic Elective (GE)

**GE 1 (choose any One)**
   (i)   BCA-HG-1016: Computer Based Accounting and Financial Management
   (ii)  BCA-HG-1026: Office Automation

**GE 2 (choose any One)**
   (i)   BCA-HG-2016:Basic Electronics
   (ii)  BCA-HG-2026:Introduction to Bio-Informatics

**GE 3 (choose any One)**
   (i)   BCA-HG-3016:Introduction to Indian History
   (ii)  BCA-HG-3026:Positive Psychology

**GE 4 (choose any One)**
   (i)   BCA-HG-4016:Introduction to Dramatic Arts
   (ii)  BCA-HG-4026:Information Security and Cyber Laws

# DETAILED SYLLABUS

## BCA-HC-1016: INTRODUCTION TO C PROGRAMMING
(Credit: 4+2=6) (L: 4, P: 4, T: 0)
Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: Overview of C** **(10 Lectures)**
Importance of C, sample C program, C program structure, executing C program. Variables, Data
Types, Constants: integer constant, real constant, character constant, string constant; Character set,
C tokens, keywords and identifiers, variables declaration, Assigning values to variables---
Assignment statement, declaring a variable as constant, as volatile.
Operators and Expression: Categories of operator- Arithmetic, Relational, logical, assignment,
increment, decrement, conditional, bitwise and special operators; arithmetic expressions, precedence
and associatively of operators, type conversions, mathematical functions Managing Input and
Output Operators: Reading and writing a character, formatted input, formatted output.

**UNIT 2: Decision Making and Branching Statement** **(8 Lectures)**
*if* statement, *if…..else* statement, nested *if…. else* statement, *switch….case* statement, *goto*
statement. Decision Making and Looping: Definition of loop, categories of loops, *for* loop *while*
loop, *do-while* loop, *break* statement, *continue* statement

**UNIT 3: Arrays** **(6 Lectures)**
Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays,
multidimensional arrays.

**UNIT 4: Functions** **(10 Lectures)**
The form of C functions, Return values and types, return statement, calling a function, categories of
functions, Nested functions, Recursion, functions with arrays, call by value, call by reference,
storage classes, Macro substitution, file inclusion.

**UNIT 5: Structures and Unions** **(8 Lectures)**
Defining, giving values to members, initialization and comparison of structure variables, array of
structure, array within structure, structure within structure, structures and functions, unions.

**UNIT 6: Pointers** **(10 Lectures)**
Definition of pointer, declaring and initializing pointers, accessing a variable through address and
through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays,
pointers and functions, pointers and structures.

**UNIT 7: File Management in C** **(8 Lectures)**
Opening, closing and I/O operations on files, random access to files, command line arguments.

## Practical / Lab work to be performed
   (**N.B:** Student has to perform **any twenty** of the following experiments)

1. Write a program to convert a given temperature value from Fahrenheit scale to Centigrade scale and vice versa.
2. Write a program to display ASCII value of a character.
3. Write a program to check whether a number is perfect or not.
4. Write a program to find out the biggest of three numbers using nested if.
5. A company insures its drivers if either of the following conditions are satisfied
    - Driver is married.
    - Driver is an unmarried, male and above 30 years of age.
    - Driver is unmarried, female and above 25 years of age.

   Write a program to decide if a driver is to be insured using logical operators.
6. Write a program to read a list of positive integers terminated by -1 and display the odd and even numbers separately and also their respective counts.
7. Write a program to read values of n and x and print the value of y using switch case where
        a. y=n+x when n=1
        b. y=1+x/n when n=2
        c. y= n+3x when n=3
        d. y=1+nx when n>3 or n<1.
8. Write a program to n values of sales and then calculate the commission on sales amount where the commission is calculated as follows:
        a. If sales <= Rs.500, commission is 5%.
        b. If sales > 500 but <= 2000, commission is Rs 35 plus 10% above Rs 500.
        c. If sales > 2000 but <= 5000, commission is Rs 185 plus 12% above Rs.2000.
        d. If sales > 5000, commission is 12.5%
9. Write a program to find out minimum, maximum, sum and average of n numbers without using array.
10. Program to find mean and standard deviation (SD) for a set of n numbers without using array.
11. Write a program to find out the roots of a quadratic equation. Use proper testing to find checks for real and complex roots.
12. Write a program to print the digits of a number in words. ( eg. if a number 841 is entered through the keyboard your program should print "Eight Four One".)
13. Write a program to print the PASCAL Triangle up to the n-th row where n is an input to the program.
14. Write a function to return the HCF of two positive integers. Write a main function to read two positive integers and print their HCF and LCM by using the above function.
15. Write a program to convert a decimal number into binary number using function.
16. Write a program to display the result of sine series using function. 17. Write a program to find the sum of the following series 1+x-x^3/3!+x^5/5!-x^7/7!+ . . . . . corrected up to the 3 decimal place.
18. Write a program to read n numbers in a sorted array and insert a given element in a particular position
19. Write functions to compute the factorial of a number using both recursive and non-recursive procedure.
20. Write a program to print the values of $_r^n c$ and $_r^n p$ for given positive integers n≥ r > 0. Use a

function fact(n) to return the factorial of a non-negative integer n.

$$\substack{n \\ r}c = n!/r!*(n-r)! \qquad \substack{n \\ r}p = n!/(n-r)!$$

21. Write a program to display the first n Fibonacci numbers using function.
22. Write a program to display the prime numbers within a given range. Write a function to check whether a given integer is prime or not and use it.
23. Write a program to Multiply two matrices using function
24. Write a program to display the upper Triangle and lower Triangle of a given square matrix using function.
25. Write a function to check if a given square matrix is symmetric or not. Write a main function to implement it.
26. Write a program to read a **m x n** matrix and calculate the Row sum and Column Sum of the matrix
27. Write a function to read in an integer and print the representation of the number using the sign and magnitude representation scheme using 8 bits. The program should check for overflow/under flow conditions. The left most bit is to be used as the sign bit.
28. Write a program to merge two sorted arrays.
29. Write a program to implement selection sort using function.
30. Write a program to count the number of vowels in a string.
31. Write a program to concatenate two strings using function (without using library function).
32. Write a program to convert a string from upper case to lower case and vice versa.
33. Write a program to swap two numbers using function (pass the pointers).
34. Write a program to sort n number of strings in ascending order using pointer.
35. Write a program using pointers to copy a string to another string variable (without using library function).
36. Declare a structure of a student with details like roll number, student name and total marks. Using this, declare an array with 50 elements. Write a program to read details of n students and print the list of students who have scored 75 marks and above.
37. Create a structure to store the following information of employees.
    a. Employee's number, name, pay and date of joining.
     It has been decided to increase the pay as per the following rules:
     Pay <= Rs.3000 : 20% increase
     Pay <= Rs.6000 but > Rs.3000 :15% increase
     Pay > Rs.6000 : no increase
    Write a program to implement the above structure.
38. Write a program to read a text file and count the number of vowels in the text file.
39. Write a program to copy a text file to another file.

**REFERENCE BOOKS**

1. Byron Gottfried, Schaum, *Outline Programming with C*, Second Edition, Tata McGraw-Hill
2. Yashavant Kanetkar, *Let Us C*, Eighth Edition, BPB Publications.
3. Kernighan and Ritchie, *The C Programming Language*, Second Edition, Prentice Hall, 1998.

# BCA-HC-1026: COMPUTER FUNDAMENTALS & ICT HARDWARE
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
## Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1:**                                                         **(20 Lectures)**

Evolution of Computer system, Classification of Computer, Modern Computer, Hardware and Software, Major components of a Digital Computer (A brief introduction of CPU, Main memory, Secondary memory devices and I/O devices) Keyboard, monitor, mouse, printers, Secondary storage devices (floppy disks, hard disks and optical disks), backup system and why it is needed? Bootstrapping a Computer, Number System: Representation of numbers (only a brief introduction to be given) and characters in computer, Binary, Hexadecimal, Octal, BCD, ASCII, EDCDIC and Gray codes, Conversion of bases, Representation of signed integers, Sign and magnitude, 1's complement and 2's complement representation. Arithmetic operations using 2's complement representation and conditions for overflow/underflow and its detection, Assembler, Compiler, Interpreter, Linker and Loader, Definition and concepts of algorithm and its different implementations-pseudo code, flowchart and Computer programs.

**UNIT 2:**                                                         **(10 Lectures)**

Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, de fragmentation, scanning for virus, formatting, installing additional HDD, New trends in HDD, Floppy Disk Drive.

**UNIT 3:**                                                         **(10 Lectures)**

Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-R, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD drives, Driver installation, Writing-cleaning CD and DVD.

**UNIT 4:**                                                         **(10 Lectures)**

Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors, Peripheral connectors. Bus slots, USB, pin connectors, Different kinds of motherboards, RAM, different kinds of RAM. RAM up gradation, Cache and Virtual Memory concept.

**UNIT 5:**                                                         **(10 Lectures)**

SMPS, BIOS, Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.


## Practical / Lab work to be performed

1.      Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Task
2.      Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva.

3.     Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

4.     Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

5.     Basic commands in Linux

6.     Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

7.     Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

8.     The test consists of various systems with Hardware / Software related troubles, formatted disks without operating systems. Installation of antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**REFERENCE BOOKS**

1. Anita Goel, *Computer Fundamentals*, Pearson, 2010
2. *Comdex: Hardware and Networking Course Kit*, DreamTech press
3. V. Rajaraman, Neeharika Adabala, *Fundamentals of Computers*, PHI, EEE 6th Edition
4. Ron Gilster, *PC hardware: A beginners Guide*, Tata McGraw Hill
5. E. Balaguruswamy, *Computer Fundamentals and C Programming*, Tata McGraw Hill

# BCA-HC-2016: MATHEMATICS –I
## (Credit: 5+1=6) (L: 5, P: 0, T: 1)
### Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Determinants and Matrices** **(22 Lectures)**

Definition and different types (such as identity matrix, diagonal matrix etc) of matrices, vectors and matrices, Addition, subtraction and multiplication of matrices, Properties of matrix operations, Existence of additive and multiplicative identity and additive inverse matrices, Transpose of a matrix and its properties. Symmetric and skew symmetric matrices, Elementary transformation of a matrix, Invertible matrices, Determinant of a square matrix, minor, cofactor, Adjoint of a matrix and matrix inversion, Determination of rank of a matrix, Eigen values and Eigen vectors of a matrix (Stressing on symmetric matrices), Cayley-Hamilton theorem – Cramer's rule, Consistency of a system of linear non-homogenous equations and existence of solutions (statement only), Simple problems, Solutions of simultaneous linear equations by Gaussian elimination method.

**UNIT 2: Complex Numbers** **(16 Lectures)**

Definition and Algebra of complex numbers, Modulus and conjugate of a complex number, Representation of complex numbers - Argrand diagram and polar representation, Roots of linear and quadratic equations in one variable, real roots, irrational roots, complex roots, Relation between the roots and the coefficients.

**UNIT 3: Limits and Derivatives** **(12 Lectures)**

Intuitive idea of limits and derivatives, Limits of polynomials and rational functions, Derivatives, Algebra of derivative of a function, Derivative of polynomials and trigonometric functions.

**UNIT 4: Calculus** **(10 Lectures)**

Roll's theorem, Lagrange's Mean Value theorem and Taylor's theorem, Meaning of the sign of derivative, indeterminate forms, maxima and minima (single variable).

**REFERENCE BOOKS**

1. Narayanan S. and Manickavachagam, *Allied Mathematics* Vol.1& Vol.2.
2. M.K. Venkataraman, NPC, *Engineering Mathematics* Vol.1 & Vol.2.

# BCA-HC-2026: DIGITAL LOGIC FUNDAMENTALS
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1:  Boolean Algebra and Logic Gates**                **(20 Lectures)**

Axiomatic definition of Boolean algebra, Rules (postulates and basic theorems) of Boolean algebra, dual and complement of Boolean expression, Canonical form and Standard form, Sum of product and product of sum form, Conversion between Boolean expression and truth table, Karnaugh map method (upto four variable kmap), Don't care condition, and Quine Mc Cluskey method, Different types of gates, Implementation of logic expression with logic gates.

**UNIT 2: Combinational Circuit**                **(12 Lectures)**

Adder: half adder, full adder, Subtractors: half subtractor and full subtractor, Magnitude comparator, Decoder, Encoder, Application examples of decoder and encoder, Multiplexer, Demultiplexer, Application examples of multiplexer and Demultiplexer.

**UNIT 3: Sequential Circuit**                **(12 Lectures)**

Simple RS flip-flop or latch, Clocked RS flip-flop, D flip-flop, JK flip-flop, T flip-flop, Analysis of Clocked Sequential circuits, State Reduction and Assignment, Flip –Flop Excitation tables, Design Procedure for sequential circuits.

**UNIT 4: Counters**                **(8 Lectures)**

Ripple counters: Binary Ripple Counter, BCD Ripple Counter, and Synchronous Counters: Binary Counter, Binary Up and down Counter, BCD Counter, Counter design using state diagram, state table and state equation.

**UNIT 5: Registers**                **(8 Lectures)**

Registers: Shift registers (serial in serial out, serial in parallel out, parallel in serial out, parallel in parallel out), Registers with parallel Load, Bidirectional shift register with parallel load.

**REFERENCE BOOKS**

1. M. M. Mano, *Digital Logic and Computer Design*, PHI, 1994
2. C. Bartee*, Computer Architecture and Logic Design*, McGraw Hill, 1991

# BCA-HC-3016: SOFTWARE ENGINEERING
## (Credit: 5+1=6)(L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Introduction** **(20 Lectures)**
Software Processes & Characteristics, Software life cycle Models: Waterfall, Prototype, Evolutionary and Spiral Models, Software Requirements analysis & specifications: Requirement engineering, requirement, elicitation techniques like FAST, QFD, requirements analysis using DFD, Data dictionaries, ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

**UNIT 2: Software Project Planning** **(10 Lectures)**
Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Risk Management.

**UNIT 3: Software Design** **(10 Lectures)**
Data design, Architectural design, Interface design, Function Oriented Design, Object Oriented Design, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Software Metrics: different types of project matrics

**UNIT 4: Software Testing and Maintenance** **(20 Lectures)**
Testing Process, Design of Test Cases, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing, Debugging Activities, Software Maintenance: Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation, Software quality Assurance, CASE tools: Analysis tools, design tools, SQA tools, software testing tools.

**REFERENCE BOOKS**

1.     Rajeev Mall  "*Software Engineering*"   PHI
2.     Pressman Roger " *Software Engineering A Practitioners Approach*"  Tata McGraw Hill
3.     James F. Peters, Witold Pedrycz "*Software Engineering An Engineering Approach*"

# BCA-HC-3026: DATA STRUCTURE AND ALGORITHMS
## (4+2=6) (L: 4, P: 4, T: 0)
## Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: Definition** (4 Lectures)

Concept of Data Types, elementary structure, words and their interpretations, packed words,

    Arrays: Types, memory representation, address translation functions for one & two dimensional arrays, different examples.

**UNIT 2: Linked Structure** (8 Lectures)

Singly and doubly linked list, circular and non circular, list manipulation with pointers, example involving insertion and deletion of elements and their comparative studies with implementations using array structure

**UNIT 3: Stacks and Queues** (6 Lectures)

Definitions, representation using array and linked list structure, application of stack and queues in simulation, postfix conversion and evolution of arithmetic expressions

**UNIT 4: Binary Trees** (12 Lectures)

Definition, quantitative properties, memory representation, Trees traversal algorithms (recursive and non-recursive), threaded trees, BFS, DFS

**UNIT 5: Searching** (10 Lectures)

Linear and binary search algorithms, performance and complexity, binary search trees (construction, insertion, deletion and search), Concept of optimal binary search trees

**UNIT 6: Sorting** (12 Lectures)

Terminology, sorting algorithms (non recursive, recursive description, Complexity, advantages and disadvantage, implementation), bubble sort, insertion sort, selection sort, tree sort, heap sort, quick sort, merge sort & radix sort, external Sorting.

**UNIT 7: Analysis of Algorithm** (8 Lectures)

Time and Space complexity of algorithms, average case and worst case analysis, asymptotic notation as a measure of algorithm complexity, $O$ and $\theta$ notations, Analysis of sorting algorithms- Selection sort, Bubble sort, Insertion sort, Heap sort, Quick sort and analysis of searching algorithms – linear search and binary search.

## Practical / Lab work to be performed

**(Write programs in C language)**
1. Implement binary search and linear search algorithms on arrays.
2. Implement following sorting algorithms:

i) Bubble sorting ii) Insertion sort iii) Heap sort iv) Quick sort v) Merge sort
3. Write a program to create a singly linked list and insert an element at the beginning, end, and at a given position of the linked list.

4. Write a program to create a singly linked list and delete an element from any position of the linked list.
5. Write a program to create a singly linked list. Write functions for
    i.  counting the number of elements in a list
    ii. to search for a given element in a list. If the item has been found then it should return the position at which the item was found; otherwise it should return -1 to indicate not found.
6. Write a function to concatenate two linked lists.
7. Write a function to merge two sorted linked lists.
8. Write a program to create a doubly linked list and insert an element at any position.
9. Write a program to create a doubly linked list and delete an element from a given position.
10. Write a program to create a circular linked list and insert / delete an element at any position.
11. Write a program to implement a stack using
     i) array structure
     ii) linked list structure
12.  Write a program to implement two stacks using a single array.
13. Write a program to evaluate a postfix expression using stack.
14. Write a program to convert an infix expression into a postfix expression.
15. Write a program to implement a queue using array.
16. Write a program to implement a queue using linked list.
17. Write a program to implement a circular queue using array.
18. Write a program to implement a circular queue using linked list.
19. Write a program to create a binary search tree using link representation and display the elements in preorder, in order and post order using recursive function.
20. Write a program to create a binary search tree using link representation and
     i) search
     ii) delete an item from the binary search tree.


**REFERENCE BOOKS**

1.        Horowitz and Sahani, Narosa, *Data Structure*
2.        A.N.Kamthane, *Introduction to Data Structures in C*, Pearson, 2007.
3.        Langsam**,** Augentein & Tanenbaum, *Data Structure using C and C++,* PHI
4.        S.K.Bandyopadhyay, K.N.Dey, *Data Structures using C,* Pearson.

# BCA-HC-3036: DATABASE MANAGEMENT SYSTEM
(Credit: 4+2=6)(L: 4, P: 4, T: 0)
Theory: 60 Lectures, Practical: 60 Lectures

**NIT 1: File Structure** **(12 Lectures)**
Record storage and primary file organization: memory hierarchies and storage devices, Storage of Databases, Placing file records on disks: Records and its Types, Files, Fixed length records and variable length records, Record Blocking, allocating file blocks on disks, operation on files, Issues in Physical Design: Concept of indexes

**UNIT 2: Overview of Database Management System** **(8 Lectures)**
Definition of Database, Traditional File Approach vs. DBMS approach, Characteristics of the Data Base Approach, DBMS user, Role of a DBA, Advantage of using DBMS, DBMS architecture, Data independence, ANSI/SPARC 3 level architecture.

**UNIT 3: Relational Models** **(20 Lectures)**
Fundamental integrity rules: entity integrity, referential integrity, Relational algebra (Select , Project, Cross ,Product , theta join, equi join, natural join, outer join ), Set Operation, ANSI SQL – 92 Standard : DDL, DML, SQL constructs(Select .. From… Where… Group by ….. Having… Order by….), Insert, Delete, Update, View, Definition and use, nested quires, Constraints considers(NOT NULL , UNIQUE, Check Primary key, Foreign key)

**UNIT 4: Database Design** **(20 Lectures)**
Conceptual model, logical model, physical model, ER model as a tool for conceptual design-entities, attributes and relationships, weak and strong entities, conversion of ER model into relational schema. DFD, Normalization: informal design guidelines for relational schemas (overview level), functional dependencies, different types of keys, Normal forms (first, second, third, BCNF), Functional dependency diagram and design of relational database from it. Database connectivity using JDBC.

## Practical / Lab work to be performed
**Each student should do at least 6 assignments from the following list. They need to connect database using JDBC.**

1. Create a table *Employee* with the following columns:
     Emp_no (numeric) primary key
     Emp_name (string)
     Join_date (Date)
     Basic_pay_fixed_at (numeric)
     Date_of_birth (Date)
  Insert the following data into the table.

| Emp_no. | Emp_name | Join_date | Basic_pay | Date_of_birth |
|---------|----------|-----------|-----------|---------------|
| 1001 | Charles Babbage | 01-Jun-2000 | 8000.00 | 03-10-1973 |
| 1002 | George Boole | 01-Jul-2001 | 5000.00 | 04-12-1972 |

| 1003 | E.F. Codd | 01-Jun-2001 | 8000.00 | 06-03-1969 |
| 1004 | Bill Gates | 01-Jul-2003 | 5000.00 | 09-10-1995 |
| 1005 | Tony Greig | 01-Aug-2004 | 8000.00 | 04-05-1985 |

2. Create the following two tables and insert data into the tables.

*Player* (Roll no.→Primary Key)

| Roll no. | Name |
| --- | --- |
| 10 | Vijay Amrithraj |
| 20 | Leander Paes |
| 30 | Mahesh Bhupathi |
| 40 | Sania Mirza |

*Match* (Match_no→Primary key,Roll no→Foreign key)

| Match_no | Roll_no. | Match_Date | Opponent |
| --- | --- | --- | --- |
| 1 | 20 | 10-Jul-2008 | Washington |
| 2 | 30 | 12-Jan-2008 | Sampras |
| 3 | 20 | 12-Aug-2008 | Borg |
| 4 | 30 | 20-Mar-2008 | Vijay |

Perform the following two operations:

(i)     Perform EQUIJOIN operation to retrieve data from both the files.
(ii)    Perform OUTERJOIN operation to retrieve the unmatched records.

3.  Design an ER diagram for a *BANK* database schema. To consider that each Bank can have multiple branches and each branch can have multiple Accounts and Loans for customer. Also to specify the non weak & weak entity types, key attributes & key types, relationship types, instances, constraints and participations.

4. Create a table *Student* taking the attributes given bellow Roll_no, Student_name, Address, Date_of_addmission, Class Section and Contact_no. Write appropriate queries to perform the following operations:

a) To insert values in the Student table.
b) To delete values from Student table
c) To list the names of all students which roll_no > 20.
d) To search for students who got admitted before 01-01-2006.
e) To change the name of the student whose roll number is 10 to Amar.

5. Create tables *Department* and *Employee* with the attributes given below.

Employee (EmpNo , Empname, Address, Dno)
Department ( Dno, Dname, Location )
*Dno* in Employee is a foreign key.

Write appropriate queries to perform the following operations:

a) To insert values in the tables.
b) To retrieve the names and addresses of all Employees working in the Finance department.
c) To print the location where Administration department is located.
d) To delete all information regarding a particular employee.

6. Create table *Student* and *Course* taking the attributes given bellow.

Student (Roll_no, Name, Semester,
Course_no(Foreign key))

Course (Course_no, Course_name)

Write appropriate queries for the following operations:

   a) To retrieve names of all students who are admitted to the course „BCA".

   b) To retrieve the names of all students whose course name is „BCA" and who are in the 3rd semester.

   c) To display details of all courses in which more than 100 students got admitted.

   d) For course being offered, display the course name and number of students admitted to the course.

7. Create tables *Employee*, *Department*, *Location*, *Works_on*, and *Project* taking the attributes given below.

   Employee (Fname, Lname, Empno, Bdate, Address, Salary, Dnumber )

   Department (Dname,Dnumber,Mgrno)

   Locations(Dnumber, DLocation)

   Works_on(Empno, Pnumber, Hours_per_day)

   Project(Pname, Pnumber, Location, Dnumber (Foreign))

   Dependent(Empno, Dependent_name, Sex, DOB, Relationship)

Write appropriate queries for the following operations:

a) Retrieve the names and addresses of all employees who work in the Finance department.

b) To retrieve the names of all employees who works on all the projects controlled by department number 6

c) For each department, print the name of the department and the name of the manager of the department.

d) Retrieve the location where the Administration department is located.

e) For every project located in Mumbai list the project number, the controlling department and department manger's name and address.

f) Find out how many employees are there in each department.

g) Find the total salary of all employees of the "Research" department, as well as the maximum, minimum and average salary in this department

h) Retrieve the name of all employees who have no dependent.

i) Alter the "Employee" table by deleting the coloumn Bdate.

j) Retrieve the Fname, Lname of all employees whose salary is higher than average salary.

k) For each department retrieve the department number, the number of employee in the department and their average salary.

l) Retrieve the name of all employees who have two or more dependent

m) Retrieve the details of all employees who works on project number 1,2,3

8. Create Table

   Client_master ( Client_no, name, address, Bdue)

   Product_master(P_number, Description, saleprice, costprice)

   Sales_master(Salesmno, Sname, Addres, Salamnt, Remarks)

   Sales_order(O_no, Client_no, Odate, Delyaddr, Salesmno)

   Sales_order_detail(Order_no, Product_no, Qtyorder, product_rate, Qty_dispatched)

Write appropriate queries to perform the following operations:

i)      List name of all clients having 'a' as the second letter in their names.
ii)     Retrieve the description and total Qty sold for each product.
iii)    Find product no. and description of non moving products (i.e product not being sold).
iv)     For each product being sold, list the product number and the total amount (in Rs.) sold.
v)      List all client who stay in 'Bangalore' or Mumbai
vi)     List the clients who stay in a city whose First letter is 'M'
vii)    Find the names of clients who had purchased the item 'Trouser'.
viii)   Find out if 'T-Shirt' has been ordered by any client and if so print the details of the client.
ix)     List details of all products whose unit price is more than Rs. 5000.00.
x)      Calculate the total amount (in Rs.) purchased by each client that has purchased items amounting more than Rs. 20000.

9.      Create table
          Author (Author_id, Name, City, Country)
          Catalog (Book_id, Title, Author1_id, Author2_id, Publisher_id, Category_id, Year, Price)
          Publisher ( Publisher_id, Name, City, Country)
          Order_details( Order_no, Book_id, Quantity)
          Category (Category_id, Description)
          Order_summary (Order_no,Member_id,Odate,Amount,Ostatus)
          Member(Member_id, Name, Address, Contact)
        Assume that all books have at most two authors. Write appropriate queries to perform the following operations:
          a) Retrieve the title, author, and publisher names of all books published in 1999 and 2006.
          b) Retrieve the title of all books whose one author is 'A Tanenbum'.
          c) Get the details of all books whose price is greater than the average price of the books.
          d) Get the names of all the books for which an order has been placed.
          e) Get the names of all authors who have more than ten books in the catalog.
          f) Get the details of the authors whose books are being sold from the book club.
          g) Get the title and price of all books whose price is greater than the maximum of the category average.

**REFERENCE BOOKS**

1.      C.J. Date, *Introduction to database management system.*
2.      Elmasri, Navathe, *Fundamentals of data base management system*
3.      Bipin C. Desai; *An introduction to Database systems*;  Galgotia publications.
4.      S.K.Singh; *Database Systems - Concept, Design and Applications*, Pearson Education.

# BCA-HC-4016: COMPUTER ORGANIZATION AND ARCHITECTURE
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Introduction** **(12 Lectures)**
Functional units of a computer, basic instructions (zero, one, two, three address, interconnection of functional units, bus structure, memory locations, memory addresses, memory operations, instruction and instruction sequencing (straight line sequencing and branching), Fixed and floating point representation of numbers, Normalized floating point representation and arithmetic operations using normalized floating point numbers, IEEE standard for binary floating point representation, Addressing modes, stack, subroutine, I/O instructions

**UNIT 2: Register Transfer Logic** **(10 Lectures)**
Introduction, inter-register transfer, arithmetic micro-operation, logic micro-operation, shift micro-operation, Conditional control statements, fixed point binary data, instruction code, design of a simple computer.

**UNIT 3: Processor Logic Design** **(8 Lectures)**
Processor organization, design of arithmetic and logic circuit, status register, design of accumulator.

**UNIT 4: Control Logic Design** **(8 Lectures)**
Hardware control, micro-programmed control block diagram, symbolic micro-program, micro-programmed CPU organization

**UNIT 5: I/O Subsystem** **(12 Lectures)**
Program controlled I/O, Interrupts: enabling and disabling interrupts, handling interrupts from multiple sources (priority control), DMA.

**UNIT 6: Memory Subsystem** **(10 Lectures)**
Semiconductor memory, SRAM, DRAM, ROM, speed size and cost, Cache memory, mapping functions

### REFERENCE BOOKS

1.      M.Morris Mano, *Digital logic and Computer Design*,  PHI publication
2.      Hamachar, Vranesic and Zaky, *Computer Architecture*.
3.      William Stallings, *Computer Organization and Architecture*; Pearson.

# BCA-HC-4026: MATHEMATICS-II
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Sets, Relations and Functions**                                    **(12 Lectures)**
Sets, relations, properties of binary relations, closures of relation, equivalence relations, equivalence classes and partitions, Partial ordering relations and lattices, Functions, one-to-one and onto, principles of mathematical induction

**UNIT 2: Graph theory**                                                     **(12 Lectures)**
Basic Definition of graph, Connectivity of graph, cut point's cycles, Hamiltonian graphs, trees, different characterization of trees, bipartite graph, Algorithms on graph, Breadth first search, Depth first search

**UNIT 3: Combinatorics**                                                    **(10 Lectures)**
Basic of counting principles, principle of inclusion-exclusion, application of inclusion and exclusion, Pigeonhole principle, generalized Pigeonhole principle and its application, permutations and combinations, permutations with repetitions, combinations with repetitions, permutations of sets with indistinguishable objects.

**UNIT 4: Matrices**                                                          **(8 Lectures)**
Row and column operations, vectors and matrices, partitioning of matrices, representing relations using matrices, Determinant of a square matrix, minor, cofactor, the Cayley-Hamilton theorem, inverse of a matrix, product form of inverse. Rank of a matrix, Solutions of simultaneous linear equations, existence of solutions and solution by Gaussian elimination, Eigen values and Eigen vectors.

**UNIT 5: Logic**                                                            **(12 Lectures)**
Connectives, truth tables, Normal forms- CNF, DNF, Converting expressions to CNF and DNF, Theory of inference, Propositional calculus, Boolean Algebra, Predicate calculus (only introduction), predicates and quantifiers

**UNIT 6: Vector Space**                                                      **(6 Lectures)**
Fields (definition with a few examples), definition and examples of vector spaces, Properties of linearly independent and dependent set of vectors, Basis and dimension of a vector space, Examples of finite dimensional vector spaces Elementary properties of $R^n$ as a vector space

**REFERENCE BOOKS**

1. *Elements of Discrete Mathematics*, C. L. Liu, Mc-Graw Hill International Ed.
2. *Discrete Mathematics and its Applications*, K. H. Rosen, Mc-Graw Hill International Ed.
3. *Discrete Mathematics structures with applications to Computer Science*, J. P. Tremblay and   R. Manohar, Mc-Graw Hill
4. *Discrete Mathematics*, N. Ch.SN Iyengar, K.A. Venkatesh, V. M. Chandrasekaran, P. S. Arunachalam, Vikash Publishing House Pvt Ltd.

# BCA-HC-4036: OBJECT ORIENTED PROGRAMMINF IN C++
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
## Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: Introduction to object oriented programming** **(10 Lectures)**

Origins of C++,  Basic Concepts of Object Oriented Programming, Benefits of OOP, Applications of OOP, Introduction to C++, Structure of a Simple C++ program, Output operator, Input operator, Cascading of I/O operators, Tokens- keyword, identifiers, constants, strings and operators. Basic data types, User defined data types, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator & applications, Member dereferencing operators, Memory Management operators, new and delete, Control Structures-simple if, if else, nested if, switch, while do, break and continue statements, Introduction to Functions-Function Prototyping, Call by reference, Return by reference, Inline functions, Default arguments, Const arguments.

**UNIT 2: Classes and objects** **(12 Lectures)**

Introduction - Defining a class-Class Vs structures, Creating objects, Accessing class members, Defining member functions- Outside the class definition, Inside the class definition, Outside functions as inline, Nesting of member functions, Private member functions, Memory allocation for objects, Array-Declaring an array-accessing elements of an array, Array of objects, Friendly functions, Constructors and destructors, Basic Concepts of constructors, Default constructor, Parameterized constructor, Multiple constructors in a class, Constructor with default arguments, Dynamic initialization of objects, Copy constructor, Dynamic constructors,Destructors

**UNIT 3: Function and operator overloading** **(10 Lectures)**

Overloading Concepts Function Overloading: Functions with different sets of parameters, default and constant parameters, Rules for overloading operators, Defining operator overloading, Overloading Unary operators, Prefix and Postfix operators overloading, Overloading Binary operators, Overloading relational operators, Overloading using friend functions, Overloading subscript operator,  Pitfalls of operator overloading, Type conversion-Basic to Class, Class to Basic

**UNIT 4: Inheritance** **(12 Lectures)**

Introduction-Defining derived classes, Types of inheritances, Making a private member inheritable, multilevel inheritance, multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors in derived classes, nesting of classes, polymorphism-Compile time and Runtime polymorphism, Pointers to objects, this pointer, Pointer to derived classes, Virtual functions, Rules for virtual functions, Pure virtual functions.

**UNIT 5: Streams** **(8 Lectures)**

C++ stream classes-put() and get() functions, getline() and write() functions, Overloading << and >>operators, Formatted Console I/O operations, ios class functions-width(), precision(), fill(), setf() and unsetf(), Formatting flags, Manipulators, User defined manipulators.

**UNIT 6: Files** (8 Lectures)

Introduction-Stream classes for files, Opening files using constructor, Opening files using open(), File modes, Detecting end of file-eof(), Sequential input and output-put() and get()-Reading and writing objects-read() and write()-Random Access files-Manipulating file.

## Practical / Lab work to be performed

1.  Define a class named *triangle* to represent a triangle using the lengths of the three sides. Write a constructor to initialize objects of this class, given the lengths of the sides. Also write member functions to check

    (a) if a triangle is isosceles

    (b) if a triangle is equilateral

    Write a main function to test your functions.

2.  Define a structure *employee* with the following specifications.

    *empno* : integer

    *ename* : 20 characters

    *basic, hra, da* : float

    *calculate()* : a function to compute net pay as basic+hra+da with float return type.

    *getdata()* : a function to read values for empno, ename, basic, hra, da.

    *dispdata()* : a function to display all the data on the screen

    Write a main program to test the program.

3.  Define a class *circle* to represent circles. Add a data member *radius* to store the radius of a circle. Write member functions area() and perimeter() to compute the area and perimeter of a circle.

4.  Define a class *complex* with two data members *real* and *imag* to represent real and imaginary parts of a complex number. Write member functions

    *rpart()* : to return the real part of a complex number

    *ipart()* : to return the imaginary part of a complex number

    *add()* : to add two complex numbers.

    *mul()* : to multiply two complex numbers.

    Write constructors with zero, one and two arguments to initialize objects. (*This is an example of polymorphism.*)

5.  Define a class *point* with two data members *xordinate* and *yordinate* to represent all points in the two dimensional plane by storing their x co-ordinate and y co-ordinate values. Write member functions

    dist() : to return the distance of the point from the origin.

    *slope():* to return the slope of the line obtained by joining this point with the origin.

    Write constructors with zero, one and two arguments to initialize objects. Also write a friend function to compute the distance between two points.

6.  Define a class *string* with the following data members char *p; int size; and write member functions to do the following (without using library function) and using dynamic memory allocation.

    - Length of the string
    - Compare two strings

- Copy one string to another
- Reverse the string

Write suitable constructors and destructors. Also write a copy constructor for the class.

7. For the class *complex* defined in 4 above, overload the <<, >>, + and * operators in the usual sense. Also overload the unary – operator.

8. For the class *string* defined in 6 above, overload the <<, >> and + operators where + is to be used for concatenating two strings.

9. Define a class *time* to store time as hour, minute and second, all being integer values. Write member functions to display time in standard formats. Also overload the ++ and -- operators to increase and decrease a given time by one second where the minute and hour values will have to be updated whenever necessary.

10. Define a class to store matrices. Write suitable friend functions to add and multiply two matrices.

11. Write a class based program implementing static members.

12. Define a class *student* with the following specification:

        rollno : integer sname : 20 characters

    Derive two classes *artst* and *scst*. The class *artst* will represent students belonging to arts stream and the class scst will represent students belonging to science stream. The artsst class will have additional data members *ph, hs, en* and as to store marks obtained by a student in three subjects Philosophy, History, English and Assamese. The class *scst* will have additional data members *ph, ch, ma and en* to store marks obtained in Physics, Chemistry, Mathematics and English. Write the following member functions in the classes artst and scst ctotal() : a function to calculate the total marks obtained by a student takedata() : function to accept values of the data members showdata() : function to display the marks sheet of a student .

13. Define an abstract base class *printer*. Derive three classes *laser-printer, line-printer* and *inkjet-printer*. The derived classes will have data members to store the features of that particular printer. Write pure virtual function display() in the base class and redefine it in the derived classes.

14. Define a abstract base class *figure* and add to it pure virtual functions

        *display()* : to display a figure
        *get()* : to input parameters of the figure
        *area()* : to compute the area of a figure
        *perimeter()* : to compute the perimeter of a figure.

    Derive three classes *circle, rectangle* and t*riangle* from it. A circle is to be represented by its radius, rectangle by its length and breadth and triangle by the lengths of its sides. Write a main function and write necessary statements to achieve run time polymorphism.

15. Write an interactive program to compute square root of a number. The input value must be tested for validity. If it is negative, the user defined function *my_sqrt()* should raise an exception.

16. Define a class *rational* to store rational numbers as a pair of integers, representing the numerator and denominator. Write a member function for setting the values of the numerator and denominator. This function should raise an exception if attempt is made to set a zero value as the denominator and in such cases it should be set to 1.

17. Write a class template for storing an array of elements. Overload the << and >> operators. Write a member function to sort the array in descending order.

18. Write a class template for representing a singly linked list. Write functions for inserting, deleting, searching and for displaying a linked list. Write a main function to test it on a linked list of integers and characters.

**REFERENCE BOOKS**

1. Schildt Herbert, *The Complete Reference C++*, Tata McGraw Hill, 4th Edition, 2003.
2. Deitel & Deitel, *C++ How to program*, Pearson Education Asia, 6th Edition, 2008.
3. Bjarne Stroustrup, *The C++ Programming Language,* Special Edition, Pearson Education, 2004.
4. M. T. Somashekara, D. S. Guru, *Object-Oriented Programming with C++,* 2nd Edition, PHI, 2012.

# BCA-HC-5016: JAVA PROGRAMMING
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
### Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: JAVA language basics**                                    **(12 Lectures)**
Basic features, Java virtual machine concepts Creation of JAVA, executing a java program using command line arguments, The primitive data types and Variables, Java Key words, integer and floating point data type, character and Boolean types, declaring and initialization variables, Type conversion and casting

**UNIT 2: Operators and Control Statements**                        **(12 Lectures)**
Java operators - Arithmetic operators, Bitwise operators, Relational operators, Boolean logical operators, Assignment operator, Conditional operator, if and switch statements, iteration statements, jump statements.

**UNIT 3: Classes and Methods**                                     **(15 Lectures)**
Class fundamentals, Objects, Constructors, this keyword, finalize () method, Overloading methods, garbage collection, Returning objects, introducing access control, understanding static, introducing final, introducing nested and inner classes, String operations, Character Extraction, Comparing, Searching & Modifying the strings, Data conversion using valueOf(), StringBuffer

**UNIT 4: Inheritance**                                             **(12 Lectures)**
Inheritance basics, using super, creating a multilevel hierarchy, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance Packages and interfaces Packages, access protection, importing packages, interfaces Multithread programming, The JAVA thread model, creating a thread, creating a multiple thread, Using is Alive() and join (), Inter thread communication, suspending, resuming and stopping threads, using multithreading.

**UNIT 5: Exception handling**                                      **(12 Lectures)**
Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, Java's built-in Exceptions, Input/output: Java I/O classes and interfaces, file, the stream classes, byte streams, character streams, console class. Applet class: Applet basics, applet architecture, simple applet skeleton, applet displaying methods, Event handling: Two event handling mechanisms, delegation event model, event classes, source of events, event listener interface

## Practical / Lab work to be performed
**Each student should do at least 10 assignments from the following list.**

**1.**      Design a class to represent a bank account and include the following data members –


**Data Members**: name of the depositor, account number, type of a/c, balance amount in the a/c

**Methods**: to assign initial values, to deposit an amount, to withdraw an amount after checking the minimum balance (Rs.1000), to display the name of the depositor and balance.

2. Write an applet programming to print the first name, last name, sex, address, mobile no. and pin code of an end user passing parameters.

3. Write an applet programming to create three buttons and draw a rectangle on clicking the first button, a solid rounded rectangle on clicking the second button and a solid circle and an arc on clicking the third button.

4. Write an applet program to draw the following shapes –
   a) A straight line b) A polygon d) A solid oval e) A solid rounded rectangle f) A polyline

5. Write a program to create 3 – threads for execution with different priorities.

6. Write a program to create three threads for execution of the natural nos. less than 5 using synchronization concept.

7. Write a program to – a) Print the name of the thread, and its priority
   b) Change the name of the current thread to "JAVA"
   c) Display the detail of the current thread

8. Write a java program for a class teacher that contains two fields name and qualification. Extend the class to department that contains data members deptno and deptname. An interface name as college contains one field name of the college. Using the above classes and interface get the appropriate information and display them.

9. Design three classes person, employee and student using the concept of inheritance. Each class should have a constructor of its own properties as name, age, gender and common method showdata().

10. Write a program to create a class shape with properties length and breadth. Extend the class to rectangle and square, and find the area of the rectangle and the square. Use input() method to take input using keyboard.

11. Write a program to create an array of employee name and salary related to the employee. If the salary is greater than Rs.10,000 raise an exception "Salary is greater than Rs.10,000", otherwise display the required information.

12. Write a program to find the square root of a number. If the input value is negative, raise a user defined exception "The number is a negative number".

13. Write a program to create three StringBuffers. The first one takes no parameters, second one takes an integer value and the third one sets an initial value "Java". Find the content, length and capacity for the StringBuffers.

14. Write a java program to input a string and converts the string to lower case and upper case. Also find the substring from 5 to end, from 0 to 5, from 3 to 7, and from 5 to 5.

15. Write a java program to create a class, library that contains the field, bookno, Extend the class, library to book having fields author and title, and then extend the class, book to issue. Create an interface, language that contains a field, lang. Implement the interface for the class, book. Use appropriate methods for the classes and interface.

**REFRERENCE BOOKS**

1. Herbert Schildt, *The Complete Reference*, Seventh Edition, Tata McGraw Hill, 2007.
2. Bruce, Eckel, *Thinking in Java*, Third edition, Pearson Education, 2005

# BCA-HC-5026: OPERATING SYSTEM
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
## Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: Introduction** **(6 Lectures)**

Basics of Operating Systems: Definition – Generations of operating systems, Types of Operating Systems (definition only): Mainframe, Batch, Multiprocessor, Distributed, Multitasking, Real time, Parallel and Time sharing.

**UNIT 2: Processes** **(6 Lectures)**

Process: Concept of a Process, Process States, Process creation, Process termination, Context switching, Thread: Concept of thread, Design issues of thread, Types of threads, Benefits of threads, Basic Concept of multithreading.

**UNIT 3: Process Synchronization** **(6 Lectures)**

Basic concept of Inter-Process communication, Race condition, Critical-Section, Mutual exclusion, semaphore, Mutex, Different ways to achieve mutual exclusion- Disabling interrupt, Test-and-Set Lock, Peterson's solution using semaphore, Brief discussion on classical IPC problem (example Dinning philosopher problem).

**UNIT 4: Scheduling** **(6 Lectures)**

Basic Concepts of scheduling, Scheduling objectives, pre-emptive and non pre-emptive scheduling, Scheduling criteria – CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time, Basic concepts on batch, interactive and real-time scheduling algorithm, Scheduling algorithms-FCFS, SJF, RR, priority scheduling, Goals of scheduling algorithms.

**UNIT 5: Deadlocks** **(6 Lectures)**

Definition, Deadlock characteristics , Methods for Handling Deadlocks, Deadlock Prevention, Deadlock detection and Recovery, Deadlock Avoidance using Banker's Algorithm.

**UNIT 6: Memory management** **(6 Lectures)**

Memory allocation in Multiprogramming, Relocation and Protection, Swapping, Virtual memory: Basics of Virtual Memory, Logical versus Physical address space, Paging and Concept of Segmentation, Page fault, Page table and its entries, Demand paging, TLB, Page replacement algorithms: LRU, Optimal, NRU, FIFO, Second chance, Clock, NFU, Working set.

**UNIT 7: File system** **(6 Lectures)**

File concepts, File naming, File types(directory, regular, device), File attributes, Operations on file, Access Methods – Sequential, Random access, Directory in UNIX, Hierarchical directory structure, Relative path and Absolute path, Operation on directories, Disk layout, Disk partition, File system layout, Disk block allocation- Contiguous allocation, Linked list allocation, FAT, i-nodes, File system security

**UNIT 8: I/O management** (6 Lectures)

Basic principles and overall structure of I/O management subsystem, Device controllers, Layers of the I/O subsystem-interrupt handler's device driver, device independent I/O software and user space I/O software.


## Practical / Lab work to be performed
**Each student should do at least 12 assignments from the following list.**

**1.** Write a program to create a child process that starts looping and then terminates.

**2.** Write a program to show that the child can be set up to ignore a signal from its parent.

**3.** Write a program to show that a process can ignore a signal.

**4.** Write a program to create a thread in which prints "We are proud to be Indians" and terminates.

**5.** Write a program to demonstrate how to "wait" for thread completions by using the P thread join routine. Threads are explicitly created in a joinable state.

**6.** Write a program to create a thread in which print "We are proud to be Indians" and pass multiple arguments using structure during its creation.

**7.** Write a program to compute the dot product of two vectors and also show the use of mutex variable.

**8.** Write a program to create threads, the main thread creates three threads. Two of these threads increment a counter variable while third thread watches the value of the counter variable. When the counter variable reaches a predefined limit, the waiting thread is signalled by one of the incrementing threads. The waiting thread "awakens" and then modifies the counter. The program continues until the incrementing threads reach a final value and also print the final value.

**9.** Write a program to show attaching and detaching shared memory.

**10.** Write a program to show the communication between two processes through shared memory.

**11.** Write a program to show how two processes can talk to each other using wait() and signal() operations applied on semaphore.

**12.** Write a program in which a parent process accepts a list of integers to be sorted. Parent process uses the fork system call to create a new process called a child process. Both the processes use shared memory for the list of integers. Now use the parent process to sort the integers using bubble sort and the child process to sort the integers using selection sort. Use semaphore variable for process synchronization.

**13.** Write a program to implement Banker's Algorithm for multiple resource type each.

**14.** Write a program to simulate Dining Philosophers Algorithm


**REFERENCE BOOKS**

1. Tannenbaum, *Operating Systems*, PHI, 4th Edition, 2000
2. Silbersachatz, Galvin, *Operating System Concepts*, Person, 5th Edition, 2001
    3. William Stallings, *Operating System*, Prentice Hall of India, 4th Edition, 2003

# BCA-HC-6016: SYSTEM ADMINISTRATION USING LINUX
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
### Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: Introduction** **(8 Lectures)**

Introduction to System Administration, Role and power of System Administrator, Basic Features of the Linux operating system, A brief Overview of the most popular Linux Distributions - Red Hat Enterprise Linux (RHEL), Ubuntu, Debian, Fedora, SUSE), Installation Requirements, Partitioning the Hard drive in Linux, Installing the Linux system, Installing and Configuring software in linux, Linux kernel and device drivers, System Startup and Shutdown. Standard I/O, Standard error, Redirection and Piping

**UNIT 2: Linux file system** **(12 Lectures)**

Basics of Linux file system - File system types (ext3, ext4, xfs, jfs, ReiserFS, iso9660 etc.), three basic types of files (ordinary or regular, special or device and directory), I-nodes and file attributes, Absolute and Relative path names. File system Mounting and Unmounting, Organization of the file tree, Standard directories and their contents.

**UNIT 3: Basic Linux Commands** **(12 Lectures)**

Files and Directory handling Commands - ls, cd, cp, mv, rm, mkdir, rmdir, Commands for Creating and Viewing ordinary files – cat, more, pg, Filter Commands – wc, head, tail, cut, tr, grep (with regular expressions), Setting user and group ownership of files and Access permissions – chmod, chown, chgrp commands, Study of different Linux Shells (sh, bash, csh, zsh), Environment variables, Shell script basics (examples of some simple shell programming).

**UNIT 4: Process Creation** **(8 Lectures)**

Basic commands for starting and stopping processes, Basic process attributes and their role in Access control, Examining the list of running processes on the system and understand the data presented there, Background process, Job control, Cron tab file format, Backup and Restore procedure, Submit a print job, check the status of a print job, cancel a print job, Configuring the Print Queue, Selecting the Print Driver, Editing the Printer configuration.

**UNIT 5: General User Administration** **(10 Lectures)**

Understanding the „root‟ account, Becoming a Superuser (su), A limited su (sudo) Managing user accounts - Adding a new user, Modifying and Removing User accounts, Changing Password, System monitoring and logging, Monitoring memory usage, disk space usage and I/Oactivity.

**UNIT 6: Networking in Linux** **(10 Lectures)**

The rules governing IP address classes and netmasks, Network Address, Netmask and Gateway, configuring Interface with ifconfig, ping, netstat, traceroute, telnet. Understanding the significance of the /etc/services file and well known port numbers, Basics of configuring
NFS, NIS, DNS, FTP, Squid Proxy, DHCP server, iptables and firewall, Basic Network SecurityIssues

## Practical / Lab work to be performed
**Each student should do at least 15 assignments from the following list.**

1. Installation of Linux Operating System and partitioning the disk.
2. Installing software packages in linux OS using GUI as well as command line.
3. Changing the default run level of a system
4. Mounting and unmounting a removable media.
5. Finding the list of all running processes and redirect the output in a file.
6. Use of different kill signals to kill a running process.
7. Bringing a process from back ground to fore ground and vice-versa.
8. Adding and managing user accounts.
9. Monitoring disk space quota and memory usage and redirect the output in a file.
10. Backup and restoring a file.
11. Compression and extracting a file. Use command line.
12. Configuring a network interface and assigning a default route.
13. Scheduling job using crontab.
14. Changing the ownership and access permission of file or directory. Use command line.
15. Copy, move and rename a file.
16. Configuring a ftp server
17. Assigning address of DNS
18. Use of ssh, telnet, netstat, ping, route commands.
19. Use grep, awk, sed commands.
20. Use of redirection and piping.
21. Monitoring and managing system log information.
22. Basics of firewall using iptables.
23. Basics of configuring http server.
24. Managing different services in linux.
25. Monitoring the traffic going through a network interface.
26. Write shell script to
    a. Find factorial of a given number
    b. Convert a decimal number to hexadecimal number

**REFERENCE BOOKS**

1. Sumitabh Das, *UNIX: Concepts and Applications*, Tata McGraw Hill, 4th Edn.
2. Satish Jain, *Basics of OS, Unix and Shell Programming*, BPB Publications, (A8-R4 Revised Syllabus).
3. Mark G Sobell, *A Practical Guide to Linux*, Prentice Hall, 2nd Edition

# BCA-HC-6026: COMPUTER NETWORKS
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1:  Physical Layer**                                                                 **(8 Lectures)**
Data communications: components, Network criteria, physical structures, network models, categories of networks, interconnection of networks, inter network Protocols and standards: protocols-standards-standards organizations- internet standards Network models: Layered tasks, OSI model, layers in the OSI model, TCP/IP protocol suite.

**UNIT 2: Digital Transmission**                                                          **(10 Lectures)**
Digital to digital conversion: Line coding, line coding schemes, block coding - analog to digital conversion, PCM, transmission modes: serial transmission, parallel transmission, Analog Transmission: Digital to analog conversion: FSK-ASK-PSK, Analog to Analog conversion: Amplitude modulation, Frequency modulation, phase modulation, Multiplexing: Frequency division multiplexing, Time division multiplexing, Transmission Media Guided media: Twisted pair cable, coaxial cable, fiber optic cable Unguided media: radio waves – microwaves-infrared.

**UNIT 3: Data Link Layer**                                                                **(12 Lectures)**
Error correction and detection: Introduction, block coding, linear block code, cyclic codes checksum, Data link Control: protocols, simplest protocol, stop and wait protocol, stop and wait automatic repeat request, go back n automatic repeat request, selective repeat, automatic repeat request, piggybacking, Multiple Access: Random access, Aloha, CSMA, CSMA/CD, CSMA/CA Controlled access: reservation, polling, token passing, Channelization:FDMA,TDMA,CDMA.

**UNIT 4: Network Layer**                                                                  **(12 Lectures)**
Wired LANs: Ethernet: IEEE standards, standard Ethernet- fast Ethernet, Wireless LANS: IEEE 802.11 architecture, MAC sublayer addressing mechanism, physical layer-Bluetooth: architecture Bluetooth layers-radio layer-baseband layer-L2CAP-other upper layers. Network Layer: IPV4 addresses, IPV6 Addresses, Internet Protocol: IPv4 &IPv6 Address mapping protocols: ARP – RARP.

**UNIT 5: Transport Layer**                                                                **(10 Lectures)**
Routing protocols: Unicast routing protocols: distance vector routing, Link State routing, Multicast Routing protocols (Any two) Transport Layer: Process to process delivery, UDP/ TCP, Congestion control and QOS: Data traffic, congestion, congestion control, quality of service techniques to improve quality of service.

**UNIT 6: Application layer & Network Security**                                **(8 Lectures)**
DNS: Name space, domain name space, distribution of name space, Electronic mail Architecture, FILE transfer: FTP WWW and HTTP: Architecture, web documents, HTTP, Network Security: Introduction, definitions, two categories, symmetric key cryptography, traditional ciphers, asymmetric key cryptography

**REFERENCE BOOKS**

1. Behrouz A Forouzan, *Data communication and networking*, McGraw-Hill, 5th edition, 2011.
2. Stalling W, *Data and Computer Communication*, PHI (EEE), 5ed.
3. Andrew S Tanenbaum, *Computer Networks*, PHI publications, 5th edition, 2011.

# BCA-SE-3014: WEB TECHNOLOGY
(Credit: 2+2=4) (L: 2, P: 4, T: 0)
Theory: 20 Lectures, Practical: 20 Lectures

**UNIT 1: Overview of the World Wide Web and the internet                (2    Lectures)**
A brief history of TCP/IP and the Internet, Internet services-email, telnet, ftp , Internet components, the birth of web, web page, home page, web site, Web browsers-Netscape navigator and IE, Web browser helper applications, Introduction to web servers and their architecture, Review of some popular    web    servers    like    Apache,    Nginx,    Litespeed,    Tomcat    etc.

**UNIT 2: Inside the firewall AND Linking database to the Web                (3 Lectures)**
Firewall, proxy server, overview of intranet security, web server security, username/password authentication, COM, DCOM, CORBA, JDBC, ODBC- CGI, ASP and PHP, Dynamic page creation and advantages

**UNIT 3: HTML editors and tools                                (5 Lectures)**
Basic HTML, HTML tags, creating list in HTML, hyperlinks, multimedia, HTML forms, tables in HTML, frames in HTML, image maps, style sheets in HTML. DHTML, XML-Introduction, syntax, DTD

**UNIT 4: Java Script                                            (10 Lectures)**
   Client side Scripting languages, Creating interactive documents using JavaScript

## Practical / Lab work to be performed

**HTML** *(At least 15 assignments have to be done from this group)*

1. Create a HTML document consisting of HTML heading, paragraphs and images.
2. Create a HTML document and insert comments in the HTML source code and insert horizontal lines.
3. Construct HTML document to set the font of a text, size of the font, style of the font.
4. Create a HTML document to show how to create hyperlinks.
5. Create a HTML document to use an image as a link.
6. Create a HTML document to open link in a new browser window.
7. Create a HTML document to jump to another part of a document (on the same page).
8. Create a HTML document to insert images from another folder or another server.
9. Create an image-map, with clickable regions.
10. Create a HTML document with all table elements (Table, Caption, Table Row, Table Data element, Table Heading Element, THEAD, TFOOT, TBODY)
11. Create HTML document to make an unordered list, an ordered list, different types of ordered lists, different types of unordered lists, Nested list, Definition list.

12. Create HTML form with the all FORM elements (text fields, password field, Checkboxes, Radio buttons, Select elements, Drop-down list with a pre-selected value, Textarea (a multiline text input field) and buttons.

13. Create HTML document with all Frame elements (FRAMESET, FRAME, NOFRAMES, and INLINE FRAME).

14. Create a HTML document to add AUDIO and VIDEO.

15. Create a HTML document to aligning images (Let the image float to the left/right of a paragraph)

16. Create a HTML document to jump to a specified section within a frame

17. Construct a HTML document with CSS to Set the background colour of a page.

18. Construct a HTML document with CSS to set an image as the background of a page.

19. Construct HTML document with CSS to Set the text color of different elements and align the text.

20. Construct HTML document to set different colours to visited/unvisited links, Specify a background colour for links

## XML *(At least 2 assignments have to be done from this group)*

21. Construct an XML document that contain information about products of an organization and check the validation of the XML document using DTD.

22. Construct an XML document that contain information of 5 students (such as roll no., name , address, class) and check the validation of the XML document using DTD.

23. Construct an XML document that contain details of 10 books and check the validation of the XML document using DTD.

## JavaScript *(At least 10 assignments have to be done from this group)*

24. Write a program in javasrcript to accept a name from the user and display the same name in an alert box.

25. Write a program in javasrcript to display a message in a confirm box.

26. Write a program in javasrcript to display the message "time is running out" in the status bar.

27. Write a program in JavaScript to enter marks of a student and find his/her grade according to the following: if marks>=90 then grade A if marks>=80 then grade B if marks>=70 then grade C if marks>=60 then grade D otherwise, fail.

28. Write a program in JavaScript to create a button and when the button is clicked the message "Hello World" is displayed on an alert box.

29. Write a program in JavaScript to accept 2 nos. from the user and show the working of all arithmetic operators.

30. Write a program in JavaScript to accept 2 strings and concatenate them.

31. Write a program in JavaScript to display the current date and time.

32. Write a program in JavaScript to find the length of an array.

33. Write a program in JavaScript to check whether a string is palindrome or not.

34. Write a program in JavaScript that responds to a mouse click anywhere on the page (using mouse click).

35. Write a program in JavaScript to display the contents of a check box in a alert box.

36. Write a program to validate a form in the user id and password forms.

37. Write a program in JavaScript to create a welcome cookie, Button animation, Image map with added JavaScript Simple timing, Timing event in an infinite loop.

**REFERENCE BOOKS**

1.      Bayross, *Web Enable Commercial Application Development Using HTML, DHTML, JavaScript, Perl, CGI*, BPB publications, 2000.

2.      J. Jawoskri, *Mastering JavaScript*, BPB publications, 1999.

3.      Margaret Levine Young – *Internet - The Complete Reference* - Millennium Edition – TMT Edition -1999.

4.       Harley Hahn - *The Internet – Complete Reference* – Second Edition - TMH Edition.

# BCA-SE-3024: PROGRAMMING WITH C#
## (Credit: 2+2=4) (L: 2, P: 4, T: 0)
### Theory: 20 Lectures, Practical: 20 Lectures

**UNIT 1: Creation of C#**                                   **(4 Lectures)**

C# family tree,, Relationship in .NET Framework, CLR, Managed vs. unmanaged code, CLS ; **Overview of C#:** Object oriented programming, executing the program in IDE & command line compiler; **Data types, Literals and variables:** Important data type, integers, floating- point, the decimal type, characters, the bool type; Literals; Variables, type conversion & casting, type conversion in Expressions.

**UNIT 2: Operators**                                           **(5 Lectures)**

Arithmetic operators, Relational & Logical operators, Assignment operators, Bitwise operators, **Control Statements:** IF statements, Switch Statement, For loop, While loop, Do- while l loop, foreach loop, Break, Continue, goto, **Classes, Objects and Methods:** Class fundamentals, creation of objects, Methods, Constructors and Destructors, new operator, this keyword.

**UNIT 3: Arrays & strings**                                      **(5 Lectures)**

One-dimensional array, Multi-dimensional array, Jagged arrays, Strings, **Closer look at methods & classes:** Method overloading, overloading constructors, the Main() method, Recursion, **Operator overloading:** Operator overloading fundamentals, Operator overload on built-in types, overloading relational operators, logical operators, Enabling short-circuit operators.

**UNIT 4: Inheritance**                                            **(3 Lectures)**

Basics, Member access & inheritance, Virtual Methods and overriding, Abstract Classes, **Interfaces, Structures & Enumerations:** interfaces, interface references, interfaces can be inherited,Structures.

**UNIT 5: Exception Handling**                                   **(3 Lectures)**

Exception handling fundamentals, using multiple catch statements, catching all exception, nesting try blocks, throwing an exception, using finally, **I/O:** The Stream classes, console I/O.

## Practical / Lab work to be performed
**Each student should do at least 20 assignments from the following list**

1.      Write a program to check whether the Entered Number is Even or Odd
2. Write a program to Swap 2 Numbers
3. Write a program to Get a Number and Display the Sum of the Digits
4. Write a program to Display the Date in Various Formats
5. Write a program to illustrate the Use of Access Specifies
6. Write a program to Illustrate Left Shift Operations
7. Write a program to Compare Two Dates
8. Write a program to demonstrate Polymorphism
9. Write a program to Demonstrate Multilevel Inheritance

10. Write a program to Illustrate Single Inheritance
11. Write a program to Illustrate Multilevel Inheritance with Virtual Methods
12. Write a program to get the Length of the Array
13. Write a program to reverse an Array
14. Write a program to perform a Selection Sort
15. Write a program to Perform Bubble Sort
16. Write a program to Perform Matrix Addition
17. Write a program to Perform Matrix Subtraction
18. Write a program to Demonstrate Properties of the Class
19. Write a program to Create Obsolete Class
20. Write a program to Demonstrate Pass by Value Parameter
21. Write a program to Combine Two Delegates
22. Write a program to Illustrate Array of Delegates
23. Write a program to Display Results using Delegates
24. Write a program to Create Generic Delegate
25. Write a program to Illustrate Predicate
26. Write a program to Illustrate Actions
27. Write a program to create a Progress Bar Control
28. Write a program to Create Input Box and Display the Text
29. Write a program to Create Radio Button and Demonstrate its Use
30. Write a program to Illustrate Elapsed Event
31. Write a program to Demonstrate Use of Clone
32. Write a program to Demonstrate Trigger Concept
33. Write a program to Create Stop Watch
34. Write a program to Demonstrate IndexOutOfRange Exception
35. Write a program to Demonstrate DivideByZero Exception
36. Write a program to create a File
37. Write a program to Read the Contents of the File
38. Write a program to create a Directory
39. Write a program to Illustrate Handling an Event Declared in an Interface
40. Write a program to Demonstrate IDumpable Interface
41. Write a program to Demonstrate iList Interface
42. C# Program to Demonstrate iDictionary Interface
43. Write a program to create a Simple Thread
44. Write a program to kill a Thread
45. WAP in C# which takes your information (name, age , address, marks etc) as input and print your information.
46. Design an interface for GUI calculator and implement logic for calculator.

**REFERENCE BOOKS**

1. Herbert Schildt, *TheComplete Reference*. C# 2.0, Tata McGraw-Hill Edition 2006.
2. Jesse Liberty. *Learning C#,* O‟reilly publications,2002.

# BCA-SE-3034: OPEN SOURCE SOFTWARE
## (Credit: 2+2=4) (L: 2, P: 4, T: 0)
## Theory: 20 Lectures, Practical: 20 Lectures

**UNIT 1: LaTeX** **(8 Lectures)**

Installation of LaTeX, Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables, Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation, List making environments, Table of contents, Generating new commands, Figure handling, table & figure numbering, List of figures, List of tables, Generating index, Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing, Classes: article, book, report, beamer, slides, Applications: Writing Resume, Writing question paper, Writing articles/ research papers, Presentation using beamer

**UNIT 2: Scilab** **(8 Lectures)**

Introduction to scilab, Installation of Scilab (windows & Linux), Basic syntax, Mathematical Operators, Predefined constants, Built in functions. Complex numbers, Polynomials, Vectors, Matrix operations (functions like inv(), spec(), zeros(), ones(), eye(), rand(), Handling these data structures using built in functions. Programming : Functions , Loops(for & while) , Conditional statements , Handling .sci files , Installation of additional packages e.g. optimization, Graphics handling: 2D, 3D , Generating .jpg files , Function plotting, Data plotting , Applications: Numerical Linear Algebra (Solving linear equations, eigen values etc.) solving Ordinary Differential Equations, Numerical Analysis – iterative methods , GUI in scilab, Plotting 2D graphs, Comparison with C / C++/ Matlab

**UNIT 3: Python** **(4 Lectures)**

Introduction to Python, The procedure to install Python, How to open Python console, Basic Python commands.

## Practical / Lab work to be performed
**Each student should do at least 8 assignments from the following list.**

1)      Calculate the value of x using the following formula in scilab
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
    where a, b and c are constants.

2)      Write a code to check if a number is less than 10, if yes, then display `< 10', if it is greater than 10, then display `> 10', else display the square of the number.

3)      Write code to check if a given number n is less than or equal to 10, if yes, display its square.

4)      Write a for loop to display all the even numbers between 1 to 50.

5)       Write a program to find the sum of a list of numbers.

6)      Write a program using while loop to display odd numbers in the range 1 to 25.

7)      if A=$\begin{bmatrix} 1 & 4 & 0 \\ -1 & 5 & 8 \\ 4 & 5 & 6 \end{bmatrix}$

    a. Find A(:,:)
    b. Extract the 2nd column of A

8)      Determine the determinant and eigen values of the matrix, A2 + 2* A where A is define in Q.No 7.

9)      Define a 3x3 matrix A with all elements equal to 1. Multiply 1st and 2nd row with scalars, 3 and 4 respectively, and determine the determinant of the resultant matrix.

10)     A = [2 3 1; 4 6 5; 1 3 6] Use a suitable sequence of row operations on A to bring A to upper triangular form.

11)     Solve the following differential equations using Scilab and plot the dependent variable vs independent variable.

   a. $\frac{dy}{dx} + \frac{y}{x} = -x^3; (x > 0)$

   b. $cos(x)\frac{dy}{dx} + sin(x)y = x^2 : y(0) = 4$

12)     plot sin(x) versus x.( Put a title: "Sine", and labels, `x axis' and `y axis')

13)     Plot sin(x) and cos(x) on the same window.

**REFERENCE BOOKS**

1. http://fossee.in or http://scilab.in
2. http://spoken-tutorial.org/NMEICT-Intro
3. Reliable web resources as recommended by class teacher.

# BCA-SE-4014: ANIMATION
## (Credit: 2+2=4) (L: 2, P: 4, T: 0)
### Theory: 20 Lectures, Practical: 20 Lectures

**UNIT 1: Multimedia and Flash Preliminaries**                              **(6 Lectures)**
Multimedia - understanding multimedia; experiencing and interacting with the message.
The Multimedia Computer and its components - multimedia hardware standards, the sound card, video card, the CD-Rom/DVD drive, Multimedia Software - types and examples of multimedia software, animation, interactive programming, audio and video software, the place of Adobe Premiere and Macromedia Flash; other commonly used post production software like Adobe After Effects, Combustion, etc. Introduction to Flash – the different aspects and uses of Flash; the Flash interface – the different windows, panels, the toolbox; Flash help system and how to use it, Working with Flash Tools – Flash tools and how to use them: navigation and viewing tools, selection tools, drawing tools; strokes and fills in Flash and how to create and edit them; tools and panels for working with colours in Flash; text in Flash, different types of text blocks and how to work with them.

**UNIT 2: Drawing in Flash**                                               **(4 Lectures)**
**Working with graphic objects in Flash** – selecting, moving, transforming, grouping, stacking, and aligning objects; breaking apart objects and groups, **Drawing in Flash:** panels used for drawing in Flash, techniques for creating different types of basic and advanced shapes, masks; editing and modifying the shapes; importing artwork and bitmaps into Flash; type effects such as masked text, drop shadowed text and embossed text.

**UNIT 3: Animation**                                                      **(4 Lectures)**
**Animating in Flash** – animation tools: the timeline and how to work with it, the library panel, symbols and instances, the movie explorer panel and its uses; Different methods of animation in Flash: frame by frame animation, tweening – shape tweening and techniques for refining shape tweens; motion tweening, motion tweening effects; motion along a path; animating using masks, editing animations, **Movie clips** - their uses, how to create them and edit them, nested movie clips; Flash buttons and how to create and animate them, **Animation using timeline effects** – how to add a timeline effect and edit its settings.

**UNIT 4: Video, Audio and Exporting**                                     **(3 Lectures)**
**Working with Video and Sound:** Video - overview of working with video in Flash and supported formats; sound – overview of working with audio in Flash, supported formats, adding sounds to a document and to buttons, sound editing controls, **Publishing and Exporting Flash movies and images** – Publishing Flash movies and images into formats such as SWF, HTML, GIF, JPEG, PNG and QuickTime; exporting Flash movies as image sequences and clips.

**UNIT 5: Action Script**                                                  **(3 Lectures)**
**ActionScript:** Introduction to ActionScript, basics syntax and data types, elements of writing and debugging scripts; Using ActionScript for interaction in a Flash movie – events and event handlers; simple Flash movies using basic event handling and navigation – creating product kiosks, interactive web pages and elementary animation using ActionScript, **Flash Learning Interactions**:

creating e-learning content using Flash learning interactions, different Flash learning interactions, using them and configuring them in a Flash movie.

## Practical / Lab work to be performed

The list of the experiments will be prepared by the respected teacher of the course.

**REFERENCE BOOKS**

1. Macromedia Flash User Manual
2. Macromedia Flash online help system

# BCA-SE-4024: MOBILE APPLICATIONS
## (Credit: 2+2=4) (L: 2, P: 4, T: 0)
### Theory: 20 Lectures, Practical: 20 Lectures

**UNIT 1: Overview** **(5 Lectures)**
A little background about mobile technologies, Introduction to mobile devices and Administration, Mobile devices vs. desktop devices, Power Management, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store, Development environments Different mobile technologies – Android, Windows, IOS, Black Berry, series 40, Bada, Benefits and drawbacks of Smartphone programming, Overview of Android, How it all got started, Why Android different and important, Android Stack overview, Linux kernel, native libraries, App framework, Apps, SDK overview, platforms, tools, versions. Creating and setting up custom Android emulator.

**UNIT 2: Get Started with Android** **(5 Lectures)**
Install the android SDK, Install base tools, install SDKs and Add-ons, Install apache Ant, Emulator and Device. Get know Eclipse, Build, install and Run the Application in your Emulator or Device, Project Structure, Creating Applications and Activities: Introducing the Application Manifest, Using the Manifest Editor, The Android Application Life Cycle, Application Priority and Process States. Creating an Activity: The Activity Life Cycle, Designing User interface, Designing by declaration, creating the opening screen, using alternate resources, implementing an about box, applying a theme, adding a menu, adding settings, debugging with log messages, debugging with debugger, The Android Widget Toolbox, Layouts, Creating and Modifying Views, Creating and Using Menus, Android Menu System

**UNIT 3:** **(4 Lectures)**
Intents, Broadcast Receivers, Adapters, and Connecting to an Internet Resource, Using Activities as Dialogs Exploring 2D graphics and Multimedia Learning the basics, adding Graphics to existing apps, handling input, learn to change the final improvements, Playing audio, Playing Video, Adding sound to existing app, Storing local Data, Reading/writing local data, Accessing the Internal File system, Accessing SD card.

**UNIT 4:** **(3 Lectures)**
**Location and Sensing:** SMS Messaging, Displaying MAPS Location Data, Monitoring and Tracking a Location, **Putting SQL to work:** Introducing SQLite, In and Out of SQLite, Hello Database, Data Binding, using content provider, implementing content provider, **Preparing and Publishing:** Preparing app for publishing, Deploying APK files, uploading in Market.

**UNIT 5: Accessing Android Hardware** **(3 Lectures)**
Using the Media APIs, Playing Media Resources, Recording Multimedia, Using the Camera, Controlling Camera Settings, Using the Camera Preview, Taking a Picture, Introducing the Sensor, Android Telephony, Making Phone Calls, Monitoring Phone State and Phone Activity, Monitoring Data Connectivity and Activity, Accessing Phone Properties and Status,
        Controlling the Phone, Controlling Device Vibration, **Web Apps and Android compatibility:** Using Web view, Introducing HTML5

### Practical / Lab work to be performed
**Each student should do at least 15 assignments from the following list**

1. Create "Hello World" application. That will display "Hello World" in the middle of the screen in the red color with white background.
2. To understand Activity, Intent
    i. Create sample application with login module.(Check username and password)
    ii. On successful login, go to next screen. And on failing login, alert user using Toast.
    iii. Also pass username to next screen.
3. Create login application where you will have to validate EmailID (UserName). Till the username and password is not validated, login button should remain disabled.
4. Create and Login application as above. On successful login, open browser with any URL.
5. Create an application that will pass some number to the next screen, and on the next screen that number of items should be display in the list.
6. Understand resource folders:
    i. Create spinner with strings taken from resource folder.
    ii. On changing spinner value, change image.
7. Understand Menu option.
    i. Create an application that will change color of the screen, based on selected options from the menu.
8. Create an application that will display toast (Message) on specific interval of time.
9. Create a background application that will open activity on specific time.
10. Create an application that will have spinner with list of animation names. On selecting animation name, that animation should affect on the images displayed below.
11. Understanding of UI:
    i. Create an UI such that , one screen have list of all the types of cars.
    ii. On selecting of any car name, next screen should show Car details like: name, launched date, company name, images(using gallery) if available, show different colors in which it is available.
12. Understanding content providers and permissions:
    i. Read phonebook contacts using content providers and display in list.
13. Read messages from the mobile and display it on the screen.
14. Create an application to call specific entered number by user in the Edit Text
15. Create an application that will create database with table of User credential.
16. Create an application to read file from asset folder and copy it in memory card.
17. Create an application that will play a media file from the memory card.
18. Create an application to make Insert, update , Delete and retrieve operation on the database.
19. Create an application to read file from the sd card and display that file content to the screen.
20. Create an application to draw line on the screen as user drag his finger.
21. Create an application to send message between two emulators.
22. Create an application to take picture using native application.
23. Create an application to pick up any image from the native application gallery and display it on the screen.
24. Create an application to open any URL inside the application and clicking on any link from that URl should not open Native browser but that URL should open the same screen.

**REFERENCE BOOKS**

1.      Ed Burnette, *Hello, Android: Introducing Google's Mobile Development Platform,* Pragmatic. Bookshelf (2009), ISBN-13: 978-1934356173.
2.      Jerome (J.F) DiMarzio , *Android - A programmer's Guide*, Tata McGrew Hill ,2010, ISBN: 9780071070591. 3 Charles Petzold, *Programming Windows Phone*, Microsoft Press,2010

# BCA-SE-4034: ADVANCED WEB TECHNOLOGY
(Credit: 2+2=4) (L: 2, P: 4, T: 0)
Theory: 20 Lectures, Practical: 20 Lectures

**UNIT 1: Web Development Techniques** **(12 Lectures)**
**Server Side Scripting with PHP**: Variable declaration, conditionals and loops, error handling with try-catch, vardump, etc. , Integrating PHP in HTML and vice-versa, understanding popular libraries like Date-Time, Math, String etc., Working with PHP superglobals, PHP-HTML form handling, Session & Cookies, File Handling in PHP, Connection of PHP to MySQL DB, PHP CRUD operation with MySQL DB, **Server Side Scripting with JSP:** Brief overview of Java, JSP Fundamentals – Environment Setup, Syntax, Architecture, Lifecycle, Debugging etc., JSP Form Processing and File Handling, Working with JDBC, Java Beans, **Intermediate Web Development Techniques:** Understanding AJAX, Working with XML Documents using PHP & JSP, Understanding JSON, JSON parsing and serialization using PHP, JSP and JavaScript

**UNIT 2: Current Trends in Web Technology** **(8 Lectures)**
Understanding Popular Architecture Paradigms – MVC, MVP and MVVM, their components and their utilization, Introduction to popular PHP based web Content Management Systems, Wordpress and Drupal(7+), Introduction to MVC paradigm using any open-source PHP framework like Symfony, Laravel etc, Introduction to Server Side JavaScript with NodeJS

## Practical / Lab work to be performed
**(Tasks should be carried out in both PHP and JSP)**

1.      Create an HTML form to take an integer value as input. Whenever use submits the form with the integer number, the next page should display the multiplication table of that particular number in an HTML table. Please perform the necessary JavaScript validation at the form for integer value and null values.
2.      Write a script to read a text file from the 'uploads' directory inside the server root and show its content inside a 'div' in an HTML page. Please make sure that the script reads only '.txt' files. Additionally, the name of the file should be suffixed with 'processed' once the script completes reading it. For e.g. if the name of the text file is 'abc.txt', then after reading and displaying the file, the script should rename this file as 'abc-processed.txt'.
3.      Write a script to read all images (.gif, .jpeg, .png extensions only) inside a folder in the server root and display them as a slideshow (using JavaScript) in an HTML page.
4.      Write a small project showing user registration and login functionality. The system should make use of sessions for data storage. The password field should be encrypted.  Use MySQL for data storage.
5.      Write a script to fetch JSON data from any Weather Forecast Website with JSON API (like OpenWeatherMap) and show today's weather data for your city/town/village with current date.
6.      Write an HTML form where a user can submit their image with a short description of the image and his/her name. On submitting the form, the next page should display the image followed the description in a paragraph ending with a hyphen (-) and the user's name. The backend script should accept only JPEG pictures under 500KB. Perform appropriate JavaScript validation.

7.      Write a simple AJAX script which takes input from and HTML form and makes a POST request to a backend script. The backend script should return back the data which will be displayed below the HTML form inside a 'div'.

## REFERENCE BOOKS

1.      David Flanagan, *JavaScript: The Denitive Guide*, O'Reilly, 2nd Edition, 2011.
2.      Jason Lengstorf, *PHP for Absolute Beginners*, APress, 2009.
3.      Herbert Schildt, *The Complete Reference*, Seventh Edition, Tata McGraw Hill, 2007.

# BCA-HE-5016: PROJECT WORK/DEISSERTATION (Credit: 6)

The students will be allowed to work on any project based on the concepts studied in core / elective or skill based elective courses. The objective of the project is to train the student to independently search, identify and study real-life important topics in CS/IT; to develop skills among students in a particular field of CS/IT; and to expose students to the world of technology, innovation, and research. The problem should be such that the students get a chance to explore one or two technologies in depth and grab good command over those technologies after successful completion of the project. Application problems, if found interesting and arisen at the demand of a particular situation, may also be assigned; but typical information management systems with just two or three simple database tables and/or data- entry forms are to be discouraged.

The group size should be maximum three (03) students. Each group will be assigned a teacher as a supervisor who will handle both their theory as well lab classes. The work will have to be submitted in the form of a dissertation.

A maximum of Four (04) projects would be assigned to one teacher.

# BCA-HE-5026: DATA MINING AND WAREHOUSING
## (Credit: 5+1=6)(L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Introduction to Data Warehousing** **(12 Lectures)**

Need for Data Warehousing, Basic elements of Data Warehousing, differences between Database Systems and Data Warehouse. Data Warehouse Architecture and its components, Infrastructure and metadata. Data Design and Data Representation - Principles of dimensional modelling, advanced topics- data extraction, transformation and loading, data quality, OLAP in Data Warehouse, Data warehousing and the web. Implementation and Maintenance: Physical design process, Data Warehouse deployment, growth and maintenance.

**UNIT 2: Introduction to Data Mining Introduction** **(8 Lectures)**

Basics of data mining, Different definitions of Data Mining and related concepts, Data mining process, Data preparation, data cleaning and data visualization. KDD process, Data mining techniques: Clustering, Association rules and Decision trees.

**UNIT 3: Clustering** **(15 Lectures)**

Concept of Similarity and distance, Euclidean distance, Manhattan distance, Cosine similarity, Jaccard coefficient, Partitional versus Hierarchical Clustering, different types of data in clustering, Partitional clustering methods – k-means, k-medoids, PAM, CLARA, CLARANS. Hierarchical clustering methods – BIRCH, CURE, Density based clustering methods-DBSCAN.

**UNIT 4: Rule Mining** **(15 Lectures)**

What is an association rule? Mining association rules, frequent sets and border sets, algorithms for mining association rules – Apriori algorithm, Pincer-Search algorithm, Border algorithm.

**UNIT 5: Classification** **(10 Lectures)**

Introduction, Clustering versus Classification, decision tree construction principle, decision tree generation algorithms – CART, ID3.

**REFERENCE BOOKS**

1. A.K. Puzari, *Data Mining Techniques*, University Press.
2. J. Han and M. Kamber. *Data Mining: Concepts and Techniques*. Morgan Kaufman. 2001.
3. P. Tan, M. Steinbach and V. Kumar, *Introduction to Data Mining*, Pearson Education (LPE); 2009.

# BCA-HE-5036: COMPUTER ORIENTED NUMERICAL METHODS AND STATISTICAL TECHNIQUES
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
## Theory: 60 Lectures, Practical: 20 Lectures

**UNIT 1: Representation of numbers**     **(4 Lectures)**

Floating point representation, single and double precision, round off errors and truncation errors

**UNIT 2: Solution of non-linear equation**     **(7 Lectures)**

Bisection method, Newtons method, Regula Falsi method.

**UNIT 3: Solution of simultaneous linear equation**     **(12 Lectures)**

Basic elimination method, Gaussian elimination method, Gauss Jordan method, method of successive approximation.

**UNIT 4: Ordinary differential equation**     **(6 Lectures)**

Euler's method, Runge Kutta method.

**UNIT 5: Interpolation**     **(8 Lectures)**

Newton's interpolation, Lagrange's interpolation, Newton's divided difference method.

**UNIT 6: Numerical integration**     **(11 Lectures)**

Trapezoidal rule, Simpson's 1/3rd and Simpson's 3/8th rule.

**UNIT 7: Statistical methods**     **(12 Lectures)**

Measure of central tendency: Mean, Median and Mode, Probability, probability distribution, Binomial, Poison and normal distribution, Mathematical expectations, moments, correlation, regression.

### REFERENCE BOOKS

1. M.K.Jain, S.R.K.Iyenger, R.K.Jain, — *Numerical methods for Scientific and Engineering Computation*, Wiley Easterns.
2. K.E. Atkinson, —*An introduction to numerical analysis*, J.Willey and Sons.

## Practical / Lab work to be performed

**(N.B:** Student has to perform **any six** of the following experiments**)**

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by Regula−Falsi method.
3. Find the solution of a system of nonlinear equation using Newton's method.
4. Find the solution of simultaneous linear equations using Gauss Elimination method.

5.    Find the solution of system of equations using Gauss-Jordan method.
6.    Evaluate the approximate value of finite integrals using Simpson's 1/3rd and Simpson's 3/8th rule.
7.    Implement Runge Kutta method for ordinary differential equations.
8.    Implement Newton's interpolation method.

Note: Programming is to be done in any one of Computer Algebra Systems:
MATLAB / MATHEMATICA / MAPLE.

## Reference Books

1.    Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e (2012)
2.    M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publisher, 6/e (2012)
3.    Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, Tata McGraw Hill, 2/e (2010)

# BCA-HE-5046: PROGRAMMING IN PYTHON
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
### Theory: 60 Lectures          Practical: 60 Lectures

**UNIT 1: Planning the Computer Program** **(4 Lectures)**

Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation

**UNIT 2: Techniques of Problem Solving** **(6 Lectures)**

Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming

**UNIT 3: Overview of Programming** **(4 Lectures)**

Structure of a Python Program, Elements of Python

**UNIT 4: Introduction to Python** **(6 Lectures)**

Python Interpreter, Using Python as calculator, Python shell, Indentation Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)

**UNIT 5: Creating Python Programs** **(8 Lectures)**

Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass), Defining Functions, default arguments, Errors and Exceptions

**UNIT 6: Iteration and Recursion** **(8 Lectures)**

Conditional execution, Alternative execution, Nested conditionals, the return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, the while statement, Tables, Two-dimensional tables

**UNIT 7: Strings and Lists** **(8 Lectures)**

String as a compound data type, Length, Traversal and the for  loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements,  List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists

**UNIT 8: Object Oriented Programming** **(4 Lectures)**

Introduction to Classes, Objects and Methods, Standard Libraries

**UNIT 9: Data Structures** **(6 Lectures)**

Arrays, list, set, stacks and queues.

**UNIT 10: Searching and Sorting** **(6 Lectures)**

Linear and Binary Search, Bubble sort, Selection sort and Insertion sort.

## Practical / Lab work to be performed

 (**N.B:** Student has to perform **any 12** of the following experiments**)**

1.  Using for loop, print a table of Celsius/Fahrenheit equivalences. Let c be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.
2.  Using while loop, produce a table of sins, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).
3.  Write a program that reads an integer value and prints —leap year‖ or —not a leap year.
4.  Write a program that takes a positive integer n and then produces n lines of output shown as follows. For example enter a size: 5

```
    *
   **
  ***
 ****
*****
```

5.  Write a function that takes an integer n as input and calculates the value of $1 + 1/1! + 1/2! + 1/3! + … + 1/n$
6.  Write a function that takes an integer input and calculates the factorial of that number.
    7.  Write a function that takes a string input and checks if it is a palindrome or not.
    8.  Write a list function to convert a string into a list, as in list ('abc') gives [a, b, c].
    9.  Write a program to generate Fibonacci series.
    10.  Write a program to check a number is Armstrong or not
    11.  Write a program to check whether the input number is even or odd.
    12.  Write a program to print all even number between a range(for example between 1 and 100).
    13.  Write a program to print all prime number between a range(for example between 1 and 100).
    14.  Write a program to compare three numbers and print the largest one.
    15.  Write a program to print factors of a given number.
    16.  Write a method to calculate GCD of two numbers.
    17.  Write a program to create Stack Class and implement all its methods. (Use Lists).
    18.  Write a program to create Queue Class and implement all its methods. (Use Lists)
    19.  Write a program to implement linear and binary search on lists.
    20.  Write a program to sort a list using insertion sort and bubble sort and selection sort.

## REFERENCE BOOKS

    1.  T. Budd, Exploring Python, TMH, 1st Ed, 2011
    2.  Python Tutorial/Documentation www.python.or 2015
    3.  Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012
    4.  http://docs.python.org/3/tutorial/index.html
    5.  http://interactivepython.org/courselib/static/pythonds
    6.  http://www.ibiblio.org/g2swap/byteofpython/read/

# BCA-HE-6016: AUTOMATA THEORY AND LANGUAGES
(Credit: 5+1=6) (L: 5, P: 0, T: 1)
Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Finite Automata** **(10 Lectures)**
DFA, NFA, NFA with ε-moves, Equivalence of DFA and NFA, Reduction of the number of states in finite automata

**UNIT 2: Regular Languages and Regular Grammar** **(12 Lectures)**
Concept of languages and grammar, Regular expressions, Connection between regular expressions and regular languages, Regular grammars, Right and Left-Linear Grammars, Equivalence between Regular languages and Regular grammars.

**UNIT 3: Properties of Regular Languages** **(13 Lectures)**
Closure under simple set operations- union, intersection, concatenation, complementation and star closure, Decision algorithms for emptiness, finiteness and infiniteness, equality, Proof of non regularity using Pigeonhole principle and using pumping lemma for regular languages.

**UNIT 4: Context Free languages** **(15 Lectures)**
Context-free grammars, leftmost and rightmost derivations, derivation trees, Parsing and Ambiguity in grammars and languages, Simplification of Context free Grammars- removing useless productions, empty-productions and unit-productions. Normal forms- Chomsky and Greibach normal forms, Pumping Lemma for CFL, Using Pumping Lemma to show that certain languages are not Context free

**UNIT 5: Pushdown Automata** **(10 Lectures)**
Definition and language accepted (acceptance by empty stack and final state and their equivalence), Pushdown Automata and Context free languages. Deterministic PDA and Deterministic Context free Languages.

**REFERENCE BOOKS**

1. Peter Linz, *An introduction to Formal Languages and Automata*, 5th Edition, Narosa.
2. J. E. Hopcroft and J. D Ullman: *Introduction to Automata Theory, Languages and Computation,* Addison Wesley Publ., New York.

# BCA-HE-6026: OPTIMIZATION TECHNIQUES
(Credit: 5+1=6)  (L: 5, P: 0, T: 1)
Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Introduction to Operation Research** **(6 Lectures)**
Origin and Development of OR, Nature and Features of OR, Applications of OR, Opportunities and Shortcomings of OR.

**UNIT 2: Linear Programming Techniques** **(12 Lectures)**
Mathematical Formulation of the Problem, Graphical Solution Method, The simplex algorithm, the two phase algorithm, Duality theorem, revised simplex algorithm, revised simplex method versus simplex method.

**UNIT 3: Transportation Problem** **(12 Lectures)**
General transportation problem, Transportation table, Duality and Loop in Transportation Problem, Formulation of Transportation Problem, Solution of Transportation Problem (North West Corner's method and Vogal's Approximation method)

**UNIT 4: Assignment Problem** **(8 Lectures)**
Mathematical Formulation of the problem, Assignment method, Special cases in assignment problem, the travelling salesman problem

**UNIT 5: Network Scheduling by PERT/CPM** **(8 Lectures)**
Introduction, Rules of Network Construction, Critical Path Analysis, Distinction between PERT/CPM.

**UNIT 6: Simulation** **(8 Lectures)**
Simulation models, even type of simulation, Generation of random numbers, Monte Carlo techniques, and simulation techniques applied to queues

**UNIT 7: Information Theory** **(6 Lectures)**
A measure of Information, Entropy-the expected information, Entropy as a measure of Uncertainty, Properties of Entropy function

**REFERENCE BOOKS**

1. K. Swarup, P.K.Gupta, M.Mohan, *Operations Research*, S.Chand & Sons, NewDelhi
2. K.V.Mittal & G Mohan, *Optimization Methods*, Wileys

# BCA-HE-6036: MULTIMEDIA AND APPLICATIONS
(Credit: 4+2=6)  (L: 4, P: 4, T: 0)
Theory: 60 Lectures        Practical: 60 Lectures

**UNIT 1: Multimedia**                                                                    **(6 Lectures)**
Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality

**UNIT 2: Text**                                                                          **(4 Lectures)**
Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext

**UNIT 3: Images**                                                                        **(6 Lectures)**
Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light & colors, computerized colors, color palettes, image file formats.

**UNIT 4: Sound**                                                                         **(6 Lectures)**
    Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats

**UNIT 5: Video**                                                                         **(8 Lectures)**
    How video works, analog video, digital video, video file formats, video shooting and editing.

**UNIT 6: Animation**                                                                     **(10 Lectures)**
    Principle of animations, animation techniques, animation file formats.

**UNIT 7: Internet and Multimedia**                                                       **(6 Lectures)**
www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders.

**UNIT 8: Making Multimedia**                                                             **(14 Lectures)**
Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware-Macintosh and Windows production Platforms, Hardware peripherals- Connections, Memory and storage devices, Multimedia software and Authoring tools.

## Practical / Lab work to be performed
**(N.B:** Student has to perform **any seven** of the following experiments**)**

Practical exercises based on concepts listed in theory using Flash/ GIMP/ PhotoShop/ Animation Tools/ Image Editors/ Video Editors. **Optional**
Implement the followings using Flash-

1.        Create an animation using the tools panel and the properties panel to draw the following – Line, pe, oval, circle, rectangle , square, pencil , brush , lasso tool
2.        Create an animation using text tool to set the font, size , color etc

3.	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

4.	Create an animation using layers having following features-Insert layer, Delete layer, guide layer, Mask layer.

5.	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

6.	Create an animation for bus car race in which both starts from the same point and car wins the race.

7.	Create an animation in which text Hello gets converted into GoodBye (using motion/shape tweening).

8.	Create an animation having five images having fade-in fade-out effect.

9.	Create an scene to show the sunrise (using multiple layers and motion tweening)

10.	Create an animation to show the ripple effect.

11.	Create an animation (using Shape tweening and shape hints) for transforming one shape into another.

12.	Create an animation for bouncing ball (you may use motion guide layer).

## REFERENCE BOOKS

1.	Tay Vaughan, *Multimedia: Making it work*, TMH, Eighth edition, 2011

*2.*	Ralf Steinmetz and KlaraNaharstedt, *Multimedia: Computing, Communications Applications*, Pearson, 2012

3.	Keyes, *Multimedia Handbook*, TMH,2000.

4.	K. Andleigh and K. Thakkar, *Multimedia System Design*, PHI, 2013

# BCA-HE-6046: DISTRIBUTED SYSTEM
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Introduction**                                                  **(12 Lectures)**
Introduction, definition of a distributed system, goals, Making Resources Accessible, Distribution, Transparency, Openness, Scalability, Types of distributed systems, Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems

**UNIT 2: Communication**                                                   **(8 Lectures)**
Remote procedure call, basic rpc operation, parameter passing, asynchronous rpc, Message-oriented communication, message-oriented transient communication, message-oriented persistentcommunication

**UNIT 3:  Synchronization**                                                **(8 Lectures)**
Clock synchronization, physical clocks, global positioning system, clock synchronization algorithms, Logical clocks, lamport's logical clocks, Mutual exclusion, a centralized algorithm, a centralized algorithm, a distributed algorithm, a token ring algorithm

**UNIT 4: Election Algorithms**                                             **(12 Lectures)**
Global positioning of nodes, election algorithms, Traditional Election Algorithms, Elections in Wireless Environments, Elections in Large-Scale Systems

**UNIT 5: Consistency and replication**                                     **(12 Lectures)**
Introduction, Reasons for Replication, Replication as Scaling Technique, data-centric consistency models, Continuous Consistency, Continuous Consistency, client-centric consistency models, Eventual Consistency, Monotonic Reads, Consistency protocols, Primary-BasedProtocols

**UNIT 6: Fault tolerance**                                                 **(8 Lectures)**
Introduction to fault tolerance, Basic Concepts, Failure Models, Failure Masking by Redundancy, process resilience, Agreement in Faulty Systems.

**REFERENCE BOOKS**

1.  Andrew S. Tanenbaum, Maarten Van Steen, *Distributed Systems: Principles and Paradigms*, 2nd Edition, Printice-Hall of India, 2008
2.  Coulouris, G, Dollimore J, Kindberg T, Blair G, *Distributed System: Concept and Design,* 5th Edition, Pearson Education
3. Tanenbaum S Andrew, *Distributed Operating Systems,* 5th Edition*,* Pearson Education Asia, 2010
4. SinghalMukesh, ShivaratriG Niranjan, *Advanced Concepts In Operating Systems Distributed Data Base And Multiprocessor Operating Systems*, McGraw-Hill, Inc., 2009

# BCA-HE-6056: MICROPOROCESSOR AND ASSEMBLY LANGUAGE PROGRAMMING
(Credit: 4+2=6)(L: 4, P: 4, T: 0)
Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: Internal Organization of 8085A microprocessor** **(12 Lectures)**
User Programmable registers, PC, SP, accumulator, flags, data bus, address bus, control bus, instruction word size, opcode format, data format, memory addressing, I/O addressing, address decoding for memory and I/O.

**UNIT 2: 8085A microprocessor architecture** **(12 Lectures)**
Pinout of 8085A microprocessor, multiplexed address/data bus, control and status signal, demultiplexing of control signals, other signals, bus timings, fetch decode and execute cycle, timing diagram for opcode fetch memory read and memory write, interfacing memory and I/O.

**UNIT 3: Assembly Language Programming in 8085A Microprocessor** **(12 Lectures)**
Complete instruction set in detail, programming examples, logic operation, counters and time delays, stack and subroutine, processing arrays, bit manipulation.

**UNIT 4: Interfacing** **(12 Lectures)**
In and OUT instruction, decoding addresses, Interfacing LED, relay, seven segment display, switch, keyboard

**UNIT 5: Interrupts** **(12 Lectures)**
Vectored interrupts, interrupt priorities, general purpose programmable peripheral devices, 8255A control and status registers, programming 8255A, introduction to 8279, 8254 and 8237 (block diagrams and basic functions).

## Practical / Lab work to be performed
**Each student should do at least 8 assignments from the following list.**
**1.** Write a program to add two 8 bit numbers & store it in a memory location 8820h.
**2.** Write a program to copy a block of memory from one location 8820h to another location 8840h.
**3.** Write a program to perform the addition of two 16 bit numbers.
**4.** Write a program to add two numbers & store it in a register e.
**5.** Write a program to load two unsigned numbers in register b & c. Subtract b from c.
If the result is in 2's complement, convert the result in absolute magnitude & display it.
**6.** Write a program to find the difference of two numbers & store the result in a memory location 8830h.
**7.** Write a program to find the larger / smaller of two given numbers.
**8.** Write a program to subtract two numbers and add it to a given memory location.
**9.** Write a program to perform x+y–5, where x and y are 16–bit numbers.
**10.** Write a program to find 2"s complement of a number.

**REFERENCE BOOKS**

1. Ramesh S. Gaonkar: *Microprocessor Architecture, Programming and Application with the 8085*, PENRAM INTL. PUBLISHING (INDIA) PVT. LTD., sixth edition
2. D.A.Godse A.P.Godse: *Microprocessor Techniques, Technical publications*, Fourth revised edition,2008
3. B.Ram**, *Microprocessor and Microcomputer*

# BCA-HE-6066: ARTIFICIAL INTELLIGENCE
## (Credit: 4+2=6)(L: 4, P: 4, T: 0)
### Theory: 60 Lectures          Practical: 60 Lectures


**UNIT 1: Introduction**                                                                    **(6 Lectures)**
Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behavior and environment.


**UNIT 2: Problem Solving and Searching Techniques**                          **(20 Lectures)**
Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.


**UNIT 3: Knowledge Representation**                                            **(20 Lectures)**
Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs.

Programming in Logic (PROLOG)


**UNIT 4: Dealing with Uncertainty and Inconsistencies**                      **(8 Lectures)**
Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.


**UNIT 5: Understanding Natural Languages**                                     **(6 Lectures)**
 Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.


## Practical / Lab work to be performed
 **(N.B:** Student has to perform **any ten** of the following experiments**)**


1.        Write a prolog program to calculate the sum of two numbers.
2.        Write a prolog program to find the maximum of two numbers.
3.        Write a prolog program to calculate the factorial of a given number.
4.        Write a prolog program to calculate the nth Fibonacci number.
5.        Write a prolog program, insert_nth(item, n, into_list, result) that asserts that result is the list into_list with item inserted as the n$^{th}$ element into every list at all levels.
6.        Write a Prolog program to remove the n$^{th}$ item from a list.
7.        Write a Prolog program, remove n$^{th}$ (Before, After) that asserts the After list is the Before list with the removal of every n$^{th}$ item from every list at all levels.
8.        Write a Prolog program to implement append for two lists.
9.        Write a Prolog program to implement palindrome (List).
10.        Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.

11.     Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.

12.     Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.

13.     Write a Prolog program to implement two predicates evenlength(List) and oddlength (List) so that they are true if their argument is a list of even or odd length respectively.

14.     Write a Prolog program to implement reverse (List, Reversed List) that reverses lists.

15.     Write a Prolog program to implement maxlist (List, Max) so that Max is the greatest number in the list of numbers List using cut predicate.

16.     Write a Prolog program to implement GCD of two numbers.

17.     Write a prolog program that implements Semantic Networks/Frame Structures.

## REFERENCE BOOKS

1.     DAN.W. Patterson, *Introduction to A.I and Expert Systems*, PHI, 2007.

2.     Russell & Norvig, *Artificial Intelligence-A Modern Approach*, LPE, Pearson Prentice Hall, 2nd edition, 2005.

3.     Rich & Knight, *Artificial Intelligence,* Tata McGraw Hill, 2nd edition, 1991.

4.     W.F. Clocksin and Mellish, *Programming in PROLOG*, Narosa Publishing House,3rd edition, 2001.

5.     Ivan Bratko, *Prolog Programming for Artificial Intelligence*, Addison-Wesley, Pearson Education, 3rd edition, 2000.

# BCA-HG-1016: COMPUTER BASED ACCOUNTING AND FINANCIAL MANAGEMENT
## (Credit: 4+2=6) (L: 4, P: 4, T: 0)
## Theory: 60 Lectures, Practical: 60 Lectures

**UNIT 1: Accounting** **(20 Lectures)**

Definition, function, objective, need, advantage, events and transaction, double entry system of book keeping, Books of accounts: classification of books of accounts, meaning of journal, journalizing of transactions, ledger and ledger posting, closing of books of accounts and preparation of trial balance, Cash book: single column, double column and triple column, depreciation, Financial statements: Trading, Profit and Loss Account and BalanceSheet.

**UNIT 2: Tally** **(20 Lectures)**

Versions of Tally, Features of Tally, ERP Features, Data Directory and Tally switching between screen areas, Company creation: Create/ Alter/Select/Close/Delete, Introduction on F11 features & F12 configuration, Basic Accounting: Accounting Info Ledger/Group (Single & Multiple) Create/Display/Alter/Delete, Accounting Voucher: Types of Voucher, Configuring Voucher, Voucher Creation, Entering/Altering & Deleting, Basic of Tally Inventory: "Integrated A/c with Inventory" Create/Display/Alter/(Single & Multiple) : Group, Category, Go down, Units (Simple/Compound), Invoicing :Purchase & Sales in Invoice format, Debit Credit notes/ Discount/Description, Inventory Voucher

**UNIT 3: Advanced Accounting** **(20 Lectures)**

Bill wise Details: Transaction wise Bill By Bill for trading & non trading organization, Interest Calculation: Simple & Advance parameters Interest calculation on outstanding Balances, use of vouchers class, Adjustment entries, BRS: Simple & Advanced, Multiple Currencies: Create of different currencies, voucher entries, Adjustment entries on for ex gain / loss, Cost Center & Cost Categories: (By using purchase, Sales, Receipt, Payment voucher) Create / Alter / Display, Advance Inventory- Actual/Different Billed Qty, O'Value, Batch wise, Alternate Units, BOM, Price List , Budget & Control : Create / Alter, Budget for group / ledger / cost Center, Scenario Mgt :  Create / Alter / Delete. Transactions, Administration: Security control, Tally Audit, Housekeeping: Group company, Split company Export Data, ODBC, Printing: Company printing option,   Setting toa Bill.

## Practical / Lab work to be performed

   **(N.B:** Student has to perform **any ten** of the following experiments*)*

1.   Create Multiple Ledger of the following Account Heads:

  Bank Charges ; Basic Pay ; Bonus ; Bonus Paid ; Business Promotion Expenses; Commission Paid ; Conveyance; Depreciation on Air Conditioner ; Depreciation on Building; Depreciation on Computers; Depreciation on Furniture & Fixtures; Depreciation on Motor Car; Depreciation on Plant & Machinery; Discount; Donation; Electricity Charges; Employers Contribution to Provident Fund ; Freight Outward; Insurance Premium ; Interest Due; Interest

& Finance Charge; Interest on Bank Overdraft ; Interest on Partner's Capital A/c ; Interest on

Unsecured Loans ; Legal Fees ; Miscellaneous Expenses ; Office Rent ; Office Repairs & Maintenance ; Printing & Stationery ; Rent ; Rent Due ; Travelling Expenses.

2. Make necessary entries in Tally in the books of Galaxy Enterprise:
   (a) Introduced Cash Rs 10,00,000, Furniture worth Rs1,00,000 , Computer worth Rs 86,000, Machinery Rs 1,20,000 into the business on 1st Jan,2010
   (b) Opened a Current A/c with Bank of Baroda with Rs 1,00,000 on 2nd Jan,2011
   (c) Purchased goods on 6th Jan'2010 from Sridhar Stores on credit Rs 2,25,000
   (d) Sold goods for Cash Rs 1,20,000 to Maitree Stores on 7th Jan,2010
   (e) Sold goods to Sankar on credit for Rs 34,000 on 9th Jan'2010
   (f) Paid Rent advance Rs 25,000 by Cheque No 345671 on 10th Jan'2010
   (g) Withdrew from bank Rs 5,000 for office expenses on 18th Jan'2010
   (h) Purchased stationery items on 22nd Jan, 2010 for office use from Radhika Stationeries for Rs 1,500
   (i) Received Advance from Jagat for supply of goods worth Rs 12,000
   (j) Paid salary to office staff Rs10,000 by Cheque 345672 on 31st Jan, 2010

3. Make Data Entries for the following transactions:
   (a) Withdrew Rs 1,00,000 cash from SBI on 6th Jan ,2011
   (b) Deposited Rs 40,000 in HDFC Bank on 9th jan, 2011
   (c) Transferred Rs 20,000 from HDFC Bank to SBI on 12th jan , 2011
   (d) Paid Rs 4,300 as Insurance charges through HDFC Bank on 18th Jan, 2011
   (e) Received Rs 3,25,000 from ABC Co. Ltd. On 23rd Jan, 2011 against our sales through Cheque and it has been deposited in SBI
   (f) Sales worth Rs 5,50,000 made on credit to Vikas Group on 29th jan,2011
   (g) Provision towards Employers PF Contribution Rs 78,000 made on 31st jan,2011
   (h) Purchased Machinery Rs 1,00,000 from Sunder Enterprise (INPUT VAT 12.5% )

4. Enter the following transactions in Tally in the books of Computer Solutions:
   (a) Purchased on 8th April, 2009 HCL Celeron 15 Nos @ Rs 14,000; HCL PIV 15 Nos @ Rs 21,000 from Next Generation Systems (Input VAT @ 4%)
   (b) Sold on 10th April, 2009 to Fortune Computer Services 10 Nos HP Laserjet Series 1010 @ Rs 12,000 (Output VAT @ 12.5%)
   (c) Received from Fortune Computer Services Rs 80,000 on 25th April, 2009
   (d) Paid to Next Generation System Rs 2,00,000 vide Cheque No 357602 of HDFC Bank

5. Record the following transactions in Tally in the books of Hind Computers:
   (a) Returned one Wireless Keyboard Rs 250 to Super Buzz (Input VAT 4%) on 13th August , 2010
   (b) Returned from Computer Junction BM PIV Rs 500 on 16th August, 2010 (CST 4%)
   (c) Transferred 10Nos CD ROM Disks (1 Box @ Rs 265/Box) from Stores to Defective Goods Stores on 31st August, 2010

6. Prepare a Cash Book from the books of ABC Enterprise:
   (a) Cash Balance on 1st April 2010 Rs 4,00,000
   (b) Opened a Current Account with UCO Bank on 5th April , 2010 with Rs16,000
   (c) Purchased goods for Cash Rs 2,50,000 on 6th April , 2010
   (d) Sold goods for Cash Rs 1,25,000 on 8th April , 2010
   (e) Paid for Travelling Expenses Rs 2,300 on 10th April, 2010
   (f) Paid for Staff Welfare Rs 1,200 on 16th April, 2010

(g) Introduced Additional Capital Rs 50,000 on 20th April, 2010

(h) Withdrew from Bank for Office Cash Rs 2,000 on 27th April, 2010

(i) Sold goods for Rs 65,000 on 28th April, 2010 and payment received by Cheque 15,000 and balance in Cash

7. Prepare a Double Column Cash Book from the following transactions of XY Ltd:

(a) On 1st Jan, 2010 Cash in Hand Rs 5,00,000 and Cash at SBI Rs 2,30,000

(b) On 4th Jan, 2010 Goods purchased for cash Rs 1,24,000

(c) On 8th Jan, 2010 Goods sold for cash Rs 2,25,000

(d) Deposited into SBI an amount of Rs 1,10,500

(e) Paid rent to landlord Rs 24,000 by Cheque no 234675

(f) Withdrew from SBI Rs 30,000 for purchase of Furniture

(g) Received payment of Rs 30,000 from Amit Kothari, a customer by Cheque

(h) Withdrew from SBI Rs 23,000 for office cash

8. Make relevant Voucher Entries from the following transactions:

(a) On 1st April, 2010 India Infotech received a Bill (vide No. 001) from Pheonix Agencies for Rs. 5,00,000 towards the Advertisement services rendered.

(b) On April 8, 2010, payment of Rs. 4,95,000 is made towards bill no. Bill-001 to Pheonix Agencies for the purchase of Advertisement services, vide cheque no. 254781

(c) On May 6, 2010, Universal Infotech, paid TDS of Rs. 5,000 towards Advertisement Expenses, vide cheque no. 056330 for the month of April, 2010.

9. Show how would you deal with the following Bills in Tally :

(a) On 7th May, 2010, India Infotech received a bill (vide no. 911) from Gautam Bishnu & Associates for Rs. 1,12,360 inclusive of other charges of Rs. 12,360 towards the auditing services provided(TDS Rs10,000)

(b) On 8th May, 2010 India Infotech received a bill (vide No. 696) from Digitech Computers for Rs. 25,000 towards commission charges

(c) On 12th May, 2010 India Infotech received a bill (vide No. 874) from Digitech Computers for Rs. 40,000 towards commission charges

(d) On 14th May, 2010 India Infotech deducted tax Rs 2,500 towards Commission Expenses for the transaction dated 8th May and Rs 4,000 towards transaction dated 12th May.

10. Prepare a Bank Reconciliation Statement of Digitech Solutions on 31st December, 2010

(a) Balance as per Bank Book on 31st Dec,2010 Rs 32,000

(b) Cheque deposited into UBI Rs 13,000 on 27th Dec , 2010 cleared by bank on 31st Dec, 2010 omitted to be recorded in Cash Book

(c) Withdrew from UBI Rs 2,000 for office cash on 28th Dec'2010 but omitted to be recorded in Cash Book

(d) Service Charge debited by UBI Rs 200 not credited in Cash Book

(e) Bank Interest Rs 568 credited by UBI not recorded in Cash Book

(f) Dividend from UTI Rs 12,450 credited by UBI not recorded in Bank Book

(g) Direct deposit by Ravi, a customer Rs 3,400 into our UBI A/c not recorded in Cash Book

11. Choose the Correct Answer:

(i) What kind of procedure is used while operating the key F1?

(a) ALT and F1

(b) CTRL and F1

(c) SHIFT and F1

(d) F1

(ii) By default how many Groups and Ledgers does Tally have?

(a) 22 Groups and 2 Ledgers

(b) 28 Groups and 3 Ledgers

(c) 28 Groups and 2 Ledgers

(d) ) 26 Groups and 3 Ledgers

(iii) To toggle back to the „Main Area" , the short cut key is

(a) CTRL and M (b) CTRL and A (c) CTRL and I (d) CTRL and N

(iv) Ledger Menu comes under

(a) Accounts Info

(b) Inventory Info

(c) Accounting Vouchers

(d) Inventory Vouchers

(v) To change the current period press

(a) F1

(b) ALT and F1

(c) F2

(d) ALT and F2

12. Fill in the Blanks:

(a) To display the „Change Voucher Type press ----------------

(b) The shortcut key to view detailed „Profit & Loss A/c is ------------------

(c) To record the Voucher in 'Sales' press --------------

(d) To shut an Activated Company press --------------

(e) The shortcut key used to get the 'Stock Journal Voucher' screen is -------------

13. Show relevant Voucher Entry in Tally:

(a) You have purchased an item at a rate of Rs.100 on 8th April, 2010 however by mistake your supplier had billed you at a rate of Rs.95. Now your supplier issues a debit note for balance of Rs. 5 plus vat and other applicable duty Rs 6.

(b) You have agreed to pay a purchase invoice of Rs 1,00,000 within 1 month time to your supplier Geeta Stores. However, you couldn't manage to pay and your supplier agreed for a delayed payment at an interest rate of @2. p.m. for the same

14. The total gross salary payable by X Ltd for the month of January 2010 is Rs. 3,00,000. Out of above, basic salary which is eligible for Provident Fund contribution @ 12% is Rs.2,00,000. X Ltd is also required to pay a sum @12% from the basic salary before the same is disbursed to employee. Apart of this, it is also required to pay @1.61% (of basic pay additional amount as per below :

@1.10% towards PF administration fees;

@0.50% towards Employees Deposit linked insurance scheme and

@0.1% towards EDLI administration charges

Show how you would record the above transactions in Tally.

15. BX Ltd purchased a machinery for Rs 5,00,000. To use this machine company requires a platform, pipe connections, electrical connections, fabrication works etc. at the cost of Rs. 1,00,000. On the expense of Rs. 1,00,000 tax to be deducted at source. The Company

made a contract with Arun Contractors for electrical and fabrication work. On 10-8-2010 BX Ltd received bill for Rs. 60,000 from Arun contractors towards electrical and fabrication work. Record the above transaction

## REFERENCE BOOKS

1. K.R.Das, K.M. Sinha, K.S.Paul Choudhury, G.G.banik; *Accountancy* (for H.S. first year); LBS Publication.
2. B.B. Dam; *Accountancy* (for H.S. first year).
3. A.K.Nadhani, K.K.Nadhani; *Implementing Tally - 9;* BPB Publication, Delhi.
4. N. Agarwal and S. Agarwal; *Comdex Tally - 9 Course Kit (with CD).*
5. A.K. Nandhani; *Tally - 9, Training Guide*, BPB Publication.

# BCA-HG-1026: OFFICE AUTOMATION
(Credit: 2+4=6)(L: 2, P: 8, T: 0)
Theory: 20 Lectures, Practical: 60 Lectures

**UNIT 1: Word Processing** **(15 Lectures)**
Introduction to Word Processing , Features , Learning document window, Creating , Saving & Closing a document, Opening an Existing document , Editing a Document , Formatting Features ( Paragraph Formats, Aligning text & paragraph, Border and Shading, Header & Footers, Bullet & Numbering ) , Inserting & Editing a Table , Inserting Picture, Checking & Spelling Correction, Page Setup , Print Preview , Printing a document , Mail Merge , Document Template & Wizards.

**UNIT 2: Spreadsheet** **(15 Lectures)**
Introduction to Spreadsheet, creating, saving and editing a workbook, Inserting, deleting Worksheets, Opening & Moving around in existing worksheets, working with Formula & Cell referencing, Functions, working with ranges - creating, editing and selecting ranges, Format Feature: AutoFormat Feature, Changing alignment, Character styles, Date Format, Border & Colors etc. Previewing & Printing a worksheet, Creating Charts & Graphs. Database in worksheet, macro, linking and embedding

**UNIT 3: Presentation Tools** **(15 Lectures)**
Creating & saving Presentations , Opening an existing Presentation, Working in different views, Working with slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and correcting typing mistakes , Adding clip art and other pictures, Inserting Animation, Designing slide shows, Running and controlling slide show, Printing Presentation.

Portable Document Format: storing, creation, conversion.

**UNIT 4: DTP Software** **(15 Lectures)**
Local language pack in Office Packages: installation and use, Document design using any DTP package, Graphics design and manipulation using any currently available package

## Practical / Lab work to be performed
**(N.B:** Students have to perform the following experiments and are encouraged to work in the Linux platform**)**

1.     Create a new folder and do the following:
•                 Make a word processing document in it.
•                 Make a Spreadsheet document in it.
•                 Make a new folder in it
•                 Rename the initial folder
•                 Move the initial folder
•                 Copy the initial folder.
•                 Delete the initial folder

2. Implement the various well known features of the operating system such as Painting, System tools, Entertainment tools etc.
3. Implement various display properties by right clicking on the Desktop.
4. Explore the taskbar
5. Set the wall paper and screen saver.
6. Set the data/time.

## *Word Processing Tool*

1. Create a document and
a.  Put Bullets and Numbers
b.  Apply various Font parameters.
c.  Apply Left, Right, and Centre alignments.
d.  Apply hyperlinks
e.  Insert pictures
f.  Insert ClipArt
g.  Show the use of WordArt
h.  Add Borders and Shading
i.  Show the use of Find and Replace.
j.  Apply header/footers
2. Create any document and show the use of File→versions.
3. Create any document and show the difference between paste and paste special.
4. Create a document to show the use of Washout/Watermark.
5. Implement the concept of mail merge.
6. Implement the concept of macros.
7. Implement the concept of importing a file/document.
8. Implement the concept of merging the documents.
9. Crate a student table and do the following:
a.  Insert new row and fill data
b.  Delete any existing row
c.  Resize rows and columns
d.  Apply border and shading
e.  Apply merging/splitting of cells
f.  Apply sort
g.  Apply various arithmetic and logical formulas.
10.  Create your resume using General Templates.

## Spreadsheet Tool

1. Create a student worksheet containing roll numbers, names and total marks. Open a document in Word and insert the excel worksheet using:-
i) Copy/Paste
ii) Embedding
iii) Linking
2. The term wise marks for APS class of 20 students are stored in 3 separate sheets named term1, term2 and term3. Create 4$^{th}$ worksheet that contains student names and their total and average marks for the entire year. Give proper headings using headers. Make the column headings bold and italic. The 4$^{th}$ worksheet should contain college name as the first line. Make it bold, italic and center it.

3. Using a simple pendulum, plot 1-T and 1-T$^2$ graph.

| I | t1 | t2 | t3 | Mean(t) | T=t/20 | T$^2$ |
|---|---|---|---|---|---|---|
| 70 | | | | | | |
| 80 | | | | | | |
| 90 | | | | | | |
| 100 | | | | | | |

4.        Consider the following employee worksheet:-

| Full    Name (First   Last) | Grade 1/2/3 | Basic Salary | HRA | PF | Gross | Net | (VA) Vehicle Allowance |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |

HRA is calculated as follows:

|  | Grade | HRA %(of Basic) |
|---|---|---|
| | 1 | 40% |
| | 2 | 35% |
| | 3 | 30% |

Gross = Basic + HRA + VA Net =
Gross –PF
PF is 8% for all Grades
VA is 15000, 10000 and 7000 for Grades 1, 2 and 3.
i)                Find max, min and average salary of employees in respective Grade
ii)               Count no. of people where VA>HRA
iii)              Find out most frequently occurring grade.
iv)              Extract records where employee name starts with "A" has HRA>10000
v)               Print Grade wise report of all employees with subtotals of net salary and also grand totals. Use subtotal command.
vi)              Extract records where Grade is 1 or 2 and salary is between 10000 and 20000 both inclusive.

5. In a meeting of a marketing department of an organization it has been decided that price of selling an item is fixed at Rs40. It was resolved to increases the sell of more of more items and getting the profit of Rs40,000/.Use Goal Seek of find out how many items you will have to sell to meet your profit figure.

6.        To study the variation in volume with pressure for a sample of an air at constant temperature by plotting a graph for P – V and P-I/V. Sample observations are:-

| Pressure(P) | Volume (V) | I/V | PV | P/V |
|---|---|---|---|---|
| 75 | 20 | | | |
| 78.9 | 19 | | | |
| 83.3 | 18 | | | |
| 88.2 | 17 | | | |

7. Plot the chart for marks obtained by the students (out of 5) vs. frequency (total number of

students in class is 50).
8. Create the following worksheet(s) containing an year wise sale figure of five salesmen in Rs.

| Salesman | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|
| MOHAN | 10000 | 12000 | 20000 | 50000 |
| MITRA | 15000 | 18000 | 50000 | 60000 |
| SHIKHA | 20000 | 22000 | 70000 | 70000 |
| ROHIT | 30000 | 30000 | 100000 | 80000 |
| MANGLA | 40000 | 45000 | 125000 | 90000 |

Apply the following Mathematical & Statistical functions:
i)        Calculate the commission for each salesman under the condition :-
a)           If total sales is greater than Rs. 3, 00,000/-, then commission is 10% of total sale made by the salesman.
b)           Otherwise, 4% of total sale.
ii)       Calculate the maximum sale made by each salesman.
iii)      Calculate the maximum sale made in each year.
iv)       Calculate the minimum sale made by each salesman.
v)        Calculate the minimum sale made in each year.
vi)       Count the no. of sales persons.
vii)      Calculate the cube of sales made by Mohan in the year 2002.
viii)      Find the difference in sales by salesman Mitra between the year 2002 and 2003. Find the absolute value of difference.
ix)       Also calculate the Mode, Stddev, Variance, Median for the sale made by each salesman.
ix)       Calculate the year wise Correlation coefficient between the sales man Mohan and Mitra year wise

9.        The following table gives an year wise sale figure of five salesmen in Rs.

| Salesman | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|
| S1 | 10000 | 12000 | 20000 | 50000 |
| S2 | 15000 | 18000 | 50000 | 60000 |
| S3 | 20000 | 22000 | 70000 | 70000 |
| S4 | 30000 | 30000 | 100000 | 80000 |
| S5 | 40000 | 45000 | 125000 | 90000 |

v)        Calculate total sale year wise.
vi)       Calculate the net sales made by each salesman
vii)      Calculate the commission for each salesman under the condition :-
a)           If total sales is greater than Rs. 4, 00,000/-, then commission is 5% of total sale made by the salesman.
b)           Otherwise, 2% of total sale.
viii)      Calculate the maximum sale made by each salesman.
ix)       Calculate the maximum sale made in each year.
x)        Draw a bar graph representing the sale made by each salesman.
xi)       Draw a pie graph representing the sale made by salesmen in year 2001.

10.      Consider the following worksheet for APS 1$^{st}$ year students:-

.

| S.No. | Name | PH | CH | BY | MT | CS | Total Marks | % | Grade |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |

Grade is calculated as follows:-

If  % >=90            Grade
A If  % >=80 & <90    Grade B
If  % >=70 & <80    Grade C If
% >=60 & <70 Grade D
Otherwise students will be declared fail.
i)          Calculate Grade using if function
ii)         Sort the data according to total marks
iii)        Apply filter to display the marks of the students having more than 65% marks.
iv)        Draw a pie chart showing % marks scored in each subject by the topper of the class.
v)         Draw the doughnut chart of the data as in (iv)
vi)        Enter the S.No. of a student and find out the Grade of the student using VLOOKUP.
vii)       Extract all records where name
a)             Begins with "A"
b)             Contains "A"
c)             Ends with "A"

## *Presentation Tool*

1.      Make a presentation of College Education System using
a.          Blank Presentation
b.          From Design Template
c.          From Auto Content Wizard
2.      Make a presentation on "Wild Life" and apply the following:
a.          Add audio and video effects
b.          Apply various Color Schemes
c.          Apply various animation schemes.
d.          Apply Slide Show

**REFERENCE BOOKS**

1.      Anita Goel, Computer Fundamentals, Pearson, 2012

## BCA-HG-2016: BASIC ELECTRONICS
### (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
### Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1:  Circuit Concepts and Circuit Analysis**                      **(20 Lectures)**
Voltage and Current Sources Resistors: Fixed and Variable resistors, Color coding of resistors, resistors in series and parallel Inductors: Fixed and Variable inductors, Self and mutual inductance, Faraday's law and Lenz's law of electromagnetic induction Capacitors: Principles of capacitance, Parallel plate capacitor, Permittivity, Definition of Dielectric Constant, Dielectric strength, Energy stored in a capacitor, Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic capacitor, capacitors in series and parallel Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis RC Circuit, RL Circuit, RLC Circuits Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.

**UNIT 2: Analog Electronics**                                   **(20 Lectures)**
PN Junction Diode, Construction and characteristics, Zener Diode, Half wave, full wave and bridge rectifier, Clipping and clamping circuit, regulated power supply, basic transistor action, Transistor current components and amplification. Transistor configurations: Common Base (CB), Common Emitter (CE) and Common Collector (CC) configuration, I-V characteristics, Concept of feedback, negative and positive feedback, Negative feedback, advantages and disadvantages of negative feedback, Barkhausen criteria for oscillations

**UNIT 3: Digital Electronics**                                  **(20 Lectures)**
Decimal, Binary, Hexadecimal and Octal number systems, base conversions, Truth Tables of OR, AND, NOT, XOR, XNOR, Universal (NOR and NAND) Gates, Basic postulates and fundamental theorems of Boolean algebra, Combinational Logic Analysis and Design, Adder, Subtractor, Encoder and Decoder, Multiplexers and Demultiplexers, Sequential logic design, Latches and Flip flops, S-R Flip flop, J-K Flip flop, T and D type Flip flops, Introduction to registers and counters

**REFERENCE BOOKS**

1.     W. H. Hayt, J. E. Kemmerly, S. M. Durbin, *Engineering Circuit Analysis*, Tata McGraw Hill(2005)
2.     R. L. Boylestad, L. Nashelsky, K. L. Kishore, *Electronic Devices and Circuit Theory*, Pearson  Education (2006).
3.  J. Millman and C. Halkias, *Integrated Electronics*, Tata McGraw Hill (2001).
4.  David A. Bell, *Electronic Devices & Circuits,* Oxford University Press, Fifth edition
5.  M. Morris Mano, *Digital System Design*, Pearson Education Asia,( Fourth Edition )

# BCA-HG-2026: INTRODUCTION TO BIO-INFORMATICS
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Introduction** **(10 Lectures)**

Definition and History of Bioinformatics, Internet and Bioinformatics, Applications of Bioinformatics

**UNIT 2: Biological Databases** **(12 Lectures)**

Sequence and structural with special emphasis on NCBI, EBI, DDBJ, PDB and SwissProt

**UNIT 3: Theoretical Aspects of Sequence Analysis** **(12 Lectures)**

Needleman-Wunsch and Smith-Waterman methods of global and local alignments between sequences

**UNIT 4: Molecular Phylogeny** **(14 Lectures)**

Properties and types of phylogenetic trees with special emphasis on tree building methods (UPGMA, Neighbour joining, Maximum parsimony, Maximum likelihood)

**UNIT 5: Biocomputing in Genomics and Proteomics** **(12 Lectures)**

Introduction to softwares and tools for sequence analysis and assembly (BLAST, FASTA, CLUSTAL W, MEGA), 2D gels and NMR and Crystallographic data

## REFERENCE BOOKS

1. *Bioinformatics Basics, Application in biological science and medicine*, Lukas K Buehler, Hooman H Rashidi
2. *Biological sequence analysis,* R. Dubin, S R Reddy, A Keogh, G Hutchison
3. *Bioinformatics: sequence & Genome analysis,* D W Mount
4. *Bioinformatics: A practical guide to the analysis of genome and proteins,* A D Barbados, B F Francis Ouellette
5. *Introduction to Bioinformatics,* Arthur M Lesk

# BCA-HG-3016: INTRODUCTION TO INDIAN HISTORY
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1:**                                                                    **(12 Lectures)**

Features of Indus Valley Civilization, Condition of India in Vedic period, Maurya dynasty with reference to Asoka's administration

**UNIT 2:**                                                                    **(12 Lectures)**

Gupta Period: Samudragupta and Chandragupta II, Harshavardhana-relation with Kamrupa, visit of Hiuen Tsang

**UNIT 3:**                                                                    **(12 Lectures)**

Foundation of Muslim rule in India: Iltutmish, Balban, Alauddin Khalji, and Muhammad-Bin-Tughluq, Rise of Mughal power in India: Akbar and Aurangzeb, Sivaji: character and achievements

**UNIT 4:**                                                                    **(12 Lectures)**

Arrival of Europeans and establishment of British power after Battle of Plassey, Revolt of 1857

**UNIT 5:**                                                                    **(12 Lectures)**

Birth of Indian National Congress and Swadeshi Movement, Non-Cooperation Movement and Civil Disobedience Movement, Quit India Movement and independence

## REFERENCE BOOKS

6.   *Modern Indian History*, B L Grover, S L Grover
7.   *Medieval India: from Sultanate to Mughals-Mughl Empire*, Satis Chandra
8.   *History of Ancient India*, K C Choudhury
9.   *Ancient India in Historical Outline*, D N Jha

# BCA-HG-3026: POSITIVE PSYCHOLOGY
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1:  Introduction**                         **(10 Lectures)**

Positive psychology: Definition; goals and assumptions; Brief history of Positive psychology, Relationship with other fields of psychology, Scope of positive psychology.

**UNIT 2:  Positive emotions**                         **(6 Lectures)**

Positive emotions: concept and theory; Cultivating positive emotions; Relevance of positive emotions.

**UNIT 3: Happiness and Well-Being**                    **(17 Lectures)**

Happiness- hedonic and Eudemonic approaches; Well- being: negative vs positive functions; Subjective well –being: Emotional, social and psychological well-being, Martin Seligman's model of well-being and happiness: PERMA model

**UNIT 4: Positive Cognitive States: Resilience and Optimism**           **(17 Lectures)**

Resilience: perspectives; Sources of resilience in childhood, adulthood and later life; Optimism-How optimism works; variation of optimism and pessimism; Explanatory or attributional style of explaining life events.

**UNIT 5: Applications of Positive Psychology**                 **(10 Lectures)**

Positive schooling: Components; Positive coping strategies, Mental health: Moving toward balanced conceptualization; Mindfulness, Essential steps to mindfulness.

**REFERENCE BOOKS**

1. Snyder, C.R. & Lopez, S.J. (2002). *Handbook of positive psychology.* (eds.). New York: Oxford University Press.
2. Baumgardner, S.R & Crothers, M.K.(2009). *Positive Psychology.* U.P: Dorling Kindersley Pvt Ltd.
3. Carr, A. (2004). *Positive psychology, The science of happiness and human strengths.*New York: Routledge.
4. Singh, A.(2013).*Behavioral science: Achieving behavioral excellence for success.* New Delhi: Wiley India Pvt ltd.

# BCA-HG-4016: INTRODUCTION TO DRAMATIC ARTS
## (Credit: 5+1=6)  (L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

### UNIT 1: General Cultural Aspects

Cultural History of India, Knowledge of major epics like Ramayana, Mahabharata, their content, character and relevance to Indian Theatrical practice, An Acquaintance with Indian Mythology

### UNIT 2: The Natyashatrric Tradition

Through knowledge of Bharata's Natyashastra, its relevance to and influence on Indian Classical Theatre, The four 'Abhinayas', aim and nature of Sanskrit natya according to Bharata and later Commentators, the concepts of Natya, Nritya and their characteristics in the earliest and medieval theories, the types of theatre and their construction according to Natyashastra

### UNIT 3: Theatre Techniques & Design

Introduction to acting, Introduction to theatre techniques and design, Forms and elements of theatre: Classical and contemporary, Stylised and Naturalistic, Types of theatre: dance, musical, puppet, mime, mask etc, Types of stages: proscenium, thrust, round, open etc., stage and its requirement: properties, costume, make-up, light etc.

### UNIT 4: Theatre History, Literature & Aesthetics

Introduction to Shakespeare's works, special reference Macbeth and Othello, Indian Theater, Introduction, special reference to Mohan Rakesh's "Adheadhure", Dharamvir Bharati's "Andhayug" and Vijay Tendulkar's "Ghasiramkotwal",  Introduction to Assamese Theatre, special reference to Jnanadaviram Barua's "Ram Navami", Hemchandra Barua's "kaniyar Kirtan", Jyotiprasad Agarwala's "Karengor Ligiri", Arun Sarma's "Aahar" and "Sri Nibaran Bhattacharya"

### REFERENCE BOOKS

1. *An Actor* Prepares by Constantin Stanislavski
2. *Building A Character* by Constantin Stanislavski
3. *Creating A Role* by Constantin Stanislavski

# BCA-HG-4026: INFORMATION SECURITY AND CYBER LAWS
## (Credit: 5+1=6)(L: 5, P: 0, T: 1)
## Theory: 60 Lectures, Tutorial: 15 Lectures

**UNIT 1: Course Introduction** **(8 Lectures)**
Computer network as a threat, hardware vulnerability, software vulnerability, importance of data security

**UNIT 2: Digital Crime** **(4 Lectures)**
Overview of digital crime, criminology of computer crime

**UNIT 3: Information Gathering Techniques** **(8 Lectures)**
Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, malicious software, session hijacking

**UNIT 4: Risk Analysis and Threat** **(10 Lectures)**
Risk analysis, process, key principles of conventional computer security, security policies, authentication, data protection, access control, internal vs external threat, security assurance, passwords, authentication and access control, computer forensics and incident response

**UNIT 5: Introduction to Cryptography and Applications** **(10 Lectures)**
Important terms, Threat, Flaw, Vulnerability, Exploit, Attack, Ciphers, Codes, Substitution Cipher (Caeser), Transposition Cipher (Rail-Fence), Public key cryptography (Definitions only), Private key cryptography (Definition and Example), Cyber forensics, Steganography

**UNIT 6: Safety Tools and Issues** **(10 Lectures)**
Firewalls, logging and intrusion detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking

**UNIT 7: Cyber laws to be covered as per IT 2008** **(10 Lectures)**
• Chapter 1: Definitions
• Chapter 2: Digital Signature and Electronic Signature
    • [Section 43] Penalty and Compensation for damage to computer, computer
•    [Section 65] Tampering with Computer Source Documents
• [Section 66 A] Punishment for sending offensive messages through communication service
  etc.
• [Section 66 B] Punishments for dishonestly receiving stolen computer resource or communication device
• [Section 66C] Punishment for identity theft
• [Section 66D] Punishment for cheating by personating by using computer resource
• [Section 66E] Punishment for violation of privacy
• [Section 66F] Punishment for cyber terrorism
• [Section 67] Punishment for publishing or transmitting obscene material in electronic form

• [Section 67A] Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form[Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form
    • [Section 72] Breach of confidentiality and privacy

## REFERENCE BOOKS

1.    M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education
2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010
3. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation, Cengage Learning India, 2008
4. Anderson, Ross, Security engineering, John Wiley & Sons, 2008 (Freely available online)

-------------------------------------------------------------------------------------------------