

# **DRAFT SYLLABUS**

## **Bachelor of Computer Application (BCA) *Honours Programme* (Semester System)**

**A THREE-YEAR DEGREE COURSE**

*of*

**North Eastern Hill University  
Shillong**

**Proposed to be Effective from the  
Academic Session 2014  
*Recommended by the Board of Under Graduate Studies (BUGS)  
for Computer Applications*  
In its meeting held on 4<sup>th</sup> March 2014**



## A Brief Note on the Programme

The BCA (Honours) programme is a three-year full-time Bachelors Degree Program in Computer Applications resulting in the award of the Bachelors Degree in Computer Applications (Honours) by the University.

### Programme Objective:

The objective is to provide a sound academic base from which a moderate to advanced career in Computer Applications can be developed. A firm, conceptual grounding in computer applications in the practical environment is the focus of the programme. Keeping the above objective in view, the programme has been designed to prepare employable students with knowledge, skills and aptitude appropriate for the prevalent IT market in India. Accordingly, the emphasis of the programme is more on programming and software applications.

### Learning Model:

It includes learning about various development tools involved in creating application software, to inculcate various methodologies in automation. The course aims at giving maximum exposure to various areas of Computer Applications including latest development keeping in pace with the industry. The curriculum also includes live Projects, Seminars etc, which aims to develop students into competent IT professionals. BCA (H) programme introduces every student to the practical aspects of software development, keeping in mind the needs and requirements of the clients, thereby the students have ample scope in the Customer Support department in making the software more viable and easier for the client to use.

### Course Guidelines:

**Internal Assessment:** The marks for internal assessment specified for each course is to be given on the basis of:

- |  |  |
|--|--|
| • Tests held during the year (for both theory and practical)-<br>Average of two best performances to be considered | 60% weightage                          |
| • Assignments / seminars etc.  | 40% (30% if there is practical record) |
| • Laboratory record book wherever applicable   | 10%                                    |

A record of this may be maintained by the college/student till the comprehensive viva voce (in the course BCA-603) is over.

**Practical Record Book:** In the course involving practicals, a standard set of problems has been listed. These and/or others similar to them are to be done as practical work and submitted by the students in a laboratory record book. For each problem, the following sections are to be recorded:

- Glossary of variables
- Pseudocode and/or flowchart
- Source code
- Sample input/output screens

**Theory Examination:** For the theory papers, the questions should be designed to test the candidates' ability to

- Understand a program segment and give a brief description of what it does
- Debug a small program containing logical/syntactical errors
- Write the output of a program given a set of input values



- Modify a small program
- Drawing/modifying flowcharts etc.

Since the courses designed follow unitization, questions are to be set from all units giving internal choices, i.e in the form of *either or* .

**For General papers**, there will be an Objective as well as a Descriptive Section. The Objective Section will cover 40% of the marks and will consists of Fill in the Blanks, True / False questions, Multiple choice and very short answer type questions, whereas the Descriptive section will cover 60% of the marks. **Honours papers** will not have any Objective Section.

(If objective type questions of true or false nature are given, the reasons for the choice should also be asked to prevent guesswork)

**Practical Examination:** For the practical examination, the problems need not be restricted to those given in the syllabus. However, they should be of similar standard. For evaluation of practical examination, the following points may be considered:

- |  |           |     |
|--|-----------|-----|
| • Logic (pseudocode and/or flowchart, source code, syntax) | Weightage | 60% |
| • Screens  | Weightage | 10% |
| • Completion   | weightage | 30% |

**Duration of Examinations:**

**Theory Papers:** Three (3) Hours for papers with 75 marks  
Two (2) Hours for papers with 45 marks

**Practical Papers:** Three (3) Hours

**COURSE STRUCTURE & DISTRIBUTION OF MARKS FOR BCA (HONOURS)  
PROGRAMME (SEMESTER)**

Course Code	Title	Theory		Practical		Total
		Paper	Internal	Paper	Internal	
<b>First Semester</b>						
BCA-101	Mathematics – 1	75	25	-	-	100
BCA-102	<i>Digital Computer Fundamentals</i>	75	25	-	-	100
BCA-103	<i>Problem Solving and Programming in C</i>	45	15	30	10	100
<b>Second Semester</b>						
BCA-201	Mathematics-II	45	15	30	10	100
BCA-202	Data Structure in C	45	15	30	10	100
BCA-203	<i>Computer System Architecture</i>	75	25	-	-	100
<b>Third Semester</b>						
BCA-301	Financial Accounting and Management	75	25	-	-	100
BCA-302	<i>Database Management System</i>	45	15	30	10	100
BCA-303	<i>Operating System and Introduction to LINUX</i>	45	15	30	10	100
<b>Fourth Semester</b>						
BCA-401	Software Engineering	75	25	-	-	100
BCA-402	<i>Data Communication And Networks</i>	75	25	-	-	100
BCA-403	<i>VB.net Programming</i>	45	15	30	10	100
<b>Fifth Semester</b>						
BCA-501	English	75	25	-	-	100
BCA-502	<i>Object Oriented Programming Through Java</i>	45	15	30	10	100
BCA-503	<b>Elective 1</b> a. Internet & Web Technology Using MYSQL And PHP b. Internet & Web Technologies Using JSP	45	15	30	10	100
<b>Sixth Semester</b>						
BCA-601	Environmental Studies	75	25	-	-	100
BCA-602	<b>Elective 2</b> a. Artificial Intelligence b. Data Warehousing and Data Mining c. Operations Research d. Network Security e. E-Commerce	75	25	-	-	100
BCA-603	<i>Project Work</i>	-	-	75	25	100
<b>Total (18 courses x 100 = 1800 marks)</b>						

BCA Honours students will be placed in different classes /divisions on the basis of their performance in the **nine core papers** each carrying 100 marks (Highlighted in bold and italic).

## ***Detailed Syllabus***

**BCA-101: MATHEMATICS-I****Objective:**

The objective of the course is to impart basic Mathematical concepts and techniques.

**Outline of the Course**

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	Functions and graphs	16	15
II	Differential Calculus	16	15
III	Integral Calculus	16	15
IV	Differential Equations	16	15
V	Matrices	16	15
<b>Total</b>		<b>80</b>	<b>75</b>

**UNIT I****Functions and graphs**

Functions and graphs: Real valued functions such as polynomials, rational functions, logarithmic functions, exponential functions, limits, standard theorems on limits, standard limits. Continuity and its properties, differentiability. Statements with applications only of the following: Boundedness, Intermediate value theorem.

**UNIT II****Differential Calculus**

Derivatives of real valued functions on intervals: definition; derivative as a rate measurer, derivative as the gradient of tangent. Working out the derivatives of the common functions mentioned in Unit-1; Review of methods of differentiation. Differentials, maxima and minima of functions. L. Hospital's Rule (statements only with applications).

**UNIT III****Integral Calculus**

Antiderivatives: Review of the standard methods, integration by parts and by partial fractions. Integral of a continuous function as the limit of sum (only for sums arising out of equal distribution of intervals); examples of evaluation of integrals from the definition. Statements with illustrations of the properties of definite integral, evaluation of integrals using these properties.

Improper integrals, convergence and evaluation from definition.

**UNIT IV****Differential Equations**

Definition and formation of differential equations, Equations of first order and first degree: Separation of variables, homogenous equations, Bernoulli's equation, exact equation. Clairaut's form, Linear equations with constant coefficients.

**UNIT V****Matrices**

Definitions, Addition, multiplication, transpose, conjugate transpose; special type of matrices: diagonal, scalar, upper/lower triangular, nilpotent, idempotent, symmetric, skew symmetric, hermitian, skew hermitian matrices; trace of a square matrix; Adjoint, Singular and Non singular matrix, Inverse of a matrix Orthogonal matrix, Elementary transformation, Rank, Normal form.

**Instructions for Paper Setter:**

Questions			
Unit	To be set	To be answered	Marks
I	2	1	15
II	2	1	15
III	2	1	15
IV	2	1	15
V	2	1	15

#### Recommended Books

##### Text:

1. Maity & Ghosh, Integral Calculus, 6<sup>th</sup> Edition, New Central Book Agency (P) Ltd., 2003
2. Maity and Ghosh, Differential Calculus, 7<sup>th</sup> Edition, New Central Book Agency (P) Ltd., 2004
3. Vasishtha, A.R., Vasishtha, A.K., Matrices, New Edition, Krishna's Educational Publishers, 2013
4. Das & Mukherjee, Integral Calculus & Differential Equations, 55<sup>th</sup> Edition, U.N. Dhur & Sons Private Ltd.

##### Reference:

1. Thomas & Finney, Calculus, 9<sup>th</sup> Edition, Pearson Asia Education, 2001
2. Pal, B.K., Das, K., BCA Mathematics Vol. IV, 1<sup>st</sup> Edition, U.N. Dhur & Sons Private Ltd., 2011
3. Das, A. N., Advanced Higher Algebra, 1<sup>st</sup> Edition, Books and Allied (P) Ltd., 2011
4. Raisinghania, M.D., Ordinary and Partial Differential Equations, 15<sup>th</sup> Edition, S. Chand Publishing, 2010

**BCA-102: DIGITAL COMPUTER FUNDAMENTALS****Objective:**

The course aims to provide students with an insight into the workings of internal circuitries of modern day Digital Computers.

**Outline of the Course**

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	Number Systems	16	15
II	Boolean Algebra and Logic Gates	16	15
III	Simplification Using Karnaugh Map and Combinational Circuits	16	15
IV	Sequential Circuits	16	15
V	Counters and Registers	16	15
Total		80	75

**UNIT I**

**Number Systems:** Bit, Byte, Nibble, Word, Binary Number, Binary Arithmetic (Addition, Subtraction, Multiplication, Division), Subtraction using  $r$ 's and  $(r - 1)$ 's Complement, Hexadecimal number system, Octal number system, Conversion between number systems, Binary codes (BCD, Error-Detection, ASCII, EBCDIC).

**UNIT II**

**Boolean Algebra:** AND, OR, NOT, NAND, NOR, XOR and XNOR operations, Boolean variables, postulates and theorems of Boolean Algebra, Boolean functions, Simplification of Boolean expressions by algebraic method, Dual and Complement of a Boolean expression, Canonical form, Standard form, Sum of Products and Product of Sums Forms of Logic expression and conversion between two, conversion of expression in Standard form into Canonical form.

**Digital Logic Gates:** Logic Gates (AND, OR, NOT, NAND, NOR, XOR and XNOR), Realization of other logic functions using NAND/NOR gates.

**UNIT III**

**Karnaugh Maps:** Minimization using Karnaugh map for two, three and four variables, Sum-of-Products and Products of sums simplification using K-map, Don't Care Conditions, Quine-McCluskey method (Tabulation method).

**Combinational circuits:** Introduction, block diagram. Arithmetic Circuits: Half – Adder, Full – Adder. n-to-m line Decoder, Encoder,  $2^n-1$  Multiplexer, De-multiplexer: 2-to-4 line decoder with enable.

**UNIT IV**

**Sequential Circuits:** Introduction, block diagram. Flip – Flops: Basic R-S flip flop (Latch), Clocked flip-flops (Logic diagram, Graphic Symbol, Characteristic table, Characteristic equation, Excitation table): R-S flip flop, D flip-flop, J-K flip flop, T flip flop. Master-Slave flip-flop using R-S flip-flop graphic symbols.

**UNIT V**

**Counters:** Design of a 3-bit binary counter using T flip-flops, 4-bit Binary Ripple counter using J-K flop-flops (Mod-16), BCD Ripple counter. Synchronous Counter: 4-bit binary synchronous counter, 4-bit up-down binary synchronous counter.

**Registers:** 4-bit Register, 4-bit Register with parallel load, Shift Register: Serial transfer.

**Instructions for Paper Setter:**

Questions			
Unit	To be set	To be answered	Marks
I	2	1	15
II	2	1	15
III	2	1	15
IV	2	1	15
V	2	1	15

**Recommended Books:****Text:**

1. Mano, M. Morris, Digital Logic and Computer design, 3rd Edition, Prentice Hall India 2002.

**Reference:**

1. Malvino & Leach, Digital Computer and Applications, 4th Edition, Tata Mc-Graw Hill Company, 2001.
2. Hayes, J.P. Computer Architecture and Organisation, 4th Edition, Tata Mc-Graw Hill Company, 2001.
3. Hamacher, V. Carl, Computer Organisation, 4th edition, Tata Mc-Graw Hill Company, 2001.
4. Bartee, Thomas C, Digital Computer Fundamentals, 6th Edition, Tata Mc-Graw Hill Company, 2001.
5. Nagpal, D.P, Computer Fundamentals: Concepts Systems & Applications, Wheeler Publishing, 2001.

**BCA-103: PROBLEM SOLVING AND PROGRAMMING IN C****Objective:**

The objective of the course is to introduce the fundamentals of C programming language and develop the skills for solving problems using computers. After completion of this course, a student will be able to

- Understand Problem solving through flowcharts and Algorithms
- Understand and use the process of abstraction using a programming language such as 'C'
- Analyze step by step and develop a program to solve real world problems
- Understand File handling in C

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
40	40	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours		Marks	
		Theory	Practical	Theory	Practical
I	Problem solving concepts and strategies	4	-	5	-
II	C Fundamentals	10	10	10	12
III	Functions and The C Preprocessor	8	10	10	
IV	Program Structure, Arrays and Pointers	10	10	10	10
V	Structure, Unions and File handling in C	8	10	10	08
<b>Total</b>		<b>40</b>	<b>40</b>	<b>45</b>	<b>30</b>

**UNIT I**

**Problem solving concepts:** Introduction to flowcharts, Basic Symbols used in Flowchart Design, Design of Algorithms, Definition, Features of Algorithm, criteria to be followed by an Algorithm

**Problem solving strategies:** top down design, bottom up design, Analysis of Algorithm Complexity

**UNIT II**

**C Fundamentals:** The C character set, identifies and key words, Data types, constants, variables and arrays, declarations, expressions, statements, symbolic constants, operators and Expressions, Arithmetic operators, many operators, relational, logical and bitwise operators, assignment operators, library functions. I/O functions, preliminaries, getch, getche, getchar, putchar, scanf, printf, gets, puts.

**Control statements:** Preliminaries, while, do, while, for, if, else, switch, break, continue, goto statements.

**UNIT III**

**Functions:** A brief overview, defining a function, accessing a function, passing arguments to a function, specifying arguments data types, function prototypes, recursion, call by value, call by reference.

**The C Preprocessor:** Macro Expansions, macro with arguments and Macro Versus function, File Inclusion, Conditional Compilation, # if and # elif directives, Miscellaneous directives, #undef and 3 pragma directives, command line parameters.

**UNIT IV**

**Program Structure:** Storage classes, Automatic, register, External, Static Variables.

**Arrays and Pointers:** Defining an array, processing an array, passing array to a function multidimensional arrays, arrays and strings, pointer declarations, passing pointer to a function, pointer and one dimensional arrays, operating on pointers, pointers and multidimensional arrays, dynamic memory allocation, arrays of

pointers, passing functions to other functions, pointer to function, functions returning pointers.

### UNIT V

**Structure and Unions:** Defining a structure, processing a structure, users defined data types, structure and arrays, structures and pointers, passing structures to a function, self referential structures, bit fields in structures, union, Union of structures, Enumerations, typedef.

**File handling in C:** Introduction, Defining and Opening a File, Closing a File, Input/Output Operations on Files, Error Handling during I/O Operations, Random Access to Files.

**Instruction for the paper Setter:**

Unit	Questions					
	Theory			Practical		
	To be set	To be answered	Marks	To be set	To be answered	Marks
I	2	1	5	-	-	-
II	2	1	10	2	1	12
III	2	1	10			
IV	2	1	10	2	1	10
V	2	1	10	2	1	08

#### Distribution of marks for practical

- 10% : Syntax and input/output screens
- 30% : Logic and efficiency (source code, pseudocode, and algorithm)
- 20% : Error trapping (illegal or invalid input, stack overflow, underflow, insufficient physical memory etc.)
- 20% : Completion
- 20% : Result

#### Recommended Books

##### Text:

- Gottfried, Byron. S., *Theory and Practice of Programming with C, Schaum's Outline Series*, 3<sup>rd</sup> Edition, McGraw-Hill, New Delhi, 2001
- Hanly J. R and Koffman E B., *Problem Solving And Program Design In C*, 5<sup>th</sup> Edition, Pearson/Addison Wesley

##### Reference Books

- Kanetkar Yeshawant, *Let us C, 10<sup>th</sup> Edition*, BPB Publications, New Delhi 2010
- Balagurusamy E, *Programming in ANSI C, 4<sup>th</sup> Edition*, TMH Publishing Co. Ltd. New Delhi 2012
- Thareja Reema, *Programming in C, 1<sup>st</sup> Edition*, Oxford University Press, New Delhi, 2011

**Sample Practical Assignments (Any Appropriate C compiler to be made available)**  
(Questions need not be restricted to this list)

Write a C program

- for swapping the two numbers without using another variable.
- for calculating simple interest.
- for converging Fahrenheit into Centigrade degree vice versa.
- for calculating the sum of the digits of the given number.
- for reversing the digits of a number and to determine whether the original and reversed numbers are equal or not.
- for finding whether the given year is a leap year or not (use % modulus operator).
- for generating prime numbers (use nested loops, break and continue)
- for generating Fibonacci numbers.

9. for finding the factorial of the given numbers.
10. for finding the value of the SINE series.
11. for generating PASCAL triangle
12. for sorting the elements of an array by using Bubble sort.
13. for finding the biggest and smallest number and its position in the given array.
14. for the addition, subtraction and multiplication of matrices using function.
15. For finding the sum of the row, column and diagonals of the given matrix.
16. for finding the largest number of the given matrix using function.
17. for sorting all the elements of a matrix using functions.
18. to read and display the text by using pointers and function.
19. to read the text and convert the case of the text.
20. to check whether the given string is palindrome or not.
21. for searching a pattern in a given text.
22. for writing a given number in words using function.
23. for displaying the text in a given file (TYPE command in DOS)
24. to copy the contents of one text to another text file.
25. to merge the two text file to another text file.
26. to copy a file by converting lower case text file to upper case text file using command line.
27. for sorting the given 10 names by using arrays of pointers.
28. to create records of students with marks.
29. display a particular record.
30. edit a particular record.

**BCA-201: MATHEMATICS-II****Objective**

The objective of the course is to impart basic Mathematical concepts and techniques.

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
50	30	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours		Marks	
		Theory	Practical	Theory	Practical
I	Set Theory	10	-	10	-
II	Mathematical Logic	10	-	10	-
III	Numerical Methods I	10	10	9	30
IV	Numerical Methods II	10	10	8	
V	Numerical Methods III	10	10	8	
<b>Total</b>		<b>50</b>	<b>30</b>	<b>45</b>	<b>30</b>

**UNIT I****Set Theory**

Basics in set theory such as ways of describing a set, set operations, empty set, disjoint sets, De Morgan's laws, Venn diagrams; power sets, Cartesian products, cardinality results; relation as a subset of Cartesian product (notation:  $xRy$  if  $(x,y) \in R$ ); relation on a set: reflexive, symmetric, anti-symmetric, transitive with examples. Equivalence relation.

**UNIT II****Mathematical Logic**

Connectives, well formed formulas, truth tables, tautology, equivalence, implication, normal forms, predicates, free & bound variables, rules of inference, consistency.

**UNIT III****Numerical Methods I**

Computer Arithmetic: Normalized floating-point representation of real numbers and operations using it; normalization and its consequences.

Errors in Arithmetic Operations: Types and measurement, absolute and relative error, approximation and significant figure.

Solution of a Single Polynomial or Transcendental Equation: Rate of convergence of iterative methods (definition only), Method of bisection, false-position, Newton-Raphson method, secant method. Solution of simultaneous algebraic Equations: Gauss elimination method, pivotal condensation.

**UNIT IV****Numerical Methods II**

Polynomial Interpolation: Lagrange's interpolating polynomial, difference tables and Newton's divided difference interpolating polynomial, Newton-Gregory forward and backward difference interpolating polynomials.

**UNIT V****Numerical Methods III**

Numerical Differentiation and Integration: numerical differentiation, quadrature formulae, trapezoidal rule, and Simpson's one-third and one-eight rules.

**Instructions for Paper Setter:**

Unit	Questions					
	Theory			Practical		
	To be set	To be answered	Marks	To be set	To be answered	Marks
I	2	1	10	-	-	-
II	2	1	10	-	-	-
III	2	1	9	3	2	30
IV	2	1	8			
V	2	1	8			

**Recommended Books****Text:**

1. Lipschutz S., Schaum's Outlines of theory and problem of Set Theory and Related Topics, 2<sup>nd</sup> edition, McGraw-Hill, 1998
2. Tremblay & Manohar, Discrete Mathematical Structures with Applications to Computer Science, 1<sup>st</sup> Edition, Tata McGraw Hill Education, 2001
3. Rajaraman V., Computer Oriented Numerical Methods, 5<sup>th</sup> Edition, Prentice Hall of India, New Delhi, 2002

**Reference:**

1. Pal, B.K., Das, K., BCA Mathematics Vol. IV, 1<sup>st</sup> Edition, U.N. Dhur & Sons Private Ltd., 2011
2. Das, A.N., Numerical Analysis Computational Techniques With Elements of Computer Science, 3<sup>rd</sup> Edition, U.N. Dhur & Sons Private Ltd., 2011

**BCA-202: DATA STRUCTURES IN C****Objective:**

The objective of the course is to present the students to learn how to create data structures in a computer language, such as C, to represent a collection of similar data, and how to process these data most efficiently for solving problems. After completion of this course, a student will be able to understand and use the process of abstraction using a programming language such as 'C' analyse step by step and develop algorithms to solve real world problems implement various data structures viz. Stacks, Queues, Linked Lists, Trees and Graphs understand various searching and sorting techniques .

It is expected that the student has basic knowledge of C language.

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
50	30	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours			Marks	
		Theory	Practical	Total	Theory	Practical
I	Arrays and Linked List	10	5	15	09	10
II	Stacks and Queues	10	5	15	09	10
III	Trees	10	8	18	09	10
IV	Graph Theory	10	7	17	09	10
V	Searching and Sorting	10	5	15	09	10
<b>Total</b>		<b>50</b>	<b>30</b>	<b>80</b>	<b>45</b>	<b>30</b>

**UNIT I**

Definition of data structure, operations, Abstract Data Type, Algorithms; Complexity, Time space Trade off with example, Rate of Growth; Big O Notation.

**Array:** Arrays and Pointers, Representation of Arrays, Row Major Representation, Column Major Representation, Operations in an Array.

**List:** Sparse Matrices, Polynomials, Linked List Implementation (Insertion, Deletion, Searching, Traversing, Sorting), Doubly Linked List, Circular Linked list (Definitions only)

**UNIT II**

**Stacks** – Definition, Stack implementation using Array, Arithmetic expressions, Polish notation, Recursion, Towers of Hanoi.

**Queues:** Definition, Queue implementation using Array, Dequeues, Priority Queues, Circular queues (Definitions Only)

**UNIT III****Trees:**

Introduction, Binary trees, 2-trees, Representing Binary trees in memory, Traversing Binary trees, Pre-order, in-order and Post-order traversal, Traversal algorithms using stacks, Header Nodes: Threads, Binary Search Trees, Searching and Inserting in Binary Search trees, Complexity of searching algorithm, Deleting in a Binary search tree, General trees, AVL and B-Trees (definition only)

**UNIT IV**

**Graph Theory:** Introduction, Graph theory terminology: Graphs and multigraphs, Directed Graphs, Sequential representation of graphs, Adjacent matrix, Path matrix, Linked representation of a Graph, Operations on Graphs: Searching in a Graph, Inserting in a graph, Deleting from a graph: Traversing a graph: Breadth – First search; Depth-First search.

**UNIT V**

**Searching:** Linear Search, Binary Search with complexity, Hashing, Hash Functions, Divide and Conquer Algorithm.

**Sorting:** Bubble sort, Selection Sort, Insertion Sort, Quick Sort, Heap Sort, Merge-Sort, Efficiency Considerations and Complexity of Sorting Algorithms.

**For Practical, any appropriate C/C++ Compiler to be made available**

**Instruction for Paper Setter:**

Unit	Theory			Practical		
	To Be Set	To Be Answered	Marks	To Be Set	To Be Answered	Marks
I	2	1	09	2	1	10
II	2	1	09	2	1	10
III	2	1	09			
IV	2	1	09	2	1	10
V	2	1	09			

**Distribution of marks for practical**

- 10% : Syntax and input/output screens
- 30% : Logic and efficiency (source code, pseudocode, and algorithm)
- 20% : Error trapping (illegal or invalid input, stack overflow, underflow, insufficient physical memory etc.)
- 20% : Completion
- 20% : Result

**Recommended Books****Text:**

1. •Lipshultz, Seymour: Theory And Problems Of Data Structures, Schaum's Outline Series, Tata McGraw Hill India Ltd
2. •Reema Thareja : Data Structures using C, Oxford University Press.
3. •Tenenbaum Aaron M, et al: Data Structures Using C & C++ 4th Edition: Prentice Hall of India

**Reference:**

1. •Horowitz & Sahani, Fundamentals of Data Structures, 4th Edition, Galgotia Publications, 2002
2. •Lafare R, Teach Yourself Data Structure & Algorithms, 4th Edition BPB Publications 2001
3. •Aho A. H, Hopcroft, J.E and Ullman, J., Data Structures and Algorithms, 6th Edition, Addison
4. Wesley Longman 2002

**Practical Assignments**

(Questions need not be restricted to this list)

1. Write a menu-driven program to
  - a) construct a singly linked list. Assume the information part of each node consists of only an

integer key. Get input for each key from the keyboard. Assume the input is over when the user enters -1

- b) print the information from each node
  - c) delete all nodes containing a given number
  - d) Exit
6. Consider that  $L$ , a linked list of  $n$  integers, is given to you. Suppose, the nodes of the list are numbered from 1 to  $n$ . It is required to split the list  $L$  into 4 lists so that the first list contains the nodes of  $L$  numbered 1, 5, 9, 13 ... The second list contains the nodes numbered 2, 6, 10, 14 ... The third list contains the nodes of  $L$  numbered 3, 7, 11, 15, .... The fourth list contains the nodes of  $L$  numbered 4, 8, 12, 16 ... Write a program to create the list and perform the splitting.
7. Write a C function to insert a node appropriately to an already sorted list so that after insertion, the new list also becomes sorted. Take care of special cases such as inserting into an empty list. Use this function to write a program which accepts integers at the input and at the end produces a sorted list. Assume that if the integer read at the input is '0' then your program should stop.
8. Write a program to implement polynomial multiplication. Test your program by inputting the following two polynomials given below.
- $$10 P^8 + 14 P^6 - 8 P^5 - 3 P^4 + P^2$$
- $$3 P^4 + 5 P^3 - 2 P + 9$$
- ( ^ is to be read as "raised to")
- Store each term of the polynomial in a linked list in descending order of the index. Use separate linked lists for each polynomial. Obtain and store the product in a third linked list, and then print out all the three polynomials in a format similar to the one shown above, in descending order of index.
9. A bi-directional list is a list of elements that are linked in both ways. Both links are originating from a header. Construct a module with procedures for searching, inserting and deleting elements.
10. Write a program to represent a sparse matrix using linked list. Add together two such matrices, and display the original and resulting matrices in matrix form.
11. Write a menu-driven program to implement a stack *using arrays*. The menu should have the following options:
- a) Push on to the stack
  - b) Pop from the stack and print the value popped from the stack
  - c) Merely print the value on top of the stack
  - d) Exit
- Error trapping should be done for underflow and overflow. Available array space should be efficiently used (i.e. there cannot be overflow if there is more than 1 empty element in the array). Assume that the information part of a stack element is only an integer.
12. Write INSERT and DELETE functions in C language simulating insertion and deletion in circular queue which stores an array of characters.
13. A double-ended queue is a linear list in which additions and deletions may be made at either end of the queue. Write a C function to implement deque with desired functionality. Illustrate use of your function in an example problem, say, a queue of integers.
14. Devise a scheme to traverse a singly linked list in both directions by reversing the links during left to right traversal. Write a C program to implement this traversal scheme.
15. Write a C program to convert an expression from its infix form to its equivalent (a) postfix form,

- (b)prefix form. Assume the infix expression contains only operators +, -, /, \*, ^. The operator '^' stands for exponentiation. The operands are all single digit integers. Display the resulting (a)postfix expression (b)prefix expression.
16. Write a program to input a postfix expression that consists of only single digit positive operands and the binary operators +, -, \*, and /. Using a function, evaluate this postfix expression. The function should report if the postfix expression is invalid, else return its value. [For example, 242/-46\*+7+ is a valid postfix expression (being the equivalent of the infix expression, 2-4/2+4\*6+7) and its value is 31.00.]
  17. Write a program to construct a binary search tree of integers using linked list. Assume the information part of each node consists of only an integer key. Get input for each key from the keyboard. Assume the input is over when the user enters -1. Next, print out the keys in ascending order of magnitude, using a non-recursive function.
  18. Write a program to create a binary tree and to traverse the tree in
    - a) pre-order
    - b) in-order
    - c) post-order
  19. Implement a procedure for deleting an element  $X$  from a binary search tree.
  20. Write a program to reconstruct a binary search tree given its pre-order and in-order traversal sequence.
  21. Write a program to find the biggest and smallest item in a binary search tree.
  22. Design and implement an algorithm for insertion of an element in AVL tree taking into account all possible conditions.
  23. Represent a graph using adjacency matrix. Write a C procedure to transform an adjacency matrix based representation to a linked-list based representation.
  24. Design a suitable representation so that a graph can be stored on a hard disk. Write a procedure adjacency matrix based representation.
  25. Write a program to represent a graph and perform a non-recursive depth first search of an item in it.
  26. Write a program to represent a graph and compute the shortest distance between two nodes in it.
  27. Write a program to input some numbers into an array, and then sort them using various sorting techniques (selection sort, bubble sort, quick sort, radix sort) and compare their time-complexities.
  28. Write a program to input some numbers (at least 128 numbers, the more the better) from a file into two arrays A and B. Sort array B. Perform the linear search in array A and binary search in array B for a given number. Repeat these as many times as user decides and compare the time-complexity of the two search methods on the average.
  29. Design and implement an algorithm to delete an identifier  $X$  from a hash table which uses hash function  $f$  and linear open addressing to resolve collisions. Your deletion scheme must ensure that correct search is possible even after deletion.

**BCA-203: COMPUTER SYSTEM ARCHITECTURE****Objective**

The course aims to impart basic knowledge of Computer Architecture with an introduction to parallel processing and data transfer techniques.

**Outline of the Course**

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal Assessment	Total
Total	Total	75	25	100
80	3			

Unit	Topic	Class Hours	Marks
I	Basic concept and Assembly language	16	15
II	Control Unit	16	15
III	Input output Organization	16	15
IV	Pipelining and vector processing	16	15
V	Memory Hierarchy	16	15
Total		80	75

**UNIT I**

Functional units of a computer, Basic operational concepts, Bus structures, memory locations, Address and Encoding of Information, main memory operations, Instructions and Instruction sequencing: Instruction Execution and straight line sequencing, Branching, Addressing modes, Assembly Language: Assembler, Assembler commands, Assembly and execution of programs.

**UNIT II**

Control memory, Address sequencing: Routine, mapping, conditioned Branching, mapping instruction, Design of control unit: Microprogram sequencer.

**UNIT III**

Accessing I/O Devices, Direct Memory Access (DMA); Interrupt Handling: Enabling and Disabling Interrupts, Handling multiple Devices, Device Identification, Vectored Interrupts, Interrupt Nesting, Simultaneous Requests, Controlling Device Request

**UNIT IV**

Four models of Computers (SISD, SIMD, MISD, MIMD), Parallel processing, pipeline. Arithmetic pipeline, Instruction pipeline, RISC pipeline, Vector processing; vector operations, Memory Interleaving, concept of Supercomputers; Array processing; attached array processor, SIMD array processor.

**UNIT V**

Memory Hierarchy: auxiliary memory, cache memory, multiprogramming; main memory, RAM, ROM, Bootstrap loader, computer start up. RAM and ROM chips, memory Address map, memory connection to CPU; auxiliary memory; magnetic disk, magnetic tape; Associative memory; cache memory; Locality of reference, hit ratio, mapping, Associative mapping, Direct mapping, writing into cache; virtual memory; Address space and memory space, Address mapping using papers, Associative memory page table; memory management hardware, memory protection.

**Instruction to the Paper Setter:**

Unit	Theory Questions		
	To be set	To be answered	Marks
I	2	1	15
II	2	1	15
III	2	1	15
IV	2	1	15
V	2	1	15

**Recommended books****Text:**

1. Mano, M. Morris, Computer System Architecture, 4th Edition, Prentice Hall India, 2002.

**Reference:**

1. Stone, H., Introduction to Computer architecture, 3rd Edition, Galgotia Publishing Ltd., 2001
2. Pal Chaudhuri, P., Computer Organization and Design, 4th Edition, Prentice Hall India, 2002.
3. Bartee, Thomas C., Computer Architecture and Logic Design, Tata McGraw-Hill, International Edition, 2001.
4. Ram, B., Computer Fundamentals, Architecture and Organization, 3rd Edition, New Age International Publishers, 2002.

**BCA 301: FINANCIAL ACCOUNTING AND MANAGEMENT****Objective**

To impart basic accounting knowledge as applicable to business as well as to acquaint the students with basic idea about business and its management.

**Outline of the Course**

Minimum Class hours	Exam Time (hours)	Marks		
		External	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	Introduction	16	15
II	Final Accounts, Depreciation and Reserves	16	15
III	Advanced study of Partnership Accounts	16	15
IV	Financial Statement Analysis	16	15
V	Business & Management Concepts	16	15
	<b>Total</b>	<b>80</b>	<b>75</b>

**UNIT I****Introduction**

Accounting – A financial information system, Accounting Cycle, inputs and output of the accounting system, Generally Accepted Accounting Principles, conventions and postulates. Basic accounting terms, the accounting equation. Books of original entry: Meaning, format and entries - Journal, Cash book (Single, Double and Triple Columns), Petty Cash Book (Imprest System), Ledger and Trail Balance

**UNIT II****Final Accounts for Trading & Non-Trading Concerns, Depreciation and Reserves**

Final Accounts and Depreciation. Final Accounts and Statements – Construction of manufacturing, trading, profit and loss accounts and balance-sheet of sole proprietorship and partnership concerns. Accounting for Depreciation - Straight line and Reducing Balance Methods only. Accounts of Non-Profit Organizations (Income and Expenditure Account with Balance Sheet only).

**UNIT III****Advanced study of Partnership and Company Accounts**

Advanced study of Partnership Accounts: Accounting problems related to admission, retirement and death of a partner, Dissolution of partnership (simple problems excluding insolvency).  
Advanced study of Company Accounts: Accounting for issue of shares (including forfeiture and re-issue) and issue of debentures; Redemption of debentures: (Conversion and Sinking fund methods) and Balance Sheet.

**UNIT IV****Financial Statement Analysis**

Financial Statement Analysis: Meaning and Significance of Financial Statement Analysis, Major user groups, Techniques of Analysis with special reference to financial ratios, cash flow statements.

**UNIT V****Business & Management Concepts**

Business Concept: Different forms of business (Definition, function, characteristics, merits & demerits of Sole proprietorship, Partnership, HUF & Company). Social responsibilities & Business Ethics.  
Management concept: Principles of Management & its Characteristics, Evolution of Management Thought from

Classical to modern (Overview), Theories of management as propounded by Henry Fayol & F W Taylor. Functions of Management (Meaning, objectives, Characteristics, Merits & Demerits of Planning, Organising, Staffing, Directing, Controlling & Coordinating)

**Instruction to paper setter**

Unit	To be set	To be answered
I	2	1
II	2	1
III	2	1
IV	2	1
V	2	1

**Recommended Books****Text:**

1. Jain S. P. and Narang K.L., Advanced Accountancy, Kalyani Publishers, Ludhiana, 2006.
2. Hanif & Mukherjee, Corporate Accounting, Tata McGraw-Hill, New Delhi, 2006.
3. LM Prasad, Principles And Practice of Management, Sultan Chand, New Delhi

**Reference :**

1. Gupta, R. L., *Accounting Systems*, 6<sup>th</sup> Edition, S.Chand & Company, 2001.
2. Gillespie, *Accounting Systems, Procedures and Method*, 4<sup>th</sup> Edition, Prentice Hall India, 2001.

**BCA - 302: DATABASE MANAGEMENT SYSTEMS**

**Objective:** The course aims to impart knowledge of Database Design, and Implementation techniques with basic ideas of advanced database concepts.

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
60	20	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours		Marks	
		Theory	Practical	Theory	Practical
I	Introduction to database and E-R Modeling	15	-	09	-
II	Record Storage and File Organization	10	-	09	-
III	Relational Model Concepts	15	20	09	30
IV	Functional dependency and Normal forms	10	-	09	-
V	Transaction Processing Concepts	10	-	09	-
<b>Total</b>		<b>60</b>	<b>20</b>	<b>45</b>	<b>30</b>

**UNIT I**

**Introduction to database and E-R Modeling:** characteristics of database approach, Database administrator (DBA). Database designers, End users, system analysis and application programs, intended uses of a DBMS, Implications of the Database Approach, Data models, Schemas, and Instances, The Three- Schema Architecture, Data Independence, DBMS, languages, DBMS Interfaces, Database System Environment; DBMS component modules, Database system utilities, communication facilities; Classification of DBMS, E-R model concepts: Entities and Attributes, entity types, value sets, key attributes, Relationships, Roles, and structural constraints, weak entity types, Notation for E-Relationship (ER) diagrams.

**UNIT II**

**Record Storage and File Organization:** Memory Hierarchies and Storage Devices, Secondary Storage Devices; Parallelizing Disk Access Using RAID Technology, Buffering of Blocks, Concepts of Record, Record Types and File Operations. Sequential file organization, Types of single-level Ordered Indexes: Primary Indexes, Clustering Indexes; Multilevel Indexes, search trees and B-trees.

**UNIT III**

**Relational Model Concepts:** Domains, Tuples, Attributes, and Relations, Characteristics of Relations, Relational Model Notation; Relational Model constraints, update operations on relations; Insert, Delete, Modify operations; Defining Relations, the Relational Algebra: SELECT, PROJECT, UNION, INTERSECTION, DIFFERENCE, JOIN, DIVISION operations; Structured Query Language (SQL): Data Definition and SQL, Basic Queries, Update statements in SQL, Views in SQL.

**UNIT IV**

**Functional dependency and Normal forms:** Definition of Functional dependency, Interference Rules for Functional Dependencies, equivalence of sets of Functional Dependencies, Minimal sets of Functional Dependencies, Introduction to Normalization, Definitions of 1NF, 2NF, 3NF, BCNF.

**UNIT V**

**Transaction Processing Concepts:** Introduction to Transaction Processing, Read & Write Operations, Need for Concurrency Control, Transaction States, Commit Point of a Transaction, Desirable Transaction Properties,

Schedules and Recoverability – Schedules, Characterizing Schedules, Serializability of Schedules, Testing for Conflict Serializability of a Schedule, Uses of Serializability, Concurrency Control Techniques : The Locking Protocol, Locks. Two Phase Locking (2PL), Deadlock and its Prevention.

**Instruction for the paper Setter:**

Unit	Questions					
	Theory			Practical		
	To be Set	To be Answered	Marks	To be Set	To be Answered	Marks
I	2	1	09	-	-	-
II	2	1	09	-	-	-
III	2	1	09	2	1	30
IV	2	1	09	-	-	-
V	2	1	09	-	-	-

**Distribution of marks for practical**

20% : Database structure

20% : Constraints Specification

40% : Queries

10% : Completion

10% : Result

**Recommended Books**

**Text:**

1. Ramez Elmasri, Shamkant B. Navathe, *Fundamentals of Database System*, Addition- Wesley, 2007

**Reference:**

1. Date, C., J., *System An Introduction to Database,, 6<sup>th</sup> Edition*, Addition-Wesley, 2002
2. Korth Henry & Others, *Database System Concepts, 3<sup>rd</sup> Edition*, Addition- Wesley, 2001
3. Hansen, G.W. & Hansen, J.V., *Database Management and Design, 3<sup>rd</sup> Edition*, Prentice Hall India, 2002
4. Sadanandan, P. *Introduction to Database Management, 4<sup>th</sup> Edition*, BPB Publications, 2002.

**Practical Assignments: SQL Queries (Any Appropriate RDBMS to be made available)**

Create a database with the following tables:

EMPLOYEE

FIELDS are: EMPLOYEE\_ID, FIRST\_NAME, LAST\_NAME, DOB, EMAIL, PHONE NUMBER, HIRE\_DATE, JOB\_ID, SALARY, DEPARTMENT\_ID.

DEPARTMENT

FIELDS are: DEPARTMENT\_ID, DEPARTMENT\_NAME, LOCATION\_ID.

LOCATION

FIELDS are: LOCATION\_ID, STREET\_ADDRESS, POSTAL\_CODE, CITY, STATE, COUNTRY.

Write an SQL Query using the above database

1. To insert, delete and edit the records of the above tables.
2. for sorting the data by salary in descending order, show the last name of the employees together with the number of years and months that they have been employed.
3. to show those employees that have name starting with A,B,C or D.
4. to create a view emp\_12 that contain details of the employees in department 12 and display the view.

5. to Modify the view by using CREATE OR REPLACE VIEW clause.
6. Create a sequence name DEPT\_DEPTID\_SEQ to be used for the primary key of DEPARTMENT table. Verify your sequence values on the USER\_SEQUENCES data dictionary table. Insert a new department name and view the current value for the DEPT\_DEPTID\_SEQ.
7. Create an index on the LAST\_NAME column in the EMPLOYEE table. Confirm the index created in the USER\_INDEXES data dictionary view.
  - o Remove the index from the data dictionary by using DROP INDEX command.
8. Create a synonym (shortened name) for DEPT\_SUM\_VU view and remove the synonym after creation.

**BCA-303: OPERATING SYSTEMS AND INTRODUCTION TO LINUX****Objective**

The course aims to impart knowledge of operating system concepts and a basic understanding of the Linux operating system with hands-on experience of Shell programming.

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
60	20	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours			Theory Marks	Practical Marks
		Theory	Practical	Total		
I	Operating Systems Overview	12		12	09	
II	Processes and Scheduling Algorithms	12		12	09	
III	Process Synchronization	12		12	09	
IV	Memory Management	12		12	09	
V	Shell Scripting using Linux	12	20	32	09	30
<b>Total</b>		<b>60</b>	<b>20</b>	<b>80</b>	<b>45</b>	<b>30</b>

**Unit 1**

**Overview of Operating Systems:** Simple Batch Systems, Time Sharing Systems, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems.

**Operating System Structures:** System Components and services, system calls, system programs, virtual machines.

**Comparative study of Mobile Operating Systems (Android, Windows Phone, Apple iOS)** with respect to Evolution, Security, Open Source and Interface.

**Unit 2**

**Process Management:** Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Threads, Inter-process Communication.

**CPU Scheduling:** Basic Concepts, scheduling criteria, scheduling algorithms, FCFS, SJF, RR, Priority Scheduling.

**Unit 3**

**Process Synchronization:** The critical section problem, two process solution and multiple process solution. Synchronization hardware, Semaphores—implementation, some critical problems of synchronization. Readers and Writers problem, Dining-Philosophers problem.

**Unit 4**

**Memory Management:** Logical and physical address space, Swapping, Contiguous allocation – memory protection, memory allocation, fragmentation. Paging: Basic method, hardware support, protection.

**Demand Paging:** Basic concepts, basic scheme of page replacement, page replacement algorithms.

**Unit 5**

**Shell Scripting using Linux:** The Linux system organization, File system: Types of files, Filenames, Pathnames, File Permissions, File Attributes (ls -l).

**Elementary Linux Utilities:** cal, date, who, uname, passwd, echo, tput, bc.

**Elementary Linux commands:** cd, mkdir, pwd, rmdir, chmod, chown, ls, cat, cp, rm, more, wc, split, cmp.

**Simple Filters:** pr, head, tail, cut, paste, sort, uniq, tr.

**Shell – Shell variables, Input and Output Redirection, Pipes, Tees, Command Substitution.**

Working with *Vim* editor: The three modes, Input mode, saving text and quitting, command mode, deletion, navigation, pattern search, undo, search and replace.  
Regular expressions and *grep* – *Regular Expressions – elementary introduction*, *grep* utility.

#### Instructions for Paper Setter (Theory & Practical):

Theory Questions				Practical Questions		
Unit	To be Set	To be Answered	Marks	To be set	To be answered	Marks
I	2	1	09	-	-	30
II	2	1	09	-	-	
III	2	1	09	-	-	
IV	2	1	09	-	-	
V	2	1	09	5	3	
<b>Total</b>	10	5	45			

#### Distribution of marks for Practical:

- 10% : Syntax and input/output screens
- 30% : Logic and efficiency (source code and algorithm)
- 20% : Error trapping (illegal or invalid input, wrong command options, error in redirection etc.)
- 20% : Completion
- 20% : Result

#### Recommended Books:

##### Text:

1. Silberschatz, Galvin, Gagne, Operating System Concepts, 6th Edition; Addison-Wesley, 2004.
2. Das, Sumitabha, Unix: Concepts and Applications, 4th Edition, Tata McGraw Hill, 2006.

##### Reference:

1. Tanenbaum, Andrew, Modern Operating Systems, Pearson Education Inc., 2009.
2. Stallings, William, Operating Systems, 3rd Edition, Prentice Hall India, 2002.
3. Dalheimer, Welsh, Running Linux, 5<sup>th</sup> Edition, Shroff/O'Reilly Media, 2006.
4. Albing, Vossen & Newham, Bash Cookbook, 1<sup>st</sup> Edition, O'Reilly Media Inc., 2007.
5. Kernighan & Pike, The Unix Programming Environment, PHI Learning Pvt. Ltd., 2011.

#### Practical Assignments – Shell Programming

1. Write a script that will accept two file names from the command line, copy the first file to the second file and then display the contents of the combined file. Proper error message should be displayed in case the copy is not successful.
2. Write a script that will read a filename from the command line and will change the name of the file to filename.aal where aal is the login\_name of the user. (E.g. if the filename is Lucky and the user's login\_name is harry then, the filename will be changed to Lucky.harry).
3. Write Script, using case statement to perform basic math operation as follows:
  - + addition
  - subtraction
  - x multiplication
  - / division

The name of script must be 'q4' which works as follows:

\$ ./q4 20 / 3. Also check for sufficient command line arguments.

4. The length and breadth of a rectangle and radius of a circle are input through the keyboard. Write a script to calculate the area and perimeter of the rectangle as well as the area and circumference of the circle.
5. Write a script that accepts a string inputted through the keyboard and echoes a suitable message if it does not have at least 10 characters.
6. In a company, an employee is paid as follows: If his basic salary is less than Rs. 5000, then HRA = 10% of basic salary and DA = 90% of basic. If his salary is either equal or above Rs. 5000, then HRA = Rs. 900 and DA = 98% of basic salary. If the employee's salary is input through the keyboard, write a script to find his gross salary.
7. Write a script that will accept a filename from the keyboard and determine whether the file exists. If the file exists then its contents will be displayed else an error message will be displayed.
8. Write a script that accepts two directory names as arguments and deletes those files in the second directory that are identical to the files in the first.
9. The marks obtained by a student in five different subjects are input through the keyboard. The student gets a division as per the following rules:
  - Percentage above or equal to 60 – First division
  - Percentage between 50 and 59 – Second division
  - Percentage between 40 and 49 – Third division
  - Percentage less than 40 – FailWrite a script to find the division obtained by the student.
10. Write a shell script that will prompt the user to enter a character. The script will then determine whether the user entered a lowercase letter, an uppercase letter, a digit or a special symbol.
11. An integer is input through the keyboard. Write a script to find out whether it is an odd or even number.
12. Write a shell script, which receives any year from the keyboard and determines whether the year is leap or not. If no argument is supplied the current year should be assumed.
13. Write shell script to convert file names from UPPERCASE to lowercase file names or vice versa.
14. Write a script that converts a decimal number to a hexadecimal number. [Hint: use bc]
15. Write a script to print all prime numbers between 1 and 150.
16. Write a shell script that displays a list of all files in the current directory to which you have read, write and execute permissions.
17. Write a shell script that will receive any number of filenames as arguments. The shell script should check whether every argument supplied is a file or a directory. If it is a directory it should be appropriately reported. If it is a filename then name of the file as well as the number of lines present in it should be reported.
18. Write a script that accepts a filename as argument and displays the last modification time if the file exists, and a suitable message if it doesn't.

## BCA 401: SOFTWARE ENGINEERING

### Objective:

Software Engineering is a fast developing field. We can view Software Engineering as the engineering approach to developing software. The objective of this paper is to provide a broad understanding of system development concepts. It provides the students with a sense of confidence to develop new systems.

### Outline of the Course

Minimum Class Hours	Exam Time (Hours)	Marks		
		External	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	System Analysis and Design	20	18
II	Introduction To Software Engineering Software life cycle models	15	14
III	Software project management, requirements and design	20	18
IV	Function Oriented Software Design, and User Interface Design	15	14
V	Testing, software reliability and maintenance	10	11
<b>TOTAL</b>		<b>80</b>	<b>75</b>

### UNIT I

**Introduction:** System definition and concepts: Characteristics and types of system, Manual and automated systems, Real-life Business sub-systems: Production, Marketing, Personal, Material, Finance

**Systems models:** Types of models, Systems environment and boundaries, Real-time and distributed systems, Basic principles of successful systems

**Systems analyst:** Role and need of systems analyst, Qualifications and responsibilities, Change agent, Investigator and monitor, Architect, Psychologist, Salesperson, Motivator, politician, The analyst /User interface-behavioural issues, conflict resolution, MIS organization

**System Planning:** Data and fact gathering techniques: Interviews, Group communication, Presentations, Site visits.

**Feasibility study and its importance:** Types of feasibility reports, System, Selection plan and proposal

**Cost-Benefit and analysis:** Tools and techniques

### UNIT II

**Introduction:** - Evolution of an art to an engineering discipline, Solution to the software crisis, Computer systems engineering.

**Software Life cycle models:** - Importance of a life cycle model, waterfall model (feasibility study, requirement analysis and specification, design, coding and unit testing, integration and system testing, maintenance), prototyping model, evolutionary model, spiral model, Comparison of different life cycle models.

### UNIT III

**Software project management:** Responsibilities of a Software Project Manager, Project Planning, Project Estimation Techniques (only Basic COCOMO), Scheduling (work breakdown, Activity Networks and Critical Path Method, Gantt Charts, PERT Charts, Project Monitoring and Control), Organization and Team Structures (Organization Structure, Team Structure), Risk management (Definition), Software Configuration Management (Definition).

**Requirement Analysis and specification:** Requirement gathering and analysis, Software Requirements Specification (Content of the SRS document, characteristics of a good SRS document, techniques for representing complex logic – Decision Tree and Decision Table).

**Software Design:** Characteristics of a good software design, cohesion and coupling (classification of cohesiveness and coupling), Software designs approaches (function-oriented design, Object-oriented Design).

#### UNIT IV

**Function Oriented Software Design:** Overview of SA/SD methodology, Structured Analysis, data Flow Diagrams (DFDs)(primitive symbols used for constructing DFDs, important concepts associated with designing DFDs, developing the DFD Model of a system, Shortcomings of the DFD Model), Structured Design (flow chart vs. structure chart, transformation of a DFD model into a structure chart).

**User Interface Design:** characteristics of a good user interface, basic concepts (user guidance and online help, mode-based vs. Modeless Interface, Graphical User Interface (GUI) vs. Text-based User Interface), Types of user interfaces (command language-based Interface, Menu-based Interface, direct manipulation Interface), Component-Based GUI Development (Window system, Types of widgets, Visual programming), User interface methodology (Design, a GUI design methodology, Task and object modeling, selecting a metaphor, interaction design and rough layout, user interface inspection).

#### UNIT V

**Coding and Testing:** coding standards and guidelines, code review (code walkthroughs, code inspection), Software Documentation (Internal and External), Testing (testing, verification vs. validation, design of test cases), Testing in the large, Testing in the small, unit testing, Black-box testing, White-box testing (Statement, Branch and Condition coverage), debugging, integration testing, system testing.

**Software Reliability:** Software reliability, software quality, and software quality management.

**Software Maintenance:** Characteristics of software maintenance (types of software maintenance, special problems associated with software maintenance), software reverse engineering.

#### Instruction to Paper Setter

Unit	Questions	
	To be Set	To be Answered
I	3	2
II	3	2
III	3	2
IV	3	2
V	2	1

#### Recommended Books

##### Text:

1. Elias M. Awad, *System Analysis and Design*, Galgotia Publications (P) Ltd, New Delhi
2. Rajib Mall, *Fundamentals of Software Engineering*, Pearson Education/Prentice Hall of India, New Delhi.

##### References:

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, *Fundamentals Of Software Engineering*, Second Edition, Prentice Hall of India Private Limited, New Delhi, 2002.
2. Richard E Fairley, *Software Engineering Concepts*, Tata McGraw Hill Publishing Company Limited, New Delhi, 1997.

**BCA-402: DATA COMMUNICATION AND NETWORKS****Objective**

Data communication and networks is one of core paper in Computer Science and Applications. This paper intends to give an in depth knowledge about the various layers in the networks, design issues, algorithms and protocols. The paper also introduces some new concepts in computer networking and few advanced topics as well.

**Outline of the Course**

Minimum Class hours	Exam Time (hours)	Marks		
		External	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	Introduction + Physical layer	10	15
II	Data link layer	20	20
III	Network layer	20	18
IV	Transport layer	20	12
V	Application layer	10	10
<b>Total</b>		<b>80</b>	<b>75</b>

**UNIT I**

**Introduction:** Data Communications, Networks, Protocols and Standards, Network Models: Layered Tasks, OSI Model, Layers in the OSI Model, TCP/IP Protocol Suite, Addressing.

**Physical Layer and Media:** Analog and Digital Signals, Data Rate Limits : Nyquist and Shannons law, Multiplexing : FDM, TDM, Guided and Unguided media: Twisted Pair, Coaxial, Fibre Optics, Radio, microwave, infrared, Mobile Telephone System – AMPS, Network connecting devices hub, repeater, bridge, switch, router, and gateway, Switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

**UNIT II**

**Data Link Layer:** Error Detection and Correction: Error Correcting using Hamming code, Error detecting using CRC, Framing and Framing Methods, Concept of Flow Control, Simplex protocol, Stop-and-Wait Protocol, Stop and Wait ARQ Protocol, Go back N ARQ Protocol, Selective Repeat Protocol, Piggybacking. Multiple Access Protocols: Random Access: Pure ALOHA, Slotted ALOHA, Carrier Sense Protocols (1-persistent, p-persistent, and Non-Persistent CSMA), CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing, Channelization: FDMA, TDMA.

Wired LANS: Standard Ethernet, Wireless LANs (IEEE 802.11), Bluetooth Architecture and Applications

**UNIT III**

**Network Layer:** Logical Addressing: IPv4 Addresses, Address Mapping: ARP, RARP, BOOTP, DHCP. Delivery, Forwarding, and Routing, Unicast Routing Protocol: Distance Vector Routing, the Count-to-Infinity problem, Link State Routing, Path Vector Routing.

Data Traffic, Congestion, Congestion Control: Open Loop and Close Loop, Quality of Service, Traffic Shaping: Leaky Bucket and Token Bucket.

**UNIT IV**

**Transport Layer:** Process to Process Delivery: Client/Server Paradigm, Multiplexing and Demultiplexing, Connectionless Vs Connection Oriented Service, UDP: User Datagram, Checksum, UDP operation, use of UDP; TCP: Services, features, segment, TCP connection, Flow control, Error Control.

**UNIT V**

**Application Layer:** WWW: Architecture, HTTP: transactions, persistent and non persistent connection, proxy server, DNS: Name Space, Domain Name Space, Resolution, Types of Record. TELNET, EMAIL: SMTP, POP and IMAP, Web based mail. FTP.

### Instructions For paper setter

The question papers will be set according to the following scheme

Unit	Theory Questions		
	To be set	To be answered	Marks
I	2	1	15
II	2	1	20
III	2	1	18
IV	2	1	12
V	2	1	10

### Recommended Books

#### Text:

1. Data Communications and Networking : Behrouz A. Forouzan, McGraw Hill 4ed,

#### Reference Books

1. Computer Networks, Andrew S. Tanenbum, PHI Publication
2. Data and Computer Communication, Stalling W, 5ed, PHI (EEE).

### BCA 403: VB.NET PROGRAMMING

**Objective:**

Visual Basic.NET is the latest version of Visual Basic, the most significant evolutionary change yet in the language. At its heart is the totally new .NET framework, a rich and powerful set of classes that provides support for just about any imaginable area of programming – desktop, Internet, database, and so on. The intent of this course is to teach:

- The language Visual Basic,
- The .NET framework,
- Programming logic,
- Database programming, and
- Web application.

#### Outline of the Course

Minimum class Hours		Exam time(Hours)		Marks				
				Theory		Practical		Total
Theory	Practical	Theory	Practical	Paper	Internal	Paper	Internal	
40	40	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours			Marks	
		Theory	Practical	Total	Theory	Practical
I	Introduction to VB.Net	7	7	14	10	10
II	Console Application, Exception handling and Library functions	6	6	12	5	
III	Object Oriented Programming	10	10	20	10	10
IV	Files and ADO.Net	10	10	20	10	
V	Web programming with ASP.Net	7	7	14	10	10
<b>Total</b>		<b>40</b>	<b>40</b>	<b>80</b>	<b>45</b>	<b>30</b>

#### UNIT I

**Introduction to VB.Net :** NET framework, common language runtime, Common type System, Value types and reference types. Variables: Variable Type, Variable Names, Variable Declarations – explicit and implicit, Scope and lifetime of variables, Namespaces and Shadowing, Binding, Constants, Symbolic Constants  
 Arrays – one and multi dimensional, jagged arrays, changing size of an array  
 Structures, Enumerations, Arithmetic and string operators, operator precedence, Expressions, Logical operators.  
 Controls in General, method, events and properties of Controls and Components, *Loop Structure* : Decision Structures – If ... Then ... Else, Select Case; Loop Structures – For ... Next, Do ... Loop, While ... End While, With ... End With, For Each ... Next, Exit

#### UNIT II

**Console Applications:** Console Fundamentals, Console Class, Command Line Arguments, Redirecting Input and Output, Errors in Console Applications  
**Exception Handling:** Structured Exception handling, Catch Expressions, Exception class and its derived classes, Throw statement. Unstructured Exception Handling, On Error statement, Resume statement, Err object.  
**MDI Applications:** MDI Basics, Creating MDI Forms, Child Window List, Child Forms, Menus and Context Menus.  
**Library Functions:** String Class, Math Class, DateTime Class

#### UNIT III

**Procedures:** Sub Procedures and Function Procedures, Passing arguments, Parameter Array Arguments

**Object Oriented Programming:** OOP Fundamentals – Class and objects, Creating Classes, Namespaces and Classes, Class Properties, Class Methods, Class Constructors, Shared Methods, Shared Variables, Class Events, Class Access Options, Interfaces, Inheritance, Subclassing, Encapsulation and Abstraction. Inheritance, Polymorphism, Base Class Design Considerations, Me Keyword, MyBase Keyword, MyClass Keyword. Building Custom Classes, Building Custom Windows Controls: Designing Windows Controls, Enhancing Existing windows Controls, Building Compound Controls.

#### UNIT IV

**File Management :** File Fundamentals, Exceptions in File Access, File Access, File Class, FileStream Class, BinaryReader Class, Closing Streams, BinaryWriter Class, StreamReader Class, StreamWriter Class, FileInfo Class, Working with Directories and Drives

**ADO.NET :** SqlConnection Class, OleDbConnection Class, SqlDataAdapter Class, OleDbAdapter Class, DataSet Class, DataView Class, Binding Controls

**Reports:** Reports controls, Design time and runtime reports.

#### UNIT V

**ASP.NET:** Designing Visual Interface, Writing Code, Controls for Web Applications, PageLoad() Event, Session Object, Application Object, Events in Web Application, Web. Config

**Web Form Controls:** Label, TextBox, Button, HyperLink, ListBox, Image, Panel, Literal, Validation. Properties, Methods and Events of Web Controls

**Database Access in Web Applications:** DataReader Class, Repeater Control, DataList Control, DataGrid Control

**Introduction to Web Services:** Creating Simple Web Services and implementation.

#### Instruction for Paper Setter

The question papers will be set according to the following scheme.

Unit	Theory			Practical		
	To Be Set	To Be Answered	Marks	To Be Set	To Be Answered	Marks
I	2	1	10	2	1	10
II	2	1	5			
III	2	1	10	2	1	10
IV	2	1	10			
V	2	1	10	2	1	10

#### Distribution of marks for practical

- 10% : Syntax and input/output screens
- 30% : Logic and efficiency (source code, pseudocode, and algorithm)
- 20% : Error trapping (illegal or invalid input, stack overflow, underflow, insufficient physical memory etc.)
- 20% : Completion
- 20% : Result

#### Recommended Books

##### Text:

1. Peter Aitken, *Visual Basic .NET Programming*, Dreamtech, New Delhi, 2002
2. Michael Halvorson, *Microsoft Visual Basic .NET Step by Step*, Prentice Hall of India Pvt. Ltd., New Delhi, 2002
3. Petroutsos, E., *Mastering Visual Basic.NET*, New Delhi: BPB Publications, 2004

##### Reference:

1. Bill Evjen et al, *Visual Basic .NET Programming Bible*, IDG Books India (P) Ltd., New Delhi, 2002

2. Pooja Bembey et al, *Microsoft Visual Basic .NET Professional Projects*, Prentice Hall of India Pvt. Ltd., New Delhi, 2002
3. Steven Holzner, *Visual Basic.Net programming Black book*.

**Practical Assignments** (Questions need not be restricted to this list)

**Console Applications:**

1. Write a program to calculate and display the factorial of a given number, using a recursive function.
2. Write a program to search for a particular word or pattern in a text and to display the position of the match. The match should also be selected. Do not use the standard VB library function *InStr()*.
3. Write a program to convert a string to proper case. Do not use standard VB functions; use ASCII values to convert from one case to another.
4. Write a program to search for an element in an array using binary search.
5. A line of text E.g. "Over to Delhi for the second day's play." is entered by the user. Write a program to print the shortest and longest word so contained in the sentence.
6. Write a program to sort the elements of an array in descending order using bubble sort.

**Windows Application:**

7. Design a form with suitable controls to input a single digit number and write appropriate event handlers to check if the number is automorphic or not. A number is called automorphic if the last digit of the square of the number is same as the number itself.(e.g., 6)
8. Design a form with suitable controls and write appropriate event handlers to list out all the Armstrong numbers within a given range of numbers 'm' to 'n'. A number is called an Armstrong number if the number is equal to the sum of the cubes of the digits of the number.
9. Design a form with suitable controls and write appropriate event handlers to take in a string and determine whether the given string is palindrome or not.
10. Design a form with suitable controls and write appropriate event handlers to generate an Ordinary Calculator Program (Using Label, CommandButton). The calculator should support the facilities such as Addition, Subtraction, Multiplication, Division, Storing in Memory, Clearing Memory and Adding to Memory etc. The display of the calculator should support up to 10 digits including decimal point. Your application should use control arrays
11. In the color code that is used in resistors, the different colors have values as follows: Black=0, Brown=1, Red=2, Orange=3, Yellow=4, Green=5, Blue=6, Violet=7, Gray=8 and White=9. The value of the resistor is indicated by drawing three colored bands round it. The first two bands indicate the first two digits in the numerical value of the resistance, while the third band is the decimal multiplier, i.e., it gives the number of zeros after the two digits. For example, if the bands have colors, Green-Blue-Orange, successively, then the numerical value is 56000. Design a form with suitable controls and write appropriate event handlers to accept the colors from the user and print the equivalent numerical.
12. Design a form with suitable controls and write appropriate event handlers to generate the calendar of a given month. The user must enter the month and the year. Assume that 1<sup>st</sup> January 1900 was a Monday. Do not use the standard Visual Basic functions to generate the calendar.
13. Using functions, write a program to calculate the simple interest accrued on a given principal using the formula  $SI = (\text{Principal} \times \text{Rate} \times \text{Time})/100$ . The user input and the output thereof must be on different forms. The input form must have a textbox where the principal will be entered by the user, a vertical scroll bar for the rate of interest, and a listbox from where the user can select the time (in years.) On clicking a button, the function must calculate the SI taking values from the textbox, scrollbar, and listbox, and the result shown in the second form. Provision must also be kept for adding and removing items to and from the listbox. The items in the listbox appear as: 1 year; 2 years; 3 years etc..... up to 10 years.
14. Design a form with suitable controls and write appropriate event handlers to convert an input decimal number to a number with a user defined base (1 to 9), and vice versa.
15. Develop an application providing the facilities for a stopwatch, a timer, and a daily alarm at a preset time, as desired by the user.
16. Load a picture on an appropriate control such that the position of the picture randomly changes within the form with time.

17. Design a project that will enable you to explore through the directory structure and open applications also, using a drive listbox, directory listbox, and a file listbox. Also design a variation of this application using common dialog control.
18. On a form, place two picture boxes and an image box. Load a picture in the first picture box, draw a diagonal through it using the line function, and give it an appropriate color. Now, copy the contents of the first picture box to the second and also to the image box. Notice the differences.
19. Write a line of text and place it centered on a form. Ensure that the text remains centered even if the form is resized manually or otherwise.
20. Design a form with suitable controls and write appropriate event handlers to load all the Colours (Using VScrollBar, HScrollBar).
21. Develop an application where all possible colours can displayed in a picture box using the three primary colours red, green, blue, whose values are selected from three scrollbars.
22. Load a picture on an appropriate control such that the position of the picture randomly changes within the form with time.
23. Develop a program to get the total file count and total size in a directory.
24. The following information is to be maintained regarding the users of electricity: Name, code and units consumed. Write a program that will take the name and units consumed, and hence generate a bill. For the first 20 units cost is 30p/unit, for the next 20 units, 40p/unit, for the rest, 50p/unit. Make provisions for reading, editing and deleting data. Make provisions to keep the rates alterable. Use ADO data control.
25. A publishing company maintains records with the following information: Name of Author, Author Code, Name of Book, Book ID and Year of Publication. Make provisions to add, edit and delete records. Every time a new Author Name is added, the code must be generated, so also with the name of book and book ID. Use ADO objects(Connection, Recordset, Command etc)
26. Refer to the above question to design a Crystal Report to display the details of the books for a given Author and given Year of Publication. Design a Visual Basic form and write appropriate code to invoke the report.
27. Develop an application that allows the user to select a drive so that the application can list out the drive information viz., drive type, free disk space, current directory and the windows system directory in the drive.
28. Write a program that will shut down the system, or restart, or simply logout, depending on user's choice.

### **Web Based Applications**

29. Create a Database in a Database Server with two tables –Biodata and Marks. The table Biodata contains the fields Name, RollNo(N, 5)(RollNo is unique), Gender(C,1), State(C,15), District(C,15), Place(C,15), Class(C,3),Dob(Date), Caste(C,10) and the table Marks contains the fields Roll No(N,5), Physics(N,2), Chemistry(N,2), Maths(N,2). Develop ASP page(s) to Add, Edit and Delete records from the table. Provision should also be made to display all the records of a given class, along with each ones' average mark, in a tabular format (the class can be selected from a list box).
30. Develop a web page that will calculate the monthly installment for a loan amount, given the rate of interest and its term.
31. Develop a web page with a counter that displays the number of visits to the site.
32. Develop a program to let user place order for ice cream over the net. This should allow selection of one or more flavours (vanilla, strawberry, etc.) and then select the item (cone, double cone, cups, etc.). The order summary should be displayed on the page once the user clicks on the *Order* button.
33. Develop a web site for a commercial organisation, where the order for goods can be placed. There should be possibility for adding new items or removing items from the shopping cart.
34. Develop a web site for registering the details of alumni for an educational institution. Make provisions for listing out the entries belonging to a particular batch.
35. Create a web service to add numbers together. Also develop a client program that uses the web service.

**BCA 501: ENGLISH**

**Same as B.Com English paper  
Business Communication Skills**

**BCA 502: OBJECT ORIENTED PROGRAMMING THROUGH JAVA****Objective**

The course is designed to impart knowledge and skill required to solve the real world problem using object-oriented approach utilizing Java language constructs. This course covers the two main part of Java i.e. Java Language and Java Library

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
40	40	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours			Theory Marks	Practical Marks
		Theory	Practical	Total		
I	Introduction to Java Programming	8	4	12	09	30
II	Classes, Methods and Inheritance	8	8	16	09	
III	Packages, Interface and Multithreading	8	8	16	09	
IV	Streams, Networking and JDBC	8	8	16	09	
V	Applets and Event Handling	8	12	20	09	
<b>Total</b>		<b>40</b>	<b>40</b>	<b>80</b>	<b>45</b>	<b>30</b>

**UNIT – I**

**Introduction to Java Programming:** Introduction to Java – Importance of Java to the Internet (Applets and Applications), Security, Portability, Bytecode, Java Buzzwords, JAVA Programming Language Syntax, Variables, Data Types, Operators, Statements and Expressions, Control Statements – if-else, for, while, and do-while loops, switch statement, named structures, functions, parameter passing, static modifier, console programming.

**UNIT – II**

**Classes, Methods and Inheritance:** Classes – Fundamentals, Declaring Objects, Methods, Constructors, *this* keyword, Garbage Collection, *finalize()* method, Overloading Methods and Constructors, Argument Passing – using objects as parameters, Returning Objects, *static*, *final* Keywords, Nested and Inner Classes, String handling – Comparison, Extraction, Various String operations, Searching strings, *String* and *StringBuffer* class, Command Line Arguments

Inheritance, Using super, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Abstract class, Using final with Inheritance.

**UNIT – III**

**Packages, Interface and Multithreading:** Packages and Interfaces, Exception Handling, Multithreaded Programming – Thread Model, Priorities, Synchronization, Messaging, Thread Class and Runnable Interface, Deadlock, Suspending Resuming and Stopping Threads,

*java.lang* Package – Simply Type Wrappers, Using *clone()* and the *Cloneable* Interface, *Class*, *ClassLoader*, *Math* Class

*java.util* package – The Collection Framework – Collection Overview, Collection Interfaces (*Collection*, *List*, *Set*, *SortedSet*), Accessing Collection via an Iterator, Using a Comparator, Arrays, Legacy Classes and Interfaces (*Enumeration*, *Vector*, *Stack*, *Dictionary*, *Hashtable*, *Properties*)

**UNIT – IV**

**Streams, Networking and JDBC:** Streams: I/O Basic (Streams, The stream classes, The predefined streams, Reading console input, writing console output, Reading and writing files) *java.io* Package - ,

Networking: Socket overview, reserved sockets, Proxy servers, Internet addressing; Domain naming services (DNS), Java and the net, The networking classes and interfaces, Inet address, Factory methods, Introspection, TCP/IP server sockets, Datagrams (Datagram packet, Datagram server and client)  
 Java database connectivity (JDBC): Introduction to JDBC, type of JDBC connectivity, Establishing database connections, Accessing relational database from Java programs.

#### UNIT – V

**Applets and Event Handling:** Applets programming – Applet Class, Architecture, Initialization and Termination, Applet Display Methods, HTML applet Tag, Passing Parameters to Applets, Events Handling – Event Handling Mechanisms, Event Delegation Model, Event Classes, Sources of Events, Event Listener Interfaces, Event driven programs, handling events, like buttons, mouse, keyboards etc., AWT components, Layout managers, writing event driven programs using components.

#### Instructions For paper setter

The question papers will be set according to the following scheme

Unit	Theory Questions			Practical Questions		
	To be set	To be answered	Marks	To be set	To be answered	Marks
I	2	1	09	4	3	30
II	2	1	09			
III	2	1	09			
IV	2	1	09			
V	2	1	09			

#### Distribution of marks for practical

- 10% : Syntax and input/output screens
- 30% : Logic and efficiency (source code, pseudocode, and algorithm)
- 20% : Error trapping (illegal or invalid input, stack overflow, underflow, insufficient physical memory etc.)
- 20% : Completion
- 20% : Result

#### Recommended Books

##### Text:

1. Patrick Naughton and Herbert Schildt, "Java-2 The Complete Reference", TMH.
2. Y. Daniel Liang, "Introduction to Java Programming, Comprehensive Version, 7/e" Pearson.

##### Reference: -

1. Krishnamoorthy R, Prabhu S, "Internet and Java Programming", New Age Intl.
2. David Flanagan, Jim Farley, William Crawford and Kris Magnusson, "Java Enterprise in a Nutshell", O'Reilly.
3. Deitel, Java How To Program, 6<sup>th</sup> Edition

*Sample Practical Assignments (Appropriate JAVA SDK and Servlet Container to be made available)*

1. Write a program to create a class called Box with a parameterized constructor, along with a method to calculate the volume of the box. Use the class to find the volume of two boxes whose height, width and depth are 10, 20,30 and 20,30,40 respectively.
2. Define a class called stack that can hold 10 integer values, then initialise top of the stack, with push and pop methods. Write a program to push the elements into the stack and pop out from the stack.
3. Write a Java program using a class to multiply two matrixes of 3\*3 order. Allow the user to input the values through the keyboard.

4. Write a program to multiply two numbers using a method in a class and pass the values using call by value (pass by value and pass by reference) techniques.
5. Write a program to multiply two matrices and store the result in a third matrix.
6. Write a Java program to find factorial of positive integer using recursion.
7. Write a Java program to accept the command line arguments and display the arguments along with the positions.
8. Write a Java program to demonstrate method overriding where the program creates a superclass called figure that stores the dimensions of various two-dimensional objects. It also defines a method called area() that computes the area of an object. The program derives two subclasses from figure. The first is Rectangle and the second is Triangle. Each of these subclass overrides area() so that it returns the area of a rectangle and a triangle respectively.
9. Write a Java program to create a thread and start running it using runnable interface. Allow the thread to display a message five times with a gap of 500ms.
10. Write a Java program to demonstrate the synchronization of two threads using the synchronized statement.
11. Write a Java program to demonstrate interthread communication considering the producer and consumer problem. There must be two classes one for producer to produce data and another is consumer to consume data [Hint: Use wait() and notify() to signal in both directions].
12. Write a Java program to copy the content of one file to another using java.io
13. Write an applet to find the biggest of three numbers from the keyboard and display it on the console.
14. Design a Calculator System using Java, The applet should have all the digit buttons along with buttons for operations +, -, \*, / and =. There is a designated panel to show the current results. If a digital button is clicked, the number is displayed on the panel. If an operator button is clicked the operation is to be performed. You may assume the expression to be infix. The calculator can operate in two modes
  - i. When the operator buttons are pressed the intermediate results should be displayed
  - ii. The operations can take in any number of arguments and the final result is displayed only when the = button is pressed. [Hint: Use Overloading]
15. Create an applet that displays four radio buttons and one text field. When a radio button is selected, its text should be displayed in the text field.
16. An organization has a record of its employees in the form of a list containing the names of employees, their date of birth, date of joining the organization and all the designation that an employee has gone through during the tenure in the office. Write a Java program to create and maintain such a list. The list should be implemented as a vector since the number of employees is likely to grow over the years.
17. Add the following functionalities to the program written in exercise 13
  - i. List all employees whose tenure in the office has been for more than 20 years
  - ii. The organization has renamed the designation 'Supervisor' as 'Manager'.Write a program to do this conversion automatically in the entire list
18. Modify the program of exercise 16 to store the data in an RDBMS of your choice. The employee list should be augmented by providing an employee id field and there should be a provision for automatically incrementing the employee id. Write a java program using jdbc to provide the following functionalities
  - i. Add data
  - ii. View data
  - iii. Search data through employee id
19. Write a socket based Java application program to create a connection between two machines such that whatever text one machine is sending to the other will be displayed at the latter's screen and vice-versa
20. Create a Java application in which a particular machine is configured as the time server which continually listens for requests for time from clients. Clients request the server for time as a result of which the server sends the current time of the clients. The clients make a correction of the received time by adding a very small positive constant to the value and display the corrected time.
21. Implement a simple networked communications clients and server. Message are typed into the window at the server and written across the network to the client side, then they are displayed to demonstrate datagrams.

**BCA-503a: INTERNET AND WEB TECHNOLOGY USING MYSQL AND PHP****Objective**

The course is designed to impart knowledge and skill to the students to learn and know the principles and techniques of programming for the Web. This course aims to build in the students a web programming knowledge using PHP and MySQL.

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
40	40	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours			Marks	
		Theory	Practical	Total	Theory	Practical
I	HTTP, Web Servers, HTML and Javascript	6	8	14	09	15
II	Introduction to PHP	8	8	16	09	
III	Object Oriented Programming with PHP	10	8	18	09	15
IV	Introduction to MySQL; MySQL and PHP	10	8	18	09	
V	Validation and Sessions	6	8	14	09	
<b>Total</b>		<b>40</b>	<b>40</b>	<b>80</b>	<b>45</b>	<b>30</b>

**UNIT I**

**HTTP and Web Servers:** HTTP; System Architecture of a Web server; Client-side Scripting versus Server-side Scripting; Apache Web Server  
**HTML:** Elements of HTML (Headers, Linking, Images, Special Characters, Lists, Tables, Forms, Frames)  
**Javascript:** Operators, Data Types, Control Structures, Functions, Arrays, String Manipulation

**UNIT II**

**Introduction to PHP:** Introducing PHP, Conditions and Branches, Loops, Functions, Working with types, User-defined Functions  
**Arrays, Strings and Advanced Data Manipulation in PHP:** Arrays, Strings, Regular Expressions, Dates and Times, Integers and Floats

**UNIT III**

**Object Oriented Programming with PHP:** Introduction to Object-Oriented Programming with PHP 5: Classes and Objects, Inheritance, Throwing and Catching Exceptions  
**Advance Features of Object-Oriented Programming in PHP 5:** Working with Class Hierarchies, Abstract Classes and Interfaces

**UNIT IV**

**Introduction to MySQL; MySQL and PHP:** Working with MySQL: Database Basics, MySQL Command Interpreter, Managing Databases and Tables, Inserting, Updating and Deleting Data, Querying with SQL SELECT, Join Queries  
**Querying Web Databases:** Querying a MySQL Database using PHP, Processing User Input  
**Writing to Web Databases:** Database Inserts, Updates and Deletes, Issues in Writing Data to Database

**UNIT V**

**Validation:** Validation with PHP: Validation and Error Reporting Principles, Server-Side Validation with PHP Sessions: Introducing Session Management, PHP Session Management, Using Sessions in Validation, PHP Session API and Configuration

**Instructions for Paper Setter:**

Unit	Theory Questions			Practical Questions		
	To be set	To be answered	Marks	To be set	To be answered	Marks
I	2	1	09	2	1	15
II	2	1	09			
III	2	1	09			
IV	2	1	09	2	1	15
V	2	1	09			

#### Distribution of marks for practical

- 10% : Syntax and input/output screens
- 30% : Logic and efficiency (source code, pseudocode, and algorithm)
- 20% : Error trapping (illegal or invalid input, stack overflow, underflow, insufficient physical memory etc.)
- 20% : Completion
- 20% : Result

#### Recommended Books

##### Text:

1. Hugh E Williams and David Lane, *Web Database Applications with PHP and MySQL*, O’Rielly, 2<sup>nd</sup> Edition
2. Luke Welling and Laura Thomson, *PHP and MySQL Web development*, Sams Publishing, 2<sup>nd</sup> Edition
3. Deitel, H. M.; P. J. Deitel, *Internet and World Wide Web: How to Program (Second Edition)*, New Delhi: Prentice-Hall India, 2002

##### Reference:

1. Programming PHP, 2nd Edition, Rasmus Lerdorf, Peter MacIntyre, Kevin Tatroe
2. Beginning PHP 5 and MySQL 5: From Novice to Professional, 2<sup>nd</sup> Edition, W. Jason Gilmore

#### Suggested Practical Assignments (Questions need not be restricted to this list)

1. Create an HTML document for yourself, including your name, address, e-mail address, phone number, date of birth and age. If you are a student, you must include the course you have undertaken and describing a little bit about the course. If you are employed, you must include your employer, your employer’s address and your job title. This document must use several headings and <em>, <strong>, <hr/>, <p> and <br/> tags.
2. Create an HTML document that defines a table with columns for state, state bird/animal, state flower and state food. There must be at least five states as rows in the table.
3. Create an HTML document that has a form with the following controls:
  - a. A text box to collect user’s name.
  - b. Four checkboxes, one each for the following items:
    - i. Four 100-watt light bulbs for Rs70.
    - ii. Eight 100-watt light bulbs for Rs140.
    - iii. Four 100-watt long-life light bulbs for Rs90.
    - iv. Eight 100-watt long-life light bulbs for rs210
  - c. A collection of three radio buttons that are labeled as follows:

- i. Visa
  - ii. Mastercard
  - iii. Maestro.
4. Write Javascript code to display a table of the numbers from 5 to 15 and their squares and cubes through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
  5. Write Javascript code to display the first 50 Fibonacci Numbers through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
  6. Write Javascript code to display a list of Armstrong numbers between 100 and 1000 through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
  7. Write Javascript code to display a table of Palindrome numbers between 100 and 500 through an HTML document. [Hint: Use document.write to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
  8. Write Javascript code to generate a list of numbers between 100 and 1000 where the result of the current number is the sum of the previous four numbers in the series. Example initial four numbers are 0,1,1,2. The next number in the series should be 4.
  9. Write Javascript code to display a list of odd numbers from 1 to 100.
  10. Write Javascript code to display all prime numbers between 1 and 100.
  11. Write a PHP script to count from 1 to 10
  12. Write a PHP function to add two numbers
  13. Write a PHP function to capitalize a string or the first letter of each word.
  14. Write a PHP script to create an associative array for Shapes and print out the contents of the array using a foreach loop. The values in the array can be something like, can => cylindrical, apple => spherical etc.
  15. Write a program to create a class called Box with a parameterized constructor, along with a method to calculate the volume of the box. Use the class to find the volume of two boxes whose height, width and depth are 10,20,30 and 20,30,40 respectively.
  16. Write a PHP script to display the contents of a database table containing information about books. The table has three fields specifying the book ID, book name and the number of pages in the book. Display the results in an HTML table.
  17. Using the previous question's database table, create HTML forms for inserting, editing and deleting records. Use regular expressions to check the correct format for bookID which is given as, first three characters have to be digits followed by an underscore and then a five character string.
  18. Write a PHP script to create a cookie with the name "username" and the value "firstcookie"
  19. Write a PHP script to view the cookie created in the previous question.
  20. Most login systems use session variables to pass useful information around without having to retrieve them from the database. Create a database table to store user information like user name and password and then check to see whether a user is valid.

**BCA 503b: INTERNET AND WEB TECHNOLOGY USING JSP****Objective:**

The objective of the course is to familiarize the students with the familiarization of Web Technologies and Internet Programming based on markup languages, stylesheets, scripting languages to enable them to build and layout useful Web pages.

**Outline of the Course**

Minimum class Hours		Exam time(Hours)		Marks				
Theory	Practical	Theory	Practical	Theory		Practical		Total
				Paper	Internal	Paper	Internal	
40	40	2	3	45	15	30	10	100

Unit	Topic	Minimum Class Hours			Marks	
		Theory	Practical	Total	Theory	Practical
I	Introduction to HTML and Cascading Style Sheets (CSS)	6	7	12	5	15
II	Basics of Javascript	8	7	18	8	
III	Servlet Basics	6	6	10	8	
IV	Introducing Javaserer Pages and Processing Input and Output	10	10	20	12	15
V	Error Handling and Debugging, Accessing Database and Authentication	10	10	20	12	
<b>Total</b>		<b>40</b>	<b>40</b>	<b>80</b>	<b>45</b>	<b>30</b>

**UNIT I****Introduction to HTML and Cascading Style Sheets (CSS):**

HTML: History of HTML and W3C, HTML and its Flavors, HTML Basics, Elements, Attributes and Tags, Basic Tags, Advanced Tags (Table, Cellspacing and Cellpadding, Forms, Form Elements, Images, Meta Tags)  
 CSS: Introduction, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property Value Forms, Font Properties, List Properties, Color, Alignment of Text, The Box Model, Background Images, The <span> and <div> tags.

**UNIT II****Basics of Javascript:**

Introduction, Variables, Literals, Operators, Control Structure, Conditional Statements, Arrays, Functions, Objects, Date Objects, String Objects.

**Javascript Regular Expression :**

Introduction, Creating Regular Expression (Simple Patterns, Properties of Regular Expression, Meta Characters, String Anchoring, Character Sets, Occurrence Indicators, Sub Expressions), Usage (Matching, Searching, Replacing, Validating Data)

**UNIT III****Servlet Basics**

Java Servlets: Background, the life cycle of a servlet, The Java Servlet Development Kit (JSDK), creating and compiling a simple servlet source code, start the *servletrunner* utility, start a web browser and request the servlet, the servlet API, The *javax.servlet* packages interfaces (*servletConfig*, *servletContext*, *servletRequest*, *servletResponse*, *singleThreadModel*), the *GenericServlet* class, the *ServletInputStream* class, the *ServletOutputStream* class, the *ServletException* class, the *UnavailableException* class), Introduction to the *javax.servlet.http* package, Handling HTTP requests and Response, HTTP GET & HTTP POST

**UNIT IV**

**Introducing Javasever Pages and Processing Input and Output**

Java Server Pages: Introducing Javasever Pages, HTTP- The HTTP Request/Response Model, JSP Overview – The problem with Servlets, The Anatomy of a JSP, JSP Processing, JSP Application Design with MVC. Setting Up the JSP Environment  
 Generating Dynamic Content – Creating a JSP Page, Installing a JSP Page, Running a JSP Page, Using JSP Directive Elements, Using Template Text, Using JSP Action Elements.  
 Using JavaBeans Components in JSP Pages - What Is a Bean?, Declaring a Bean in a JSP Page, Reading Bean Properties, Setting Bean Properties  
 Using Custom Tag Libraries and the JSP Standard Tag Library - What Is a Custom Tag Library?, Installing a Custom Tag Library, Declaring a Custom Tag Library, Using Actions from a Tag Library  
 Processing Input and Output- Reading Request Parameter Values, Validating User Input, Formatting HTML Output

**UNIT V****Error Handling and Debugging, Accessing Database and Authentication**

Error Handling and Debugging - Dealing with Syntax Errors, Debugging a JSP Application, Dealing with Runtime Errors,  
 Sharing data Between JSP Pages, Requests and Users - Passing Control and Data Between Pages, Sharing Session and Application Data.  
 Accessing a Database - Accessing a Database from a JSP Page, Validating Complex Input Without a Bean, Using Transactions  
 Authentication and Personalization - Container-Provided Authentication, Application-Controlled Authentication  
 Using Scripting Element – Using page Directive Scripting Attributes, Implicit JSP Scripting Object, Using Scriptlets, Using Expressions, Using Declarations, Mixing Action Elements and Scripting Elements, Dealing with Scripting Syntax Errors.

**Instructions For paper setter**

The question papers will be set according to the following scheme

Unit	Theory Questions			Practical Questions		
	To be set	To be answered	Marks	To be set	To be answered	Marks
I	2	1	5	2	1	15
II	2	1	8			
III	2	1	8			
IV	2	1	12	2	1	15
V	2	1	12			

**Distribution of marks for practical**

- 10% : Syntax and input/output screens
- 30% : Logic and efficiency (source code, pseudocode, and algorithm)
- 20% : Error trapping (illegal or invalid input, stack overflow, underflow, insufficient physical memory etc.)
- 20% : Completion
- 20% : Result

**Recommended Books****Text:**

1. JavaServer Pages, O'Reilly
2. Naughton & Schildt, The Complete Reference 3<sup>rd</sup> Edition, TMH India
3. Uttam K. Roy, *Web Technologies*

**Reference Books:**

1. Deitel, Java How To Program, 6<sup>th</sup> Edition
2. Robert W. Sebesta, *Programming with World Wide Web* (4th edition), Pearson Education

**(Sample Practical Assignments)**

1. Create an HTML document for yourself, including your name, address, e-mail address, phone number, date of birth and age. If you are a student, you must include the course you have undertaken and describing a little bit about the course. If you are employed, you must include your employer, your employer's address and your job title. This document must use several headings and `<em>`, `<strong>`, `<hr/>`, `<p>` and `<br/>` tags.
2. Create an HTML document to describe an unordered list of a typical grocery shopping list you write.
3. Create an HTML document to describe an unordered list of at least four states. Each element of the list must have a nested list of at least three cities in the state.
4. Create an HTML document to describe an ordered list of your favorite top ten movies.
5. Modify the list of Exercise 4 to add nested, unordered lists of at least two actors and/or actresses in your favorite movies.
6. Create an HTML document that defines a table with columns for state, state bird/animal, state flower and state food. There must be at least five states as rows in the table.
7. Create an HTML document that has a form with the following controls:
  - a. A text box to collect user's name.
  - b. Four checkboxes, one each for the following items:
    - v. Four 100-watt light bulbs for Rs70.
    - vi. Eight 100-watt light bulbs for Rs140.
    - vii. Four 100-watt long-life light bulbs for Rs90.
    - viii. Eight 100-watt long-life light bulbs for rs210
  - c. A collection of three radio buttons that are labeled as follows:
    - iv. Visa
    - v. Mastercard
    - vi. Maestro.
8. Write a Javascript code to display a table of the numbers from 5 to 15 and their squares and cubes through an HTML document. [Hint: Use `document.write` to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
9. Write a Javascript code to display the first 50 Fibonacci Numbers through an HTML document. [Hint: Use `document.write` to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
10. Write a Javascript code to display a list of Armstrong numbers between 100 and 1000 through an HTML document. [Hint: Use `document.write` to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
11. Write a Javascript code to display a table of Palindrome numbers between 100 and 500 through an HTML document. [Hint: Use `document.write` to display output in a tabular form, using the assistance of table HTML tags]. Use for loop or do loop.
12. Write a Javascript code to generate a list of numbers between 100 and 1000 where the result of the current number is the sum of the previous four numbers in the series. Example initial four numbers are 0,1,1,2. The next number in the series should be 4.
13. Write a Javascript code to display a list of odd numbers from 1 to 100.
14. Write a Javascript code to display all prime numbers between 1 and 100.
15. Create a servlet that displays the current date and time.
16. Develop a servlet allowing you to read the names and values of parameters that are included in a client request using `ServletRequest` class. Develop the web page corresponding to the servlet.
17. Develop a servlet that handles an HTTP GET request. The servlet is involved when a form on a web page is submitted. The HTML web page defines a form that contains a select elements and a submit buttons. The select element name is color and the options are Red, Green and Blue. The servlet responses according to the option submitted and display the message "you have selected color".

18. Develop a servlet that handles an HTTP POST request. The servlet is involved when a form on a web page is submitted. [Hint: The HTML source code is same as the above problem. Except that the method parameter for the form tag explicitly specifies that the POST method should be used and the action parameter for the form tag specifies a different servlet].
19. Create a HTML form with three input fields: first name, last name and email. Use the get method to pass these values to a servlet. Notice how data is attached to the URL. In the servlet, verify all input fields are non-null and display them back to the client.
20. Solve Q15-19 using JSP instead of Servlets
21. Create a JSP- and JDBC-based address book that will enable users to place their first name, last name and e-mail address into a guest-book database. After submitting their information, users see a Web page containing all the users in the guest book
22. Create a Web application for dynamic FAQs. The application should obtain the information to create the dynamic FAQ Web page from a database that consists of a topics table and an faq table. The topics table has two fields a unique integer ID for each topic (topicID) and a name for each topic (topicName). The faq table has three fields the topicID (a foreign key), a string representing the question (question) and the answer to the question (answer). When the JSP page is invoked, it should read the data from the database and return a dynamically created Web page containing each question and answer, sorted by topic.

**BCA 601: ENVIRONMENTAL STUDIES**

**University Common Paper  
for all Undergraduate courses**

**BCA 602a: ARTIFICIAL INTELLIGENCE**

**Objective**

Artificial Intelligence has embraced the larger scientific goal of constructing an information-processing theory of intelligence. If such a science of intelligence could be developed, it could guide the design of intelligent machines as well as explicate intelligent behavior as it occurs in humans and other animals. This paper describes the fundamental AI ideas that underlay many of the AI applications and provides a base for understanding natural intelligence.

**Outline of the Course**

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	Overview and Problem Solving Techniques	16	15
II	Heuristic Search and Adversarial Search	20	20
III	Knowledge Representation using Logic and Reasoning	20	20
IV	Expert Systems and Learning	12	10
V	Natural Language Processing	12	10
<b>Total</b>		<b>80</b>	<b>75</b>

**UNIT I**

**Overview and Problem Solving Techniques**

Definition of AI, foundations of AI, AI technique, State space, defining a problem as a state space, Uninformed search strategies - Breadth-First, Depth-First, Iterative deepening

**UNIT II**

**Heuristic Search and Adversarial Search**

Heuristic functions, Heuristic search strategies (Best-First Search, A\*, Hill climbing search, Steepest Ascent Hill climbing), Problem Reduction search: AO\* algorithm, Constraint satisfaction problems, Game Playing (Overview, Minimax algorithm, alpha-beta pruning)

**UNIT III**

**Knowledge Representation using Logic and Reasoning**

Knowledge representation using logic, representing facts in logic, representing instances and ISA relationships, computable functions and predicates, resolution, conversion to clausal form, basis of resolution, resolution in propositional logic, unification, resolution in predicate logic, question answering, Representation of knowledge using rules: Procedural vs. Declarative Knowledge, Logic Programming, Forward vs. Backward Reasoning, Matching, Control Knowledge.

**UNIT IV**

**Expert Systems and Learning**

Expert System: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.  
Learning: Rote Learning, Learning by Taking Advice, Learning by Induction

**UNIT V**

**Natural Language Processing**

Natural Language Processing: Overview, Steps in the process: Morphological Analysis, Syntactic Analysis, Semantic Analysis, Discourse Integration, Pragmatic Analysis

**Instructions for Paper Setter:**

Unit	Questions		
	To be Set	To be Answered	Marks
I	2	1	15
II	2	1	20
III	2	1	20
IV	2	1	10
V	2	1	10

**Recommended Books****Text:**

1. Rich, E.; Knight K.; Nair S. B. , Artificial Intelligence, (Third Edition), New Delhi: Tata McGraw-Hill, 2009

**Reference:**

1. Russell, S.; P. Norvig, Artificial Intelligence: A Modern Approach (Second Edition), Pearson Education Inc., 2003
2. Sivanandam, S.N. ; Deepa, S. N. : Principles of Soft Computing (Second Edition), New Delhi, Wiley India Pvt. Ltd., 2012
3. Negnevitsky, M., Artificial Intelligence: A Guide to Intelligent Systems (Second Edition), New Delhi: Pearson Education Inc., 2002
4. Giarratano J. C.; Riley G. D., , Expert Systems : Principles and Programming, New Delhi, Cengage Learning , 2005

## BCA 602b: DATA WAREHOUSING AND DATA MINING

**Objective:** Capabilities of both generating and collecting data have been increasing rapidly in the last several decades due to the use of bar codes, computerizations of many products, advances of data collection tools etc. This growth in stored data has generated an urgent need of the subject like Data Mining. The paper aims to give the concept and various techniques of data mining to the students. Students will also learn the feasibility, usefulness, efficiency and the scalability of the techniques for discovery of patterns hidden in large databases.

### Outline of the course

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal	Total
80	3	75	25	100

Unit	Topic	Class Hours	Marks
I	Data Warehousing	20	20
II	Data Mining Introduction	10	10
III	Clustering	20	15
IV	Rule Mining	15	15
V	Classification and Prediction	15	15
<b>Total</b>		<b>80</b>	<b>75</b>

### UNIT I

**Data Warehousing:** Overview and Concepts: Need for Data Warehousing, Basic elements of Data Warehousing, differences between Database Systems and Data Warehouse.  
**Planning and Requirements:** Project planning and management, collecting the requirements.  
**Architecture and Infrastructure:** Data Warehouse Architecture and its components, Infrastructure and metadata.  
**Data Design and Data Representation:** Principles of dimensional modeling, advanced topics- data extraction, transformation and loading, data quality.  
**Information Access and Delivery:** Matching information to classes of users, OLAP in Data Warehouse, Data warehousing and the web.  
**Implementation and Maintenance:** Physical design process, Data Warehouse deployment, growth and maintenance.

### UNIT II

**Data Mining Introduction:** 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 III

**Clustering:** Partitional versus Hierarchical Clustering, 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. Categorical clustering - DBSCAN.

### UNIT IV

**Rule Mining:** 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. Generalized association rule, quantitative association rule, association rule with item constraint.

### UNIT V

**Classification and Prediction:** Introduction, Classification by Decision Tree Induction, Tree construction

principle, decision tree generation algorithms - CART, ID3.

**Instruction to paper setter**

Unit	To be set	To be answered
I	3	2
II	2	1
III	2	1
IV	2	1
V	2	1

**Recommended Books**

**Text**

1. A.K. Puzari, Data Mining Techniques, University Press.
2. J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufman. 2010.

**Reference:**

1. P. Tan, M. Steinbach and V. Kumar; Introduction to Data Mining; Pearson Education (LPE); 2009.

**BCA 602c: OPERATIONS RESEARCH****Objective:**

The objective of this course is to learn the operations research methodologies in information systems. The students will know how to apply operations research techniques to solve the real problems.

**Outline of the Course**

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal	Total
80	3	75	25	100

Unit	Topic	Class Hours	Marks
I	Introduction	16	15
II	Linear Programming	16	15
III	Transportation Problems	16	15
IV	Games and Strategies	16	15
V	Queueing Theory	16	15
<b>Total</b>		<b>80</b>	<b>75</b>

**UNIT -I**

**Introduction:** Origin & development of O.R., Nature & Characteristics features of O.R., Models & Modeling in Operation Research. Methodology of O.R., General methods for solving O.R. Models, O.R. & Decision making, Application, Use & Limitations of O.R.

**UNIT-II**

**Linear Programming:** Linear Programming Applications, Simplex method, Applications of Simplex method. Used of Artificial Variables: Two phase method, Big M Method, Duality in Linear Programming: Conversion of Primal to Dual, Duality and Simplex Method,.

**UNIT-III**

**Transportation Problems:** General Transportation Problem, The Transportation Table, Duality in Transportation Problem, Solution of a Transportation problem, Finding an initial basic feasible solution, Test for Optimality, Degeneracy in Transportation Problems. Unbalanced

**UNIT-IV**

**Games and Strategies:** Introduction, Two Person Zero-Sum Games, The Maximin-Minimax Principle, Games Without Saddle points, Graphic solution of a  $2 \times n$  and  $m \times 2$  Games, Dominance Property, Arithmetic method of  $n \times n$  Games, Limitations and Extensions.

**UNIT- V**

**Queueing Theory:** Queueing System, Elements of a Queueing System, Operating characteristics of a Queueing System, Classification of Queueing Models, Definition of Transient and Steady States, Poisson Queueing Systems

**Network Scheduling by PERT/CPM:** Network and Basic Components, Logic Sequencing, Rules of Network Construction, Critical Path Analysis, Probability Considerations in PERT, Distinction between PERT and CPM.

**Instruction to the Paper Setter:**

Unit	Theory Questions		
	To be set	To be answered	Marks
I	2	1	15
II	2	1	15
III	2	1	15
IV	2	1	15
V	2	1	15

**Recommended books:****Text:**

1. Kanti Sawrup, P.K. Gupta and Manmohan, "Operations Research", Sultan Chand & Sons, New Delhi.
2. Billy E. Gillett, "Introduction to Operations Research", Tat McGraw Hill, New Delhi.

**Reference:**

1. Hamdy A.Taha, Operations Research, An Introduction.

**BCA 602d: NETWORK SECURITY****Objective**

With expanding use of computer networks in general and the Internet in particular in financial and business transactions, the issue of security of such networks has come to the forefront. This course focuses on the fundamental concepts, theory and techniques of Cryptography and Network Security. Various security issues in computer communications and applications will also be introduced.

**Outline of the Course**

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	Information Security	8	10
II	Cryptography	20	20
III	Public Key Infrastructure and Message Authentication	20	15
IV	Network Security	20	20
V	Web Security	12	10
<b>Total</b>		<b>80</b>	<b>75</b>

**UNIT I**

**Information Security:** Attributes of Information Security: Confidentiality, Integrity, Availability. Threats and Vulnerabilities: Unauthorized Access, Impersonation, Denial of Service, Malicious Software: Trap Doors, Logic Bomb, Trojan Horses, Viruses, Worms

**UNIT II**

**Cryptography:** Plain Text, Cipher Text, Requirements for Cryptography, Classical Encryption techniques: Symmetric cipher model, Cryptography, Cryptanalysis, Substitution techniques – Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Transposition techniques, Block and Stream ciphers, DES, Triple DES

**UNIT III**

**Public Key Infrastructure and Message Authentication:** Public Key Cryptography Principles & Applications, Public key algorithm: RSA, Diffie-Hellman key exchange, Message Authentication, One way Hash Functions, Message Digest: MD5, SHA1. Digital Signatures, Digital Certificates, Certificate Authorities

**UNIT IV**

**Network Security:** Network Scanning: ICMP, TCP sweeps; Denial of Service Attacks: SYN Flood  
IP security Architecture: Overview, Authentication header, Encapsulating Security Pay Load, combining Security Associations, Key Management. Virtual Private Network Technology: Tunneling using IPSec.

**UNIT V**

**Web Security:** Requirements, Secure Socket Layer, and Secure Electronic Transactions, Network Management  
Security: Overview of SNMP Architecture  
Firewall Characteristics & Design Principles, Types of Firewalls: Packet Filtering Router

**Instructions for Paper Setter:**

Unit	Questions		
	To be Set	To be Answered	Marks
I	2	1	10
II	2	1	20
III	2	1	15
IV	2	1	20
V	2	1	10

**Recommended Books****Text:**

1. W. Stallings, Cryptography and Network Security, Principles and Practice, Pearson Education, 2000.
2. A. Forouzan, "Data Communication and Networking", Tata Mc Graw Hill

**Reference:**

1. W. Stallings, Networks Security Essentials: Application & Standards, Pearson Education, 2000
2. Singh, Brijendra, "Network Security and Management", PHI, 2007.
3. Hans, "Information and Communication Security", Springer Verlag, 1998.
4. Simonds, "Network Security", McGraw Hill, 1998.

**BCA 602e: E-COMMERCE****Objective:**

The objective of the course is to familiarize the students with E-Commerce, its importance in today's world and also the pitfalls involved.

**Outline of the Course**

Minimum Class Hours	Exam Time (Hours)	Marks		
		Theory	Internal	Total
80	3	75	25	100

Unit	Topic	Minimum Class Hours	Marks
I	History of E-commerce and Indian Business Context	16	15
II	Enabling Technologies of the World Wide Web	16	15
III	e-Security	16	15
IV	e-Payment Systems	16	15
V	Information systems for Mobile Commerce	16	15
<b>Total</b>		<b>80</b>	<b>75</b>

**UNIT I**

**History of E-commerce and Indian Business Context :** E-Commerce – Emergence of the Internet – Emergence of the WWW – Advantages of E-Commerce – Transition to E-Commerce in India – The Internet and India – E-transition Challenges for Indian Corporates. Business Models for E-commerce: Business Model – E-business Models Based on the Relationship of Transaction Parties - E-business Models Based on the Relationship of Transaction Types.

**UNIT II**

**Enabling Technologies of the World Wide Web:** World Wide Web – Internet Client-Server Applications – Networks and Internets – Software Agents – Internet Standards and Specifications – ISP. e-Marketing : Traditional Marketing – Identifying Web Presence Goals – Online Marketing – E-advertising – E-branding.

**UNIT III**

**e-Security :** Information system Security – Security on the Internet – E-business Risk Management Issues – Information Security Environment in India. Legal and Ethical Issues : Cyberstalking – Privacy is at Risk in the Internet Age – Phishing – Application Fraud – Skimming – Copyright – Internet Gambling – Threats to Children.

**UNIT IV**

**e-Payment Systems:** Main Concerns in Internet Banking – Digital Payment Requirements – Digital Token-based e-payment Systems – Classification of New Payment Systems – Properties of Electronic Cash – Cheque Payment Systems on the Internet – Risk and e-Payment Systems – Designing e-payment Systems – Digital Signature – Online Financial Services in India - Online Stock Trading.

**UNIT V**

**Information systems for Mobile Commerce:** What is Mobile Commerce? – Wireless Applications – Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies – Different Generations in Wireless Communication – Security Issues Pertaining to Cellular Technology. Portals for E-Business: Portals – Human Resource Management – Various HRIS Modules.

**Instructions for Paper Setter:**

Unit	Questions		
	To be Set	To be Answered	Marks
I	2	1	15
II	2	1	15
III	2	1	15
IV	2	1	15
V	2	1	15

**Recommended Books****Text:**

1. E-Commerce - An Indian Perspective, P.T.Joseph, S.J., Fourth Edition, PHI 2012.

**Reference**

1. E-Commerce Strategy, Technologies and Applications David Whiteley Tata Mc-Graw-Hill

**BCA-603: PROJECT**

The project work consists of two parts as described hereunder:

**A. PROJECT REPORT**

In the third year, every student will have to submit a Project Report on a problem/topic to be approved by the Department running the programme in the college/institution under the supervision of a core faculty member of the department/any other competent person. At the end of the 2<sup>nd</sup> year coursework, the students are to be advised to prepare a project proposal in consultation with the faculty member(s) for approval by the department of the college/institution where they are pursuing the programme. The concerned department has to allot a faculty member under whose supervision the student has to prepare the project report. The report may be of a research/software design/consultancy type or any other academically/professionally justified one. The report shall contain the objectives and scope of the study, methodology used, importance of the study, recommendations etc along with flowchart, ER-diagrams, DFDs, source code, relevant charts, diagrams and bibliography etc where applicable.

A certificate of the Supervisor / the Head of the department/ program, certifying the authenticity of the report shall be attached therewith. The student will submit a copy of the report to the Head of the concerned department / programme. The report should be neatly typed in A-4 size paper and soft bound (paperback) with a front page specifying the particulars of the student and the title of the project.

**B. COMPREHENSIVE VIVA**

The comprehensive viva voce is to be scheduled at the end of the third year (at the time of project evaluation) in order to judge the complete personality of the student along with the understanding as well as application of the knowledge gained by the student at the end of the programme. The idea is to see whether the student has been able to comprehend what has been taught during the three-year programme and see their relevance not only in the practical field but also their interrelationship. The student is expected to answer questions raised about concepts taught in the programme.

**Evaluation**

The evaluation of the project report and the comprehensive viva voce will be done by three examiners- two externals to be appointed by the university and the other internal by the college/institution. The average of the two closest marks awarded by the three examiners will be taken into account for the result.

***Distribution of Marks******Project Report & Demonstration***

Completion	10 marks
Complexity	15 marks
User Friendliness	10 marks
Domain Knowledge	10 marks
Project Report	10 marks

***Comprehensive Viva Voce***

Subject Knowledge	20 marks
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***Internal Assessment***

25 marks

