

# BABU BANARASI DAS UNIVERSITY, LUCKNOW

## B. Sc. (Hons.) Computer Science

### COURSE STRUCTURE (Under CBCS)

Course	Code	Title	Teaching			Evaluation				Credits	
						Theory		Lab/Seminar / Viva Voce/ Dissertation			Total
			L	T	P	CIA	ESE	CIA	ESE		
Core	BSC1101	Programming Fundamentals using 'C'	4	-	4	40	60	20	30	150	6
Core	BSC1102	Computer System Architecture	5	1	-	40	60	-	-	100	6
GE		Generic Elective - I	-	-	-	-	-	-	-	-	6
AECC	BSAE1101	Communicative English	2	-	-	40	60	-	-	100	2
GP	BSGP11	General Proficiency	-	-	-	-	-	100	-	100	1
<b>21</b>											
<b>SEMESTER – II</b>											
Core	BSC1201	Data Structures	4		4	40	60	20	30	150	6
Core	BSC1202	Discrete Structure	5	1		40	60	-	-	100	6
GE		Generic Elective - II	-	-	-	-	-	-	-	-	6
AECC	BSAE1201	Environmental Studies	2	-	-	40	60	-	-	100	2
GP	BSGP12	General Proficiency	-	-	-	-	-	100	-	100	1
<b>21</b>											
<b>SEMESTER – III</b>											
Core	BSC1301	Programming in JAVA	4	-	4	40	60	20	30	150	6
Core	BSC1302	Operating Systems	4	-	4	40	60	20	30	150	6
Core	BSC1303	Computer Networks	5	1	-	40	60	-	-	100	6
GE		Generic Elective - III	-	-	-	-	-	-	-	-	6
SEC	BSSE1311	Skill Enhancement Course - I	-	-	-	-	-	-	-	-	2
GP	BSGP13	General Proficiency	-	-	-	-	-	100	-	100	1
<b>27</b>											
<b>SEMESTER – IV</b>											
Core	BSC 1401	Design and Analysis of Algorithms	5	1		40	60	-	-	100	6
Core	BSC 1402	Software Engineering	5	1	-	40	60	-	-	100	6
Core	BSC 1403	Database Management Systems	4		4	40	60	20	30	150	6
GE		Generic Elective - IV	-	-	-	-	-	-	-	-	6
SEC	BSSE1412	Skill Enhancement Course - II	-	-	-	-	-	-	-	-	2
GP	BSGP14	General Proficiency	-	-	-	-	-	100	-	100	1
<b>27</b>											
<b>SEMESTER – V</b>											
Core	BSC 1501	Internet Technologies	4	-	4	40	60	20	30	150	6
Core	BSC 1502	Theory of Computation	5	1	-	40	60	-	-	100	6
DSE		Discipline Specific Elective - I	-	-	-	-	-	-	-	-	6
DSE		Discipline Specific Elective - II	-	-	-	-	-	-	-	-	6
Lab	BSC S15	Seminar	-	-	-	-	-	100	-	100	2
<b>26</b>											
<b>SEMESTER – VI</b>											
Core	BSC 1601	Artificial Intelligence	4	-	4	40	60	20	30	150	6
Core	BSC 1602	Computer Graphics	4	-	4	40	60	20	30	150	6
DSE		Discipline Specific Elective - III	-	-	-	-	-	-	-	-	6
DSE		Discipline Specific Elective - IV	-	-	-	-	-	-	-	-	6
Lab	BSC V16	Viva Voce	-	-	-	-	-	-	100	100	2
<b>26</b>											

**ELECTIVE COURSES – B. Sc. (Hons.) Computer Science**

Code	Title	Teaching			Evaluation						Credits
					Theory		Lab/Seminar/ Viva Voce/ Dissertation		Total		
		L	T	P	CIA	ESE	CIA	ESE			
<b>Generic Elective – I</b>											
BSM 1101	Calculus	5	1	-	40	60	-	-	100	6	
BSE 1101	Basic Circuit Theory & Network Analysis	4	-	4	40	60	20	30	150	6	
<b>Generic Elective – II</b>											
BSM 1202	Differential Equation	5	1	-	40	60	-	-	100	6	
BSE 1201	Semiconductor Devices	4	-	4	40	60	20	30	150	6	
<b>Generic Elective – III</b>											
BSM 1303	PDE and System of ODE	5	1	-	40	60	-	-	100	6	
BSE 1302	Digital Electronics	4	-	4	40	60	20	30	150	6	
<b>Generic Elective – IV</b>											
BSM 1401	Numerical Methods	5	1	-	40	60	-	-	100	6	
BSE 1402	Signal Systems	5	1	-	40	60	-	-	100	6	

<b>Discipline Specific Elective – I</b>											
BSC 1551	Microprocessor	5	1	-	40	60	-	-	100	6	
BSC 1552	Data Mining	5	1	-	40	60	-	-	100	6	
BSC 1553	Big Data Analysis	5	1	-	40	60	-	-	100	6	
<b>Discipline Specific Elective – II</b>											
BSC 1554	Network Programming	5	1	-	40	60	-	-	100	6	
BSC 1555	Cloud Computing	5	1	-	40	60	-	-	100	6	
BSC 1556	System Programming	5	1	-	40	60	-	-	100	6	
<b>Discipline Specific Elective – III</b>											
BSC 1651	Information Security	5	1	-	40	60	-	-	100	6	
BSC 1652	Digital Image Processing	5	1	-	40	60	-	-	100	6	
BSC 1653	Soft Computing	5	1	-	40	60	-	-	100	6	
<b>Discipline Specific Elective – IV</b>											
BSC 1654	Machine Learning	5	1	-	40	60	-	-	100	6	
BSC 1655	Introduction to Data Science	5	1	-	40	60	-	-	100	6	
BSC 1656	Project Work	-	-	-	-	-	50	50	100	6	

<b>Skill Enhancement Course – I</b>											
BSSE1301	LaTeX and HTML	1	-	2	40	60	50	-	150	2	
BSSE1311	Web Technologies	1	-	2	40	60	50	-	150	2	
<b>Skill Enhancement Course – II</b>											
BSSE1411	Linux / Unix Programming	1	-	2	40	60	50	-	150	2	
BSSE1421	Programming in MATLAB	1	-	2	40	60	50	-	150	2	

<b>Course Name</b>	<b>Programming Fundamental using C</b>		
<b>Category: Core</b>	<b>Code: BSC 1101</b>	<b>Credits: 6</b>	<b>L-4 T-0 P-2</b>
<b>Exam: Theory 3 Hrs, Practical 2 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

## SYLLABUS

**Module I:** Introduction to C; History of C, Overview of procedural programming, Structure of C program, Compiling and executing simple programs in C, Key words Data types, Variables, Constants, Operators and Basic I/O( printf, scanf, getchar, putchar,getc, getch, gets, puts) Expressions, Conditional statements (if, else if , nested if , else if ladder, switch), Iterative statements(do loop , while loop , for loop), Jump statements (break, continue and goto).

**Module II:** Functions and Arrays;Arrays, Derived data types: Structures and Unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of structures, Individual data members as structures, Structure with union as members, Union with structures as members.String handling, Functions, Call by value, Call by reference, Functions returning value, passing and returning structures from functions, Recursion.

**Module III:** Pointers &Memory Allocation in C; Pointers in C, pointer to pointer, pointers to structures, Problems with pointers, Passing pointers as function arguments, returning a pointer from a function, using arrays with pointers, Passing arrays to functions. Static and dynamic memory allocation, use of malloc(), calloc() and free() functions, storage of variables in static and dynamic memory allocation.

**Module IV:** Preprocessor directives and File Handling in C; Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros.File I/O, Opening and closing a file, Reading and writing text files, Using put(), get(), read() and write() functions, Random access in files,

### Text Books:

1. E Balaguruswamy, Computer Concepts and Programming in C, TataMcGraw Hill Publications
2. Yashavant P. Kanetkar, Let UsC , BPB Publications

### Reference Books:

1. Jeri R. Hanly, Elliot B.Koffman, Problem Solving and ProgramDesign in C, Pearson Addison-Wesley.
2. BehrouzA.Computer Science-A Structured Programming Approach Using C.

### COMPUTER SCIENCE LAB (C-I): Programming Fundamentals using C Lab Practical:

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series  $S = 1 + 1/2 + 1/3 + 1/4 + \dots$
4. WAP to compute the sum of the first n terms of the following series  $S = 1 - 2 + 3 - 4 + 5 - \dots$
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):
 

```

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

10. WAP to perform following actions on an array entered by the user:
  - i) Print the even-valued elements
  - ii) Print the odd-valued elements
  - iii) Calculate and print the sum and average of the elements of array
  - iv) Print the maximum and minimum element of array
  - v) Remove the duplicates from the array
  - vi) Print the array in reverse order

The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.

13. Write a program in which a function is passed address of two variables and then alter its contents.

14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() /calloc() functions or new operator.

16. Write a menu driven program to perform following operations on strings:
  - a) Show address of each character in string
  - b) Concatenate two strings without using strcat() function.
  - c) Concatenate two strings using strcat() function.
  - d) Compare two strings
  - e) Calculate length of the string (use pointers)
  - f) Convert all lowercase characters to uppercase
  - g) Convert all uppercase characters to lowercase
  - h) Calculate number of vowels
  - i) Reverse the string

17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.

18. WAP to display Fibonacci series (i) using recursion, (ii) using iteration.

19. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration.

20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.

21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose .
22. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
23. Write a program to retrieve the student information from file created in previous question and print it in following format:

Roll No. Name Marks

24. Copy the contents of one text file to another file, after removing all whitespaces.
25. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void
26. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.
27. Write a Program to Create a File & Store Information
28. Write a C Program to Illustrate Reading of Data from a File
29. Write a C Program Delete a specific Line from a Text File
30. Write a C Program to Append the Content of File at the end of another.

<b>Course Name</b>	<b>Computer System Architecture</b>		
<b>Category: Core</b>	<b>Code: BSC 1102</b>	<b>Credits: 6</b>	<b>L-5 T-1 P-0</b>
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module-I:** Introduction; Logic gates, Boolean algebra, Combinational circuits, Circuit simplification, Flip-flops, Decoders, Multiplexers, Registers, Counters and Memory units.

**Module-II:** Data Representation and Basic Computer Arithmetic II; Number system, Complements, Fixed and Floating point representation, Addition, Subtraction, Magnitude comparison, Multiplication algorithms for integers.

**Module-III:** Basic Computer Organization and Central Processing Unit Design; Computer registers, Bus system, Instruction set, Timing and control, Instruction cycle, Memory reference, Input-output and interrupt, Interconnection Structures, Bus Interconnection, Design of basic computer.

Register organization, Arithmetic and logical micro-operations, Stack organization, Micro programmed control. Instruction formats, Addressing modes, Instruction codes, RISC, CISC architectures, Pipelining and Parallel architecture.

**Module-IV:** Memory; Cache memory, Associative memory, Mapping, Input/Output: External Devices, I/O Modules, Programmed I/O, Interrupt -Driven I/O, Direct Memory Access.

**Text Books:**

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009
4. M. Mano, Digital Design, Pearson Education Asia, 2013
5. Carl Hamacher, Computer Organization, Fifth edition, McGrawHill, 2012.

**Reference Books:**

1. Patterson, "Computer Organization and Design", Elsevier Publication
2. Tannenbaum, "Structured Computer Organization", PHI
3. John P Hays, "Computer Organization", McGraw Hill.
4. P Pal Chaudhary, "Computer Organization & Design", PHI.

<b>Course Name</b>	<b>Data Structures</b>		
<b>Category: Core</b>	<b>Code: BSC1201</b>	<b>Credits:</b>	<b>L-4 T-0 P-2</b>
<b>Exam: Theory 3 Hrs, Practical 2 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

## SYLLABUS

**Module I:** Introduction to data structures: Basic terminology, Algorithm and its complexity, Arrays: Definition, Analysis of arrays, Address calculation, Single and multidimensional arrays, Sparse Matrices (Array and Linked Representation). Stacks: Implementing single / multiple stack/s in an Array; Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another application of stack Limitations of Array representation of stack.

**Module II:** Link List; Singly, Doubly and circular lists (Array and Linked representation) Normal and circular representation of stack in lists, Self organizing lists. Recursion: Developing recursive definition of simple problems and their implementation; Advantages and limitations of recursion. Understanding what goes behind recursion (Internal Stack Implementation)

**Module III:** Queue; Array and linked representation of queue, De-queue, Priority queues Introduction to tree as a data structure; Binary trees (Insertion, Deletion, Recursive and iterative Traversals on binary search trees); Threaded binary trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

**Module IV:** Searching and sorting; Linear search, Binary search, Comparison of linear and Binary search, Selection sort, Introduction to hashing, Deleting from hash table, Efficiency of rehash methods, Hash table reordering, Resolving collision by open addressing, Coalesced hashing, Separate chaining, Dynamic and extendible hashing, Choosing a hash function, Perfect hashing function.

### Textbooks:

1. Data Structures Using C and C++ YddishLangsam, Moshe J.Augenstein and Aaron M. Tanenbaum, Prentice Hall of India, IIndedition.
2. Data Structures, Algorithms and Applications with C++, SahaniMc-GrawHill.

### Reference Books:

1. Jean Paul Trembley and Paul G. Sorenson, —An Introduction to Data Structures with applications, McGraw Hill.
2. R. Kruseetal, —Data Structures and Program Designin Cl, Pearson Education 5. Lipschutz,- Data Structures, Schaum's Outline Series, TMH.

### COMPUTER SCIENCE LAB (C-V): Data Structures Lab

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.

3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation. Use Templates.
8. Perform Queues operations using Circular Array implementation. Use Templates.
9. Create and perform different operations on Double-ended Queues using Linked List implementation.
10. WAP to scan a polynomial using linked list and add two polynomials.
11. WAP to calculate factorial and to compute the factors of a given no. (i) using recursion, (ii) using iteration
12. (i) WAP to display fibonacci series (ii) using recursion, (iii) using iteration
13. WAP to create a Binary Search Tree and include following operations in tree:
  - (a) Insertion (Recursive and Iterative Implementation)
  - (b) Deletion by copying
  - (c) Deletion by Merging
  - (d) Search a no. in BST
  - (e) Display its preorder, postorder and inorder traversals Recursively
  - (f) Display its preorder, postorder and inorder traversals Iteratively
  - (g) Display its level-by-level traversals
  - (h) Count the non-leaf nodes and leaf nodes
  - (i) Display height of tree
  - (j) Create a mirror image of tree
  - (k) Check whether two BSTs are equal or not
14. WAP to convert the Sparse Matrix into non-zero form and vice-versa.
15. WAP to reverse the order of the elements in the stack using additional stack.
16. WAP to reverse the order of the elements in the stack using additional Queue.
17. WAP to implement Lower Triangular Matrix using one-dimensional array.
18. WAP to implement Upper Triangular Matrix using one-dimensional array.
19. WAP to implement Symmetric Matrix using one-dimensional array.
20. WAP to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the successor / predecessor of an element, insert an element, inorder traversal.



<b>Course Name</b>	<b>Discrete Structures</b>		
<b>Category: Core</b>	<b>Code: BSC 1202</b>	<b>Credits: 6</b>	<b>L-5 T-1 P-0</b>
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

## SYLLABUS

**Module I:** Introduction; Sets - finite and infinite sets, uncountably infinite sets, functions, relations, operations on relation, composite relations, equality of relations, properties of binary relations, closure, partial ordering relations, Counting - Pigeonhole principle, permutation and combination, mathematical induction, principle of inclusion and exclusion.

**Module II:** Growth of Functions and Recurrences; Asymptotic notations, summation formulas and properties, bounding summations, approximation by integrals, recurrence relations, generating functions, linear recurrence relations with constant coefficients and their solution, substitution method, recurrence trees, Master theorem.

**Module III:** Graph Theory; Basic terminology, models and types, multi-graphs and weighted graphs, graph representation, graph isomorphism, graph homomorphism, connectivity, Euler and Hamiltonian paths and circuits, planar graphs, bipartite graph, graph coloring, definition of trees, binary tree traversal, binary search tree, spanning trees.

**Module IV:** Propositional Logic; Definition of propositions, Well-formed formulas, tautologies, satisfiability, contradiction, algebra of proposition, theory of inference.

### Text Book:

1. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition, McGraw Hill 2006.

### Reference Books:

1. T.H. Cormen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009.
2. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms, John Wiley Publication, 1988.
3. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009.
4. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008.
5. C.L. Liu, D.P. Mahapatra, Elements of Discrete mathematics, 2nd Edition, Tata McGraw Hill, 1985.

<b>Semester</b>	Third			
<b>Course Name</b>	Programming in JAVA			
<b>Category: Core</b>		<b>Code: BSC1301</b>	<b>Credits: 6</b>	L-4 T-0 P-2
<b>Exam: Theory 3 Hrs. Practical 2 Hrs.</b>		<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module I: Introduction to Java:** Java Architecture and Features, semantic and syntax, differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods)

**Module II: Arrays, Strings, I/O and Object-Oriented Programming:** Creating & Using single Multi-dimensional Arrays, Referencing Arrays, Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings to & from Methods, String Buffer Classes. Simple I/O using Scanner class, Byte and Character streams, Reading/Writing from console and files. Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection

**Module III: Inheritance, Interfaces, Packages and Exception handling:** Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata. Exception types, Uncaught exceptions, Throw, Built-in exceptions, Creating your own exceptions.

**Module IV: Multi-Threading, Networking Basics and Database Connectivity, Applets and Event Handling:** Multi-threading: Creating single and multiple threads, Thread prioritization, Synchronization and communication, Suspending/resuming threads. Using java.net package. Accessing and manipulating databases using JDBC. Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. Design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

#### Recommended Books:

##### Text Book:

1. Herbert Schildt, "Java: The Complete Reference", Seventh Edition.

##### Reference Books:

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley "The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition, Publisher: Addison-Wesley, 2008.
4. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 1, 9<sup>th</sup> Edition, Printice Hall. 2012
5. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill. 2009.

## COMPUTER SCIENCE LAB (C-VI): Programming in JAVA Lab

### Practical: 60 Lectures:

1. To find the sum of any number of integers entered as command line arguments.
2. To find the factorial of a given number.
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .length in case of a two dimensional array.
5. To convert a decimal to binary number.
6. To check if a number is prime or not, by taking the number as input from the keyboard.
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument.
8. Write a program that show working of different functions of String and StringBufferclasses like setCharAt(), setLength(), append(), insert(), concat()and equals().
9. Write a program to create a distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword.
13. Write a program to show the use of static functions and to pass variable length arguments in a function.
14. Write a program to demonstrate the concept of boxing and unboxing.
15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
18. Write a program Divide byZerothat takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of throwable).
21. Write a program to demonstrate priorities among multiple threads.
22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it examine the different components of the URLand content.
24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet's window.
26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).

<b>Semester</b>	Third			
<b>Course Name</b>	Operating System			
<b>Category: Core</b>	<b>Code: BSC 1302</b>	<b>Credits: 6</b>	L-4 T-0 P-2	
<b>Exam: Theory 3 Hrs, Practical 2 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>		

### SYLLABUS

**Module I: Introduction:** Definition of operating system (OS), Kernel, Shell, History of Operating Systems, Single/Multi User and Single and Multitasking OS; types of operating systems– multiprogramming systems, batch systems, time sharing systems, Distributed System, real time systems; Functions of operating system: Memory management, process management, device management, file management etc.

**Module II: Operating System Organization:** system calls and system programs. **Process Management:** System view of the process and resources, process abstraction, process hierarchy, threads; Process synchronization: concurrent processes, critical sections, methods for inter-process communication; classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers etc.).

**Module III: Process Scheduling:** non-pre-emptive and pre-emptive scheduling algorithms-FCFS, SJF, SRTF, Round Robin etc., Semaphores. **Memory Management:** Memory address, Physical and virtual address space; memory allocation strategies –fixed and variable partitions, Concept of paging, segmentation, demand paging, virtual memory, page replacement algorithms, virtual memory

**Module IV: Deadlocks:** prevention and avoidance, detection and recovery. **File and I/O Management** File concepts, Access methods, Directory structure, File system structure, files operations, files allocation methods, device management, **Protection and Security**, Policy mechanism, Authentication

#### Recommended Books:

#### Text Book:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.

#### Reference Books:

1. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
2. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
3. W. Stallings, Operating Systems, Internals & Design Principles , 5th Edition, Prentice Hall of India. 2008.
4. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

## COMPUTER SCIENCE LAB: Operating Systems Lab

### Practical: 60 Lectures: C/ C++ programs

1. WRITE A PROGRAM (using *fork()* and/or *exec()* commands) where parent and child execute:
  - a) Same program, same code.
  - b) Same program, different code.
  - c) Before terminating, the parent waits for the child to finish its task.
2. Write a program to report behavior of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behavior of Linux kernel including information on configured memory, amount of free and used memory. (Memory information)
4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
5. Write a program to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRTF scheduling algorithm.
12. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

<b>Semester</b>	Third		
<b>Course Name</b>	Computer Networks		
<b>Category: Core</b>	<b>Code: BSC1303</b>	<b>Credits: 6</b>	<b>L-5 T-1 P-0</b>
<b>Exam: Theory 3 Hrs.</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module-I : Data Communication Fundamentals and Techniques :** Analog and digital signal; Data-rate limits; Digital to digital line encoding schemes; Pulse code modulation; Parallel and serial transmission; Digital to analog modulation; Multiplexing techniques: FDM, TDM; transmission media.

**Computer Networks:** Network definition; Network topologies; Network classifications; Network protocol; Layered network architecture; OSI reference model

**Module –II:** TCP/IP Model and its protocol suite, Comparison of OSI and TCP/IP Models. **Networks Switching Techniques and Access mechanisms:** Circuit switching; Packet switching- Connectionless datagram switching, Connection-Oriented virtual circuit switching; Dial-up modems; Digital subscriber line; Cable TV for data transfer. **Data Link Layer Functions and Protocol :** Error detection and error correction techniques; Data-link control- Framing and Flow control; Error recovery protocols- Stop and wait ARQ, Go-back-n ARQ; Point to Point Protocol on Internet.

**Module –III: Multiple Access Protocol and Networks:** CSMA/CD protocols; Ethernet LANS; Connecting LAN and back-bone networks- Repeaters, Hubs, Switches, Bridges, Router and Gateways;

**Networks Layer Functions and Protocols:** Routing, Routing algorithms: Distance Vector, Shortest Path Routing Algorithm, Network layer protocols: IP protocol, Internet control Message protocol, IGMP, ARP, RARP.

**Module-IV: Transport Layer Functions and Protocols:** Transport services- Error control and Flow control, Reliability, TCP and UDP, Connection establishment and release: Three way handshaking, Concept of Socket and ports; **Application layer protocol:** Overview of WWW, URL, HTTP, SMTP, FTP, POP, TELNET. Domain Name System, Domain Name Servers, DNS Space.

### Text Book:

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM, 2007.

### Reference Books

1. Computer Network and Internet by Douglas E Comer
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI, 2002
3. William Stallings, “Data and Computer Communication”, Prentice Hall

<b>Semester</b>	Fourth		
<b>Course Name</b>	Design and Analysis of Algorithms		
<b>Category: Core</b>	<b>Code: BSC1401</b>	<b>Credits: 6</b>	<b>L-5 T-1 P-0</b>
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module I: Introduction:** Algorithm Definition and Characteristics, Design and Analysis, Notion of Algorithm, Analysis of algorithms, Designing of Algorithms, Growth of Functions, Master's Theorem, **Advanced Design and Analysis Techniques:** Iterative techniques, Divide and Conquer, Dynamic Programming: Matrix chain multiplication Problem, Optimal Binary search tree, Knapsack 0/1, Greedy Algorithms: Fractional Knapsack; Amortized Analysis

**Module II: Searching and Sorting:** Internal and External, Sorting Techniques, Elementary sorting techniques–Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques: Linear Search, Binary Search, complexity analysis.

**Module III: Graph Algorithms and Advanced Data Structures:** Terminology, Representation of graph, Graph Algorithms– Breadth First Search, Depth First Search and Minimum Spanning Trees: Prim's and Kruskal's, Shortest Path: Dijkstra's Algorithm

**Module IV: Advanced Data Structures:** AVL Tree, Red-Black Trees, Binomial Heaps, Fibonacci Heaps **String Matching:** String Matching Algorithms: Naïve, Rabin Karp, KMP.

#### Recommended Books:

##### Text Book:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press/McGraw-Hill, 2001.
2. Udit Agarwal, Algorithms Design and Analysis, Dhanpat Rai & Co.

##### Reference Books:

1. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
2. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006

<b>Semester</b>	Fourth			
<b>Course Name</b>	Software Engineering			
<b>Category: Core</b>	<b>Code: BSC 1402</b>	<b>Credits: 6</b>	<b>L-5 T-1 P-0</b>	
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>		

### SYLLABUS

**Module-I: Introduction:** Introduction to System, Characteristics of System, System Development Life Cycle, Evolution of Software, Software as System, Significance of Software, Software characteristics, Changing nature of Software, Software Engineering as a Layered Technology, Software process framework, Framework and umbrella activities, Process Capability Maturity Model Integration (CMMI).

**Module-II: Requirement Analysis & Specification:** Software Requirement Analysis, Initiating requirement engineering process, Requirement Analysis, and Modeling Techniques, Models, Waterfall model, Prototyping, Flow Oriented Model, Need for SRS, Characteristics of SRS, Components of SRS, Software project management, Software project planning, Software monitoring and control, Estimation in project planning process, Project scheduling: Gantt chart, Pert/CPM.

**Module-III: Risk Management** Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan, Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects, Identify IT Project Risk, Risk Analysis and Assessment, Risk Strategies, Risk Monitoring and Control, Risk Response and Evaluation.

**Module-IV: Software Design & Testing :** Design Objectives, Design Concepts, Types of Design, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design. Software Testing Fundamentals, Strategic Approach to Software Testing, Functional Testing, Structural Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing, Path Testing, Strategic issues in testing.

#### Recommended Books:

##### Text Book:

1. Roger S. Pressman, Software Engineering: A practitioner's approach, McGraw Hill.

##### Reference Books:

1. Rajib Mall, Fundamentals of Software Engineering, Prentice Hall India
2. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
3. K.K. Aggarwal and Y. Singh, Software Engineering ( 2nd Edition), New Age International Publishers, 2008
4. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.



<b>Semester</b>	Fourth		
<b>Course Name</b>	Database Management System		
<b>Category: Core</b>	<b>Code: BSC 1403</b>	<b>Credits: 6</b>	<b>L-4 T-0 P-2</b>
<b>Exam: Theory 3 Hrs, Practical 2 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

## SYLLABUS

### Module I: Introduction to DBMS

**(16 Lectures)**

Introduction to Traditional File Oriented System, Disadvantages of File Oriented System, An overview of the DBMS: Concept of database system, Advantages of DBMS over the File oriented System, Components of DBMS, Database Administrator and Database Users, Structure of DBMS, Data Independence, Data Abstraction, Three level Architecture of database system; Introduction to Data Models: Hierarchical, Network and Relational Model. Comparison of Network, Hierarchical and Relational Model. Database Languages and Interfaces.

### Module II: Relational and E-R model:

**(14 Lectures)**

Relational data model: Relational database, Codd's Rules of relational algebra. E-R Modeling: Entity types, Entity set, Attribute and keys concept, Entity integrity and referential integrity, Relationships types, Roles and structural constraints, Strong and weak entities. Data Modelling using the Entity-Relationship Model, Concepts, Notation for ER diagram, Mapping constraints, keys, Aggregation, Specialization and Generalization, Relational Algebra.

### Module III: Introduction to SQL queries:

**(17 Lectures)**

Structured Query Language, SQL data types, Basic SQL Query, Nested Queries, JOIN, Aggregate Operators, Null Values, Basic retrieval capability, Insert, Update commands, DDL, DML, Views. Data Normalization: Functional dependencies, Armstrong rules, Closure of attributes, Normal form up to 3rd Normal form, BCNF, Join dependencies, Decompositions.

### Module IV: Database Protection & Distributed Database:

**(13 Lectures)**

Transaction Processing Concepts, Introduction to Transaction Processing, Transaction states and State Diagram, Transaction and System Concepts, Desirable Properties of Transactions, Schedules and Recoverability, Serializability of Schedules, Concurrency Control Techniques, Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multiversion Concurrency Control Techniques,

#### Text Books:

1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 4<sup>th</sup> Edition, McGraw Hill, 1997

#### Reference Books:

1. Bipin Desai, "An Introduction to database Systems", Galgotia Publications, 1991
2. Date, "Database Management Systems", Pearson Education Asia.
3. Naveen Prakash, "Introduction to Database Management Systems", Tata McGraw Hill.
4. Leon, and Leon, "SQL", Tata McGraw Hill Pub. Co. Ltd.
5. Ivan Bayross, "Database Technologies", Sybex Computer Books Inc.
6. Abbey and Corey, "Oracle 8", Tata McGraw Hill Pub Co. Ltd.

## COMPUTER SCIENCE LAB: Database Management System Lab

**Q1. Create the following tables:**

1) client\_master

Column_name	Datatype	Constraints
client_no	varchar2	Primary Key
Name	varchar2	
address1	varchar2	
City	varchar2	
State	varchar2	
Pincode	NUMBER	Not Null
bal_due	NUMBER	

II)Product\_master

Column_name	Datatype	Constraints
Product_no	varchar2	Primary Key
Description	varchar2	
Profit_percen	NUMBER	
Unit_measure	varchar2	
Qty_on_hand	NUMBER	
Sell_pric	NUMBER	
Cost_price	NUMBER	

**Q 2) Insert the following data into their respective tables:**

i) Insert at least 6 rows in table client\_master

client_no	name	address1	City	State	Pincode	bal_due
001	IVAN		NAGPUR	Maharashtra	400054	15000
002	VANDANA		CHENNAI	Tamilnadu	780001	0
003	PRANAV		NAGPUR	Maharashtra	400057	5000
004	BASU		NAGPUR	Maharashtra	400056	0
005	RAVI		LUCKNOW	UP	226025	2000
006	ARTI		LUCKNOW	UP	226001	0

ii) Insert at least 10 rows in table Product\_master.

Product_no	Description	Profit_percen	Unit_measure	Qty_on_hand	Sell_pric	Cost_price
P07865	1.22 floppies	5	piece	100	5	500
P00001	1.44floppies	5	Piece	100	525	50
P08865	1.22 Drive	5	Piece	2	1050	1000
P07975	1.44 Drive	5	Piece	10	1050	1000
P07965	540 HDD	4	Piece	10	8400	8000
P03453	Monitors	6	Piec	1	12000	1120

**Q3:- On the basis of above two tables answer the following Queries:**

- i) Find out the names of all the clients.
- ii) Retrieve the list of names and cities of all the clients.
- iii) List the various products available from the product\_master table.
- iv) List all the clients who are located in Bombay.
- v) Display the information for client no 0001 and 0002.
- vi) Find the products with description as '1.44 drive' and '1.22 Drive'.
- vii) Find all the products whose sellprice is greater then 5000.
- viii) Find the list of all clients who stay in in city 'Nagpur' or city 'Delhi' or 'Chennai'.
- ix) Find the product whose selling price is greater than 2000 and less than or equal to 5000.
- x) List the name, city and state of clients not in the state of 'Maharashtra'

**Q4.** To Manipulate the Operations on the table.

Using the table client master and product master answer the following:

- (a) Change the selling price of '1.44 floppy drive' to Rs.1150.00
- (b) Delete the record with client 0001 from the client master table.
- (c) Change the city of client\_no '0005' to Mumbai.
- (d) Change the bal\_due of client\_no '0001, to 1000.
- (e) Find the products whose selling price is more than 1500 and also find the new selling price as original selling price \*15.
- (f) Find out the clients who stay in a city whose second letter is a.
- (g) Find out the name of all clients having 'a' as the second letter in their names.
- (h) List the products in sorted order of their description.
- (i) Count the total number of orders x.
- (j) Calculate the average price of all the products.
- (k) Calculate the minimum price of products.
- (l) Determine the maximum and minimum prices
- (m) Rename the title as 'max\_price' and min\_price respectively.
- (n) Count the number of products having price greater than or equal to 1500

**Q5.** To Implement the restrictions on the table.

- (a) Create the following tables, with constraints:

**SALES\_MASTER**

COLUMN NAME	CONSTRAINT
Salesman_no	Primary key
Sal_name	Not null
Address	Not null
City	
State	
Pincode	
Sal_amt	Not null
Tgt_to_get	Not null
Ytd_sales	Not null
Remarks	

**b) SALES\_ORDER**

COLUMN NAME	CONSTRAINT
S_order_no	Primary/first letter must be 0
S_order_date	Primary key reference clientnoofclient_master table
Client_no	
Dely_add	
Salesman_no	Foreign key references salesman_noofsalesman_master table
Dely_type	Delivery part(p)/full(f)/default f
Billed_yn	
Dely_date	Can not be less than s_order_date
Order_status	Values ('in process'; 'fulfilled'; 'backorder'; 'cancel')

**Q6.** To Implement and manipulate the structure of the table.

Write SQL Queries to perform following operations.

- To change the name of any existing table.
- To change the name of column.
- To drop a column from the current table.
- To decrease the cardinality of a table if table data exist.
- To add a new column to the existing tables.
- To Drop a table from the database.
- To change the datatype of any column.
- To Add Primary key constraint.
- To Add Foreign key constraint.
- To Drop Primary key constraint.
- To Drop Foreign key constraint.

**Q7. (a)** To Implement the concept of joins.

- Write Sql queries to implement or Joint Multiple Table (Equi Join).
- Write Sql queries to implement Natural Join.
- Write Sql queries to implement Cartesian product.
- Write Sql queries to implement INNER JOIN.

- (e) Write Sql queries to implementLEFT OUTER JOIN.
- (f) Write Sql queries to implementRIGHT OUTER JOIN.
- (g) Write Sql queries to implementFULL OUTER JOIN.

**(b) Answer the following Queries**

- (a) Find out the product which has been sold to ‘Ivan Sayross.’
- (b) Find out the product and their quantities that will have do delivered.
- (c) Find the product\_no and description of moving products.
- (d) Find out the names of clients who have purchased ‘CD DRIVE’
- (e) List the product\_no and s\_order\_no of customers having qty ordered less than 5 from the order details table for the product “1.44 floppies”.
- (f) Find the products and their quantities for the orders placed by ‘VandanSaitwal ’ and “Ivan Bayross”.
- (g) Find the products and their quantities for the orders placed by client\_no “ C00001” and “C00002”
- (h) Find the order No., Client No and salesman No. where a client has been received by more than one salesman.
- (i) Display the s\_order\_date in the format “dd-mm-yy” e.g. “12- feb-96”
- (j) Find the date , 15 days after system date

**Q8** To implement the concept of grouping of Data.

- (a) Print the description and total quantity sold for each product.
- (b) Find the value of each product sold.
- (c) Calculate the average quantity sold for each client that has a maximum order value of 15000.
- (d) Find out the products which has been sold to Ivan.
- (e) Find the names of clients who have ‘CD Drive’.
- (f) Find the products and their quantities for the orders placed by ‘Vandana’ and ‘Ivan’.
- (g) Select product\_no, total qty\_ordered for each product.
- (h) Select product\_no, product description and qty ordered for each product.
- (i) Display the order number and day on which clients placed their order.
- (j) Display the month and Date when the order must be delivered.

**Q9.** To implement the concept of Subqueries.

- (a) Find the product\_no and description of non- moving products.
- (b) Find the customer name, address, city and pincode for the client who has placed order no “019001” .
- (c) Find the client names who have placed order before the month of may 96.
- (d) Find out if product “1.44 Drive” is ordered by only client and print the client\_name to whom it was sold.
- (e) find the names of client who have placed orders worth Rs.10000 or more.
- (f) Select the orders placed by ‘Rahul Desai’
- (g) Select the names of persons who are in Mr. Pradeep’s department and who have also worked on an inventory control system.
- (h) Select all the clients and the salesman in the city of Nagpur.

<b>Semester</b>	Fifth		
<b>Course Name</b>	Internet Technologies		
<b>Category:</b> Core	<b>Code:</b> BSC 1501	<b>Credits:</b> 6	L-4 T-0 P-2
<b>Exam:</b> Theory 3 Hrs, Practical 2 Hrs	<b>ESE:</b> 60 Marks	<b>CIA:</b> 40 Marks	

### SYLLABUS

**Module-I: Java and Java Script:** Introduction to core java programming, Use of Objects, Inheritance, Abstract classes and interfaces, Exception handling and multithreaded programming, Packages and access modifiers, Handling string, Input output classes, Array and ArrayList class  
**JDBC:** JDBC fundamentals, Establishing connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, Working with Result Set Objects.

**Module-II:** Scripting languages, Use of scripting, Validation and verification, Java Script Introduction to Java Script, The Document Object Model, Managing Web Page Styles using JavaScript and CSS, Data types, Operators, Functions, Control structures, Events and event handling.

**Module-III: JSP:** Introduction to JavaServer Pages, HTTP and Servlet basics, Problem with Servlets, Anatomy of a JSP page, JSP Processing, JSP application design with MVC, Setting up the JSP environment, Implicit JSP objects, Conditional processing, Displaying values, Using an expression to set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

**Module-IV: Java Beans** Java Beans fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to Database, Enterprise Java Bean.

#### Recommended Books:

##### Text Book:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi , BPB Publications, 2009.
2. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
3. O'Reilly , Java Server Pages, Hans Bergsten, Third Edition, 2003.

##### Reference Books:

1. Jim Keogh , The Complete Reference J2EE, TMH, , 2002.
2. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,
3. Dream Tech, Black Book “Java 8 programming”.

### **COMPUTER SCIENCE LAB (C-XI): Internet Technologies Lab**

Create event driven program for following:

1. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
2. Print the largest of three numbers.
3. Find the factorial of a number input by user.
4. Enter a list of positive numbers terminated by zero. Find the sum and average of these numbers.
5. A person deposits Rs. 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.



<b>Semester</b>	Fifth		
<b>Course Name</b>	Theory of Computation		
<b>Category:</b> Core	<b>Code:</b> BSC 1502	<b>Credits:</b> 6	L-5 T-1 P-0
<b>Exam:</b> Theory 3 Hrs	<b>ESE:</b> 60 Marks	<b>CIA:</b> 40 Marks	

### SYLLABUS

**Module-I: Languages:** Alphabets, String, Language, Basic operations on language, Concatenation, KleeneStar.

**Module-II: Finite Automata and Regular Languages:** Regular Expressions, Transition Graphs, Deterministic and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.

**Module-III: Context Free Languages:** Context Free Grammar's, Parse trees, Ambiguities in Grammars and Languages, Pushdown automata (Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages, Normal forms.

**Module-IV: Turing Machines and Models of Computation:** Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, Decidability, Halting problem, Recursively enumerable and recursive languages, UnsolvabilityProblems.

#### Recommended Books:

##### Text Book:

1. Hopcroft, Aho, Ullman, Introduction to Automata theory, Language & Computation – 3<sup>rd</sup> Edition, Pearson Education. 2006

##### Reference Books:

1. Daniel I.A.Cohen, Introduction to computer theory, John Wiley,1996
2. Lewis & Papadimitriou, Elements of the theory of computation , PHI 1997.
3. P. Linz, An Introduction to Formal Language and Automata 4th edition Publication Jones Bartlett, 2006

<b>Semester</b>	Fifth		
<b>Course Name</b>	Artificial Intelligence		
<b>Category: Core</b>	<b>Code: BSC1601</b>	<b>Credits: 6</b>	<b>L-4 T-0 P-2</b>
<b>Exam: Theory 3 Hrs, Practical 2 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module-I: Introduction:** Introduction to Artificial Intelligence, AI- Definitions, Background and Applications, Turing Test, Chinese Room Test and Rational Agent approaches to AI, Introduction to Intelligent Agents and their structure, Behavior and environment, Agent function.

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

**Module-III: Knowledge Representation:** Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames and Scripts, Production Rules, Conceptual Graphs.  
Functional Programming Languages-LISP/Programmable Logic (PROLOG) basic syntax rules and programming

**Module-IV: Dealing with Uncertainty and Inconsistencies and Understanding Natural Languages:** Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Parsing, Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

#### Recommended Books:

##### Text Book:

1. Artificial Intelligence: A Practical Approach- Rajiv Chopra, S. Chand Publication.

##### Reference Books:

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.
5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

### **COMPUTER SCIENCE LAB: Artificial Intelligence Lab**

1. Write a prolog program to calculate the sum of two numbers.
2. Write a prolog program to find the maximum of two numbers.
3. Write a prolog program to calculate the factorial of a given number.
4. Write a prolog program to calculate the nth Fibonacci number.
5. Write a prolog program, insert\_nth(item, n, into\_list, result) that asserts that result is the list into list with item inserted as the n<sup>th</sup> element into every list at all levels.
6. Write a Prolog program to remove the n<sup>th</sup> item from a list.
7. Write a Prolog program, remove-n<sup>th</sup>(Before, After) that asserts the After list is the Before list with the removal of every n<sup>th</sup> item from every list at all levels.
8. Write a Prolog program to implement append for two lists.
9. Write a Prolog program to implement palindrome (List).
10. Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.
11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.
12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.
13. Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.
14. Write a Prolog program to implement reverse(List,ReversedList) that reverses lists.
15. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List using cut predicate.
16. Write a Prolog program to implement GCD of two numbers.
17. Write a prolog program that implements Semantic Networks/Frame Structures.

<b>Semester</b>	Sixth			
<b>Course Name</b>	Computer Graphics			
<b>Category: Core</b>	<b>Code: BSC 1602</b>	<b>Credits: 6</b>	L-4 T-0 P-2	
<b>Exam: Theory 3 Hrs, Practical 2 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>		

### SYLLABUS

**Module I: Introduction to Computer Graphics, Graphic Displays, Line and Circle Drawing algorithm:** Introduction to computer graphics, Advantages and application of computer graphics, Classification of computer graphics Graphic displays: Random scan displays, Raster scan displays, Line drawing algorithms: DDA algorithm, Bresenham's algorithm, Circle drawing algorithm: DDA circle drawing algorithm, Bresenham's circle drawing algorithm, Midpoint circle drawing algorithm

**Module II: Transformations, Windowing and Clipping, 3-D Transformation** Basic transformation: Translation, Rotation, Scaling, Matrix representations, Homogenous coordinates, Composite transformations Reflections and shearing transformations, Viewing pipeline, Viewing transformations, Polygon filling, 2D Clipping algorithms, Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non-rectangular clip windows, Polygon clipping, Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping and Text clipping, 3-D Geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing and projections, 3-D clipping

**Module III: Curves and Surfaces, Hidden Lines and Surfaces:** Introduction to Curves and Surfaces, Quadric surfaces, Spheres, Ellipsoid, Introductory concepts of spline, B-spline and Bezier curves and surfaces, Introduction to Hidden Lines and Surfaces, Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method, Painter's algorithm.

**Module IV: Basic Illumination Model:** Light sources, Ambient light, Diffuse illumination, Specular reflection and Phong model, Combined approach, Warn model, Intensity attenuation, Color consideration, Transparency and Shadows

#### Recommended Books:

#### Text Book:

1. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.

#### Reference Books:

1. T.J.D.Foley, A.Van Dam, Van Dam, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.
2. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

### **COMPUTER SCIENCE LAB (C-VI): Computer Graphics Lab**

1. Write a program to plot a point (pixel) on the screen.
2. Write a program to draw a straight line using DDA Algorithm.
3. Write a program to draw a straight line using Bresenham's Algorithm.
4. Implementation of DDA circle generating Algorithm.
5. Implementation of Mid-point circle generating Algorithm.
6. Implementation of Bresenham's circle generating Algorithm.
7. Implementation Cohen Sutherland line clipping algorithm.
8. Write a program to translate an object (line, triangle or rectangle) with translation parameters in X and Y directions.
9. Write a program to scale an object (line, triangle or rectangle) with scaling factors along X and Y directions.
10. Write a program to rotate an object with a certain angle about origin.
11. Write a program to perform the rotation of an object with certain angle about an arbitrary point.
12. Write a program to perform composite transformations of an object.
13. Write a program to perform the reflection of an object about major axis.

<b>Semester</b>	Fifth		
<b>Subject Name</b>	Microprocessor		
<b>Category: DSE-I</b>	<b>Code: BSC1551</b>	<b>Credits: 6</b>	L-5 T-1 P-0
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module-I: Introduction: Memory Unit:** Primary Memory, Cache memory, Semiconductors Technology for memory, Processing speed of computer, Evolution of Microprocessor and its types, **Microprocessor architecture:** Internal architecture, System bus architecture.

**Module-II: Microprocessor 8085:** 8085 Block diagram, Pin out diagram, Instruction set of 8085, Fetching and executing instructions of 8085, Idea of fetch execute overlap. Introduction to word size, Addressing modes, Microprocessor communication and Bus timings. Register organization, General purpose Register, Special purpose Register, Instruction formats, One word instruction, Two word instruction, Three word instruction format.

**Module-III: 8086 Microprocessor:** 8086 Block diagram, Functional units of 8086, Bus Interface Unit, Execution Unit, Pin out diagram, Assembly language programming, Arithmetic, Logical branch operations, Looping, Counting, Indexing, Programming techniques, Counters and Time delays.

**Module-IV: Interfacing:** Memory address decoding, Cache memory and Cache controllers, Interfacing, I/O interface, Keyboard, Display, Timer, Interrupt controller, DMA controller, Video controllers and Communication interfaces.

#### Recommended Books:

##### Text Book:

1. U.S. Shah "Introduction To Microprocessor" TechMax Publication, Pune
2. Gaonkar, Ramesh S "Microprocessor Architecture, Programming and Applications with 8085", Penram International Publishing.

##### Reference Books:

1. Barry B. Brey : The Intel Microprocessors : Architecture, Programming and Interfacing. Pearson Education, Sixth Edition, 2009.
2. Walter A Triebel, Avtar Singh; The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications. PHI, Fourth Edition 2005.

<b>Semester</b>	Fifth			
<b>Course Name</b>	Data Mining			
<b>Category:</b> DSE-1	<b>Code:</b> BSC1552	<b>Credits:</b> 6	L-5 T-1 P-0	
<b>Exam:</b> Theory 3 Hrs	<b>ESE:</b> 60 Marks	<b>CIA:</b> 40 Marks		

### SYLLABUS

**Module I: Introduction to Data Mining:** Introduction: Data mining, Functionalities, Classification, Introduction to Data Warehousing, Data Preprocessing: Preprocessing the Data, Data cleaning, Data Integration and Transformation, Data reduction.

**Module II: Data Mining Primitives and Characterization and Comparison:** Data Mining, Primitives, Languages and System Architecture, Data Mining Query Language, Architectures of Data mining Systems. Concept description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Mining Class Comparison

**Module III: Mining Association Rules:** Basics Concepts, Single Dimensional Boolean Association Rules from Transaction Databases, Multilevel Association Rules from Transaction Databases, Multi dimension Association Rules from Relational Database and Data Warehouses.

**Module IV: Classification and Prediction:** Classification and Prediction: Introduction, Issues, Decision Tree Induction, Bayesian classification. Classification based on Concepts from Association Rule Mining, Other Methods. Prediction, Introduction, Classifier and Accuracy.

#### Recommended Books:

##### Text Book:

1. I.J.Han and M. Kamber, Data Mining Concepts and Techniques, Harcourt 2001

##### Reference Books:

1. K.P. Soman, ShyamDiwakar, V.Ajay, Insight into Data Mining Theory and Practice, Prentice Hall of India, 2006
2. Mallach, "Data Warehousing System", McGraw –Hill
3. M.H.Dunham, "Data Mining :Introductory and Advanced Topics" Pearson Education

<b>Semester</b>	Fifth			
<b>Course Name</b>	Cloud Computing			
<b>Category: DSE-I</b>	<b>Code: BSC1555</b>	<b>Credits: 6</b>	L-5 T-1 P-0	
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>		

### SYLLABUS

**Module-I: Overview of Cloud Computing Paradigm:** Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing,

**Module-II: Cloud Computing Architecture:** Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), How Cloud Computing works, Deployment Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

**Module-III: Information Storage in Cloud Computing:** Introduction- Objectives, Storage as a Service, Storage Providers- Amazon Simple Storage Service- Nirvanix- Google BigtableDatastore- MobileMe- Live Mesh, Storage Security, Merits and Demerits of Storage, Public, Private, and Hybrid Clouds – A Comparison, Examining the Economics of the private cloud.

**Module-IV: Cloud Security:** Infrastructure Security- Network level security, Host level security, Application level security, Data security and storage- Data privacy and security issues, Jurisdictional issues raised by data location, Authentication in cloud computing.

#### Text book:

1. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011

#### Reference Books

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
3. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010
4. GautamShroff, Enterprise Cloud Computing Technology Architecture Applications , Adobe Reader ebooks available from eBooks.com,2010
5. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach ,McGraw Hills, 2010.
6. Dimitris N. Chorafas, Cloud Computing Strategies ,CRC Press, 2010



<b>Semester</b>	Fifth		
<b>Course Name</b>	Network Programming		
<b>Category: DSE-II</b>	<b>Code: BSC 1554</b>	<b>Credits: 6</b>	L-5 T-1 P-0
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module–I:** Introduction: Reference models, ISO-OSI model, Origin of TCP/IP and Internet, Communication, Need of Protocol on Communication, Problems in Computer Communication, Dealing with Incompatibility, TCP/IP model, TCP/IP protocol suite, TCP/IP Layer and Protocols, Network Access Layer, Internet Layer, Need for IP Address, Classes of IP Address, Internet Protocol, ARP, RARP, ICMP.

**Module–II:** Transport Layer: Overview of TCP, Transport Layer protocols, TCP, UDP and SCTP, TCP Header, Connection Management in TCP, Connection oriented service and connectionless services, Connection establishment and termination, Three Way handshaking, TCP Well known ports and Empirical ports. , UNIX Standards Novell’s IPX/SPX Protocol Stack.

**Module–III:** Introduction to Socket, Socket family, Data types of Sockets, Socket Address Structure, Types of Sockets, Active Sockets, Passive Sockets, Stream Socket, Datagram Socket, Socket System Calls , Reserved ports, Elementary TCP Socket , Client Server model, Characteristics of Client and Server, Signal handling, I/O Multiplexing using Socket. UDP Client Server Example, Address lookup using Socket.

**Module–IV: Network Application:** Remote Logging, Telnet, REXEC, RSH, E-mail: WWW, and HTTP, FTP, DNS: Domain Name Space, Domain Name Servers, LAN Administration: Linux and TCP/IP, Networking: Network Management and Debugging: Configure TCP/IP, PING utility, IPConfig, Inetd Daemon, Netstate, Tracing a connection, Net diagnosis, Pathping, NS-Lookup, Hostname.

#### **Recommended Books:**

##### **Text Book:**

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM Publishing Company Ltd., 2003
2. Internetworking with TCP/IP; Volume I : Principles, Protocols, and Architecture by Douglas E. Comer, Pearson.

##### **Reference Books:**

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, The Sockets Networking API, Vol. 1, 3rd Edition, PHI, 2003
2. Nemeth Synder & Hein, Linux Administration Handbook, Pearson Education, 2nd Edition, 2010
3. R. Stevens, Unix Network Programming, PHI 2nd Edition, 1990.

<b>Semester</b>	Fifth		
<b>Course Name</b>	Big Data Analysis		
<b>Category: DSE-I</b>	<b>Code: BSC 1553</b>	<b>Credits: 6</b>	<b>L-5 T-1 P-0</b>
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**MODULE-I:Introduction to Big Data:**Introduction: distributed file system , Big Data and its importance, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector multiplication by map reduce.

**MODULE-II:Introduction to Hadoop: Big Data :**Apache Hadoop&HadoopEcoSystem , Moving Data in and out of Hadoop , Understanding inputs and outputs of MapReduce , Data Serialization.

**MODULE-III:Hadoop Architecture:**Hadoop Architecture, **Hadoop Storage:** HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, HadoopMapReduce paradigm, Map and Reduce tasks, Job, Task trackers, Cluster setup, SSH &Hadoop Configuration, HDFS Administering , Monitoring & Maintenance.

**MODULE-IV:Hadoop Ecosystem and Yarn:**Hadoop ecosystem components, Schedulers, Fair and Capacity, Hadoop 2.0 New Features NameNode,High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

#### Text book:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.

#### Reference books

1. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
2. Tom White, “HADOOP: The definitive Guide” , O Reilly 2012. 6 IT2015 SRM(E&T)
3. VigneshPrajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013.
4. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014.
5. JyLiebowitz, “Big Data and Business analytics”,CRC press, 2013.

<b>Semester</b>	Fifth		
<b>Course Name</b>	System Programming		
<b>Category: DSE-II</b>	<b>Code: BSC1556</b>	<b>Credits: 6</b>	L-5 T-1 P-0
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

## SYLLABUS

**Module-I: Overview of System Software:** Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Different Views on the Meaning of a Program, System Software Development, Recent Trends in Software Development, Levels of System Software. **Overview of Language Processors** Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables Data Structures for Language Processing: Search Data Structures, Allocation Data Structures.

**Module-II: Assemblers:** Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler. **Linkers and Loaders:** Introduction, Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders

**Module-III: Scanning and Parsing:** Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatical Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC. **Compilers:** Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization

**Module-IV: Interpreters & Debuggers:** Benefits of Interpretation, Overview of Interpretation, Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger

### Text book:

1. Santanu Chattopadhyaya, *Systems Programming*, PHI, 2011.

### Reference Books

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, *Compilers: Principles, Techniques, and Tools*, 2nd edition, Prentice Hall, 2006.
2. D. M. Dhamdhare, *Systems Programming*, Tata McGraw Hill, 2011.
3. Leland Beck, D. Manjula, *System Software: An Introduction to System Programming*, 3rd edition, Pearson Education, 2008.
4. Grune D, Van Reeuwijk . K, Bal H. E, Jacobs C J H, Langendoen K, *Modern Compiler Design*, 2<sup>nd</sup> edition, Springer, 2012

<b>Semester</b>	Sixth			
<b>Course Name</b>	Information Security			
<b>Category: DSE-III</b>	<b>Code: BSC1651</b>	<b>Credits: 6</b>	L-5 T-1 P-0	
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>		

### SYLLABUS

**Module-I: Introduction and Cryptography:** Security, Attacks, Computer Criminals, Security Services, Security Mechanisms **Cryptography:** Substitution Ciphers, Transpositions Cipher, Confusion, Diffusion, Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption, Hash function, Key exchange, Digital Signatures, Digital Certificates.

**Module-II: Program Security and Threats:** Secure programs, Non malicious program errors, Malicious codes virus, Trap doors, Salami attacks, Covert channels, Control against program **Threats:** Protection in OS: Memory and Address protection, Access control, File protection, User Authentication.

**Module-III: Database Security and Security in Networks:** Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security. **Security in Networks:** Threats in Networks, Security Controls, Firewalls, Intrusion Detection Systems, Secure e-mails

**Module-IV: Administrating Security:** Security Planning, Risk Analysis, Organizational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and data. Information and law.

#### Text Books:

1. W. Stallings, Cryptography and Network Security: Principles and Practice, Seventh Edition ,Pearson.
2. AtulKahate, Cryptography and Network Security , Second Edition, Tata McGraw-Hill.

#### Reference Books:

1. C. P. Pfleeger, S. L. Pfleeger; Security in Computing, Prentice Hall of India, 2006
2. W. Stallings; Network Security Essentials: Applications and Standards, 4/E, 2010

<b>Semester</b>	Sixth			
<b>Course Name</b>	Digital Image Processing			
<b>Category: DSE-III</b>	<b>Code: BSC1652</b>	<b>Credits: 6</b>	L-5 T-1 P-0	
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>		

### SYLLABUS

**Module-I:** Introduction of Light, Brightness adaption and discrimination, Pixels, Coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, Sampling and Quantization. Spatial Domain Filtering Intensity transformations, Contrast stretching, Histogram equalization, Correlation and convolution, Smoothing filters, Sharpening filters, Gradient and Laplacian.

**Module-II:** Filtering in the Frequency Domain Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering. Image Restoration Basic Framework, Interactive Restoration, Image deformation and geometric transformations, Image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions.

**Module-III: *Image Compression*** Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, Blocking artifacts, DCT implementation using FFT, ***Wavelet based Image Compression***: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking.

**Module-IV :*Morphological Image Processing***: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, Convex hull, Thinning, Thickening, Skeletons, Pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and Erosion. ***Image Segmentation***: Boundary detection based techniques, Point, Line detection, Edge detection, Edge linking, Local processing, Regional processing, Hough transform, Thresholding, Iterative Thresholding, Otsu's method, Moving averages, Multivariable Thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

#### Text Book

1. R C Gonzalez , R E Woods, Digital Image Processing, 3rd Edition, Pearson Education.2008.

#### Reference Books

1. A K Jain, Fundamentals of Digital image Processing, Prentice Hall of India.1989.
2. K R Castleman, Digital Image Processing, Pearson Education.1996
3. Schalkoff, Digital Image Processing and Computer Vision, John Wiley and Sons.1989.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

<b>Semester</b>	Sixth			
<b>Course Name</b>	Soft Computing			
<b>Category: DSE-III</b>	<b>Code: BSC 1653</b>	<b>Credits: 6</b>	L-5 T-1 P-0	
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>		

### SYLLABUS

**Module-I:** Introduction: Soft Computing; Introduction of soft computing, Soft computing vs. Hard computing, Various types of soft computing techniques; Artificial neural networks, Fuzzy logic, Genetic Algorithms. Applications of soft computing.

**Module-II:** Neural Network, Structure of Biological neuron; Neuron, Nerve Structure and synapse. Artificial neuron and its model. Activation functions. Neural network architecture; Single layer feed forward networks, Multilayer feed forward networks. Various learning techniques; Perceptron training algorithm; Linearseparability, Widrow&Hebb's learning rule/Delta rule. ADALINE v/s MADALINE. Introduction of MLP and BPN. Error back propagation algorithm (EBPA); Characteristics and applications of ANN. Associative Memory and its characteristics.

**Module-III: Fuzzy Logic:** Basic concepts of fuzzy logic. Fuzzy sets versus Crisp sets. Fuzzy set theory and operations. Properties of fuzzy sets and crisp sets. Fuzzy relations and Crisp relations. Fuzzy to Crisp conversion. Membership functions. Fuzzyfication&Defuzzifications. Fuzzy preposition. Fuzzy inference System. Fuzzy Rule Base. Fuzzy reasoning and decision making. Fuzzy Logic Controller (FLC). Formation, Decomposition & aggregation of fuzzy rules. Industrial applications of Fuzzy.

**Module-IV: Genetic Algorithm:** Introduction of Genetic Algorithm; Fundamentals of GA, Basic concepts of GA, Working principle, Encoding, Fitness function, Reproduction. Genetic modeling: Inheritance operator, Cross over Operators, Inversion & deletion, Mutation operator, Bitwise operators. Generational Cycle of GA. Convergence of GA. Applications & advances in GA. Differences&similarities between GA & other traditional methods.

#### **Text Book:**

1. S. Rajsekaran& G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.

#### **Reference Books:**

1. Sivanandani, Deepa, "Principles of Soft Computing", Wiley India (2007)
2. Jang J.S.R. Sun C.T. and Mizutani E., "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross. "Fuzzy Logic with Engineering Applications", McGraw Hill
4. LaureneFausett. 'Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning". Addison Wesley.

<b>Semester</b>	Sixth		
<b>Course Name</b>	Machine Learning		
<b>Category:</b> DSE-IV	<b>Code:</b> BSC 1654	<b>Credits:</b> 6	L-5 T-1 P-0
<b>Exam:</b> Theory 3 Hrs	<b>ESE:</b> 60 Marks	<b>CIA:</b> 40 Marks	

### SYLLABUS

**Module-I : Introduction:** Definition of learning systems. Goals and applications of machine learning. **Aspects of developing a learning system:** Training data, Concept representation, Function approximation. **Inductive Classification:** The concept learning task, Concept learning as search through a hypothesis space, General-to-specific ordering of hypotheses, Finding maximally specific hypotheses, Version spaces and the candidate elimination algorithm, Learning conjunctive concepts, Importance of inductive bias.

**Module-I I: Decision Tree Learning:** Representing concepts as decision trees. Recursive induction of decision trees, **Picking the best splitting attribute:** Entropy and information gain, Searching for simple trees and computational complexity, Occam's razor, Overfitting, Noisy data and pruning.

**Module-III: Rule Learning:** Propositional and First-Order, Translating decision trees into rules, Heuristic rule induction using separate and conquer and information gain, First-order Horn-clause induction (Inductive Logic Programming) and Foil, Learning recursive rules, Inverse resolution, Golem and Prolog.

**Module-IV: Bayesian Learning:** Probability theory and Bayes rule, Naive Bayes learning algorithm, Parameter smoothing, Generative vs. Discriminative training, Logistic regression, Bayes nets and Markov nets for representing dependencies.

#### Text books:

1. Ethem Alpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.

#### Reference books:

1. Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education, 2013.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.
3. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2012.

<b>Semester</b>	Sixth		
<b>Course Name</b>	Introduction to Data Science		
<b>Category: DSE-IV</b>	<b>Code: BSC1655</b>	<b>Credits: 6</b>	L-5 T-1 P-0
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

## SYLLABUS

**Module-I: Introduction to Data Science:** Role and Importance, Data science process, Types of data, Example applications, Data Scientist's Tool Box: Turning data into actionable knowledge, Tools used in building data analysis software: Version control, Markdown, git, Gitllub, R, and RStudio.

**Module-II: R Programming Basics:** Overview of R, R data types and objects, reading and writing data, Control structures, Functions, Scoping rules, Dates and times, Loop functions, Debugging tools, Simulation, code profiling. **Getting and Cleaning Data:** Sources of data, Data storage and management, Using multiple data sources Obtaining data from the web, from APIs, from databases and from colleagues in various formats. Basics of data cleaning and making data -tidyl.

**Module-III: Exploratory Data Analysis:** Essential exploratory techniques for summarizing data, Applied before formal modeling commences, Eliminating or sharpening potential hypotheses about the world that can be addressed by the data, Common multivariate statistical techniques used to visualize high-dimensional data.

**Module-IV: Data Visualization:** Basic principles, Ideas and tools for data visualization, Exercise: Create your own visualization of a complex dataset, Data Science and Ethical Issues. Discussions on Privacy, Security, Ethics.

### Text Book :

1. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontline" by Schrott/O'Reilly, 2013.

### Reference Books

1. Foster Provost, Tom Fawcett, "Data Science for Business" What You Need to Know About Data Mining and Data-Analytic Thinking" by O'Reilly, 2013.
2. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" by John Wiley & Sons, 2013.
3. Ian Ayres, "Super Crunchers: why Thinking-by-Numbers Is the New way to Be Smart" 1st Edition by Bantam, 2007.
4. Eric Seigel, "Predictive Analytics: The Power to Predict who will Click, Buy, Lie, or Die", is Edition, by Wiley, 2013.
5. Matthew A. Russel, "Mining the Social web: Data mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More", Second Edition, by O'Reilly Media, 2013.



<b>Semester</b>	Third			
<b>Course Name</b>	LaTeX and HTML			
<b>Category:</b> SEC-I	<b>Code:</b> BSSE1301	<b>Credits:</b> 2	L-1 T-0 P-1	
<b>Exam:</b> Theory 3 Hrs	<b>ESE:</b> 60 Marks	<b>CIA:</b> 40 Marks		

### SYLLABUS

**Module-I: Elements of LaTeX:** Basic syntax, Writing equations, Mathematical formulas, Mathematical symbol, Arrays, Multiline formulas, Matrix and tables, Figure handling. Page layout: Titles, Abstract, Chapters, Sections, References, Equations references, Citations. Packages: Hyperref, amsmath, amssymb, algorithms, graphics, color. Classes: article, book, report, Beamer presentation. (Chapter 9-11, 15[1])

**Module-II: Introduction To HTML:** Introduction, Objectives, HTML basics, Document tags, Comment tags, Container and Empty tags. **Working with HTML:** Headings, Emphasizing text, Appearance of text, Some special characters. Using list in Web documents, Using graphics and links. More on HTML-table, Frames & Forms. **Tools for web designing:** Introduction, Objectives, HTML Editors, Features of Web page design tools. Advantages of using web page designing tools. **Designing of frames and forms:** Introduction, Objectives.

#### Practical

Six practical should be done by each student. The teacher can assign practical from the exercises from [1] & [4]

#### References:

[1] Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.

[2] L. Lamport, LATEX: A Document Preparation System, User's Guide and Reference Manual. Addison-Wesley, New York, second edition, 1994.

[3] Mastering HTML, CSS & Javascript Web Publishing (English, Paperback, Lemay Colburn Kyrnin)

[4] HTML & CSS: The Complete Reference, Fifth Edition Paperback – 1 Jul 2017 by Thomas Powell (Author)

<b>Semester</b>	Third		
<b>Course Name</b>	Web Technologies		
<b>Category: SEC-I</b>	<b>Code: BSSE1311</b>	<b>Credits: 2</b>	<b>L-1 T-0 P-1</b>
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

### SYLLABUS

**Module-I: Elements of Web Technologies & PHP:** Elements of web page, Web protocols, Development strategies, Web applications, Web project, Web team, Web forms handling, Environment variables, File and directory handling, Identifying data origin and data validation, Redirecting pages, Cookies, Session and user, PHP basics, PHP installation, PHP configuration, Loops, Functions in PHP, PHP E-mail, Function, Syntax, Structure, Strings, Numbers, Variables, flow controls.

**Module-II: PHP in depth:** Arrays in PHP with attributes, Date, Time, Image Uploading, File handling in PHP, Functions in PHP, Object oriented PHP introduction, PHP functions, Using exceptions to handle errors, Errors handling in PHP. Exercise sets on every topic. Validating an application using PHP, Web-services, Data handling and retrieving data from MySQL using PHP. MySQL: Data Types, Functions, Conversion, Creation of database table, Constraints etc., Importing and exporting database.

**PHP-MYSQL:** Communicating with MySQL; Creating, Inserting, updating and deleting from database using PHP.

#### Practical

Exercise sets should be done by each student. The teacher can assign practical from the exercises from [1] to [4]

#### References:

1. Xavier, C, "Web Technology and Design", New Age International
2. Ramesh Bangia, "Internet and Web Design", New Age International
3. PHP: The Complete Reference : Steven Holzner (McGraw-Hill)
4. PHP and MySQL by Example: Ellie Quigley (PHI)

<b>Semester</b>	Fourth		
<b>Course Name</b>	Linux/Unix Programming		
<b>Category: SEC-II</b>	<b>Code: BSSE1411</b>	<b>Credits: 2</b>	L-1 T-0 P-1
<b>Exam: Theory 3 Hrs</b>	<b>ESE: 60 Marks</b>	<b>CIA: 40 Marks</b>	

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**Module I: LINUX/UNIX Basics:** Introduction to LINUX/UNIX, Features of LINUX/UNIX, LINUX/UNIX system organization (the kernel and the shell), Files and directories, **Basic UNIX commands:**ls, mkdir, chdir, rmdir,cmp, comm, cat, date, time, cal, echo, cp, mv, wc, cat, chown,chgrp,chmod,gzip, tar,locate,find,grep,diff,mount, unmount , cut, paste, head, tail, sort, nl, tr etc. **Commands for performing arithmetic operations:**bc,expr,let, factor etc. **Disk related utilities:**dd, du, df,dfspace, fdisketc. Implementing the file security using chmod, umask and sticky bit. **Commands for Processes:** ps, fg, bg, nice, kill, nohup, jobs, corn etc

**Module II: Shell programing:** Learning vi editor, Types of editors, Basic features, Modes of execution in vi editor, Different commands to manage vi editor, Writing, Compiling and Running a C program on Unix/Linux. Writing and executing shell script in Unix environment.

#### Some shell scripting programs:

1. Write a shell script that prints the even and odd numbers.
2. Write a shell script to display Prime numbers in a given range.
3. Write ashell script to print given numbers sum of all digit.
4. Write a shell script to print the Fibonacci series.
5. Write a shell script to say Goodmorning /Afternoon /Evening as you log in to system.
6. Write a shell script to find whether entered year is Leap or not.
7. Write ashell script to check whether a number is palindrome or not.
8. Write ashell script to count numbers of words in a file.
9. Write ashell script to check whether a character is vowel or not using Switch-case.
10. Write ashell script to Sort the given five numbers in ascending order.
11. Write a shell script to add two numbers supplied as command line args.
12. Write a shell script to calculating average of given numbers on command line args.
13. Writea shell script to find out biggest one from 3 numbers supplied as command line args.
14. Write a shell program to develop basic math calculator.
15. Write a shell programto print the patterns using for loop.
16. Write a shell programto calculating factorial of given number.