

DSE		DSE-2									6
SEC	BSCS25	Seminar						100		100	2
											26
SEMESTER – VI											
CORE	BSC2601	Theory of Computation	5	1		40	60			100	6
CORE	BSC2602	Machine Learning	4		4	40	60	20	30	150	6
DSE		DSE-3									6
DSE		DSE-4									6
VV	BSCV26	Viva Voce							100	100	2
											26

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

Code	Title	Teaching			Evaluation				Total	Credits
					Theory		Lab/Seminar / Viva Voce/ Dissertation			
					L	T	P	CIA		
Generic Elective-I										
BSM2101	Calculus	5	1		40	60			100	6
BSM2102	Algebra and Geometry	5	1		40	60			100	6
BSE1101	Basic Circuit Theory and Network Analysis	5	1		40	60			100	6
Generic Elective– II										
BSM2201	Multivariable Calculus	5	1		40	60			100	6
BSM2202	Ordinary Differential Equations	5	1		40	60			100	6
BSE1201	Semiconductor Devices	5	1		40	60			100	6
Generic Elective- III										
BSM2301	Real Analysis	5	1		40	60			100	6
BSM2302	Group Theory	5	1		40	60			100	6
BSE1302	Digital Electronics	5	1		40	60			100	6
Generic Elective- IV										
BSM2401	Mechanics	5	1		40	60			100	6
BSC 2402	Linear Algebra	5	1		40	60			100	6
BSE1401	Operational Amplifiers and Applications.	5	1		40	60			100	6

Discipline Specific Elective – I										
BSC2551	Big Data Analysis	5	1		40	60			100	6
BSC2552	Data Analytics	5	1		40	60			100	6
BSC2553	System Security	5	1		40	60			100	6
Discipline Specific Elective – II										
BSC2554	Cloud Computing	5	1		40	60			100	6
BSC2555	Data Science	5	1		40	60			100	6

BSC2556	System Programming	5	1		40	60			100	6
Discipline Specific Elective – III										
BSC2651	Information Security	5	1		40	60			100	6
BSC2652	Digital Image Processing	5	1		40	60			100	6
BSC2653	Internet of Things	5	1		40	60			100	6
Discipline Specific Elective – IV										
BSC2654	Computer Graphics	5	1		40	60			100	6
BSC2655	E-Commerce	5	1		40	60			100	6
BSC2656	Project Work	5	1		40	60			100	6

Skill Enhancement Course – I										
BSSE2301	LaTeX and HTML	2		4	40	60			100	4
BSSE2302	Programming in MATLAB	2		4	40	60			100	4
BSSE2303	GIMP(GNU Image Manipulation Program)	2		4	40	60			100	4
BSSE2304	Python Programming	2		4	40	60			100	4
Skill Enhancement Course – II										
BSSE2401	Mobile Application Development	2		4	40	60			100	4
BSSE2402	Web Programming	2		4	40	60			100	4
BSSE2403	Linux / Unix Programming	2		4	40	60			100	4
BSSE2404	Network Programming	2		4	40	60			100	4

Semester	First		
Course Name	Principles of Programming and C Language		
Category: Core	Code: BSC2101	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 hrs, Lab 2 hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. Learn to develop Simple Algorithms and Flow charts to solve a Problem.
2. Develop problem Solving skills coupled with Top-Down Design Principles.
3. Learn about the strategies of writing efficient and well-structured computer algorithms and programs.
4. Develop the skills for formulating Iterative solutions to a problem.
5. Learn Array processing Algorithms coupled with Iterative methods.
6. Learn text and string processing Efficient Algorithms.
7. Learn Searching Techniques and use of Pointers.
8. Understand Recursive Techniques in Programming.

SYLLABUS

Module I

Introduction to Programming: Introduction to Components of a Computer System, Operating System, Concept of Assembler, Compiler, Interpreter ([1] Chapter 1). The Role of Programming Languages, HLL, LLL, Programming Paradigms, Programming Environments. Idea of Algorithm: Representation of Algorithm ([1] Chapter 1). **Programming Basics:** Structure of C Program, Writing and Executing the first C program, Syntax and Logical Errors in Compilation, Object and Executable Code. Components of C language: Standard I/O in C, Fundamental Data Types, Variables and Memory Locations, Storage Classes ([1] Chapter 1,2).

Module II

Arithmetic expressions & Conditional Branching: Arithmetic Expressions and Precedence, Operators and Expression using Numeric and Relational Operators, Mixed Operands, Type Conversion, Logical Operators, Bit Operations, Assignment Operator, Operator Precedence and Associativity. Conditional Branching: Applying if and Switch Statements, Nesting If-Else, Break and Continue, Switch-case Statement ([1] Chapter 6). Loops & Functions: Iteration and Loops, While, Do-while and for Loops, Multiple Loop Variables, Break and Continue Statements ([1] Chapter 6). Functions: Introduction, Types of Functions, Functions with Array, Passing Parameters to Functions, Call by value, Call by Reference ([1] Chapter 7).

Module III

Arrays and Structures: Array Notation and Representation, Manipulating Array Elements, Arrays Using Multi-Dimensional, Character Arrays and Strings, Structure, Union, Enumerated Data Types, Array of Structures, Passing Arrays to Functions ([1] Chapter 9). Basic Algorithms: Searching & Basic Sorting Algorithms (Bubble, Insertion and Selection).

Module IV

Pointers & File Handling: Pointers: Pointers & Memory Allocation 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 ([1] Chapter 10). File handling: File I/O functions, Standard C Pre-processors, defining and calling Macros ([1] Chapter 1-2).

Recommended Books:

1. Schaum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brian W. and Ritchie Dennis M, Pearson Education.
3. Computer Basics and C Programming by V. Rajaraman, PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House.

Principles of Programming and C Language Lab

- 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 $S = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$
- 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.
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 Swapstwo numbers.
9. 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 elements 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.

10. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as Command line Arguments.
11. Write a program that Swapstwo numbers using Pointers.
12. Write a program in which a Function is passed address of two variables and then alter its contents.
13. 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.
14. 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.

15. 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 Uppercasecharacters to Lowercase.
 - h) Calculate number of Vowels.
 - i) Reverse the String
16. Given two ordered Arrays of Integers, Write a program to merge the two-Arrays to get an ordered Array.
17. WAP to display Fibonacci series:
- (i)Using Recursion.
 - (ii) Using Iteration.
18. WAP to calculate Factorial of a number:
- (i)Using Recursion.
 - (ii) Using Iteration.
19. Create a Structure Student containing fields for Roll No., Name, Class, Year and Total Marks.Create 10 such Students and store them in a file.
20. Copy the contents of one text file to another file, after removing all Whitespaces.
21. Write a function that reverses the elements of an Array in place. The function must accept only one Pointer value and return void.
22. 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.
23. Write a Program to create a file & store information.
24. Write a C Program to illustrate reading of data from a File.
25. Write a C Program delete a specific Line from a text File.

Semester	First		
Course Name	Computer System Architecture		
Category: Core	Code: BSC2102	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To make students understand the Basic Structure, Operation and Characteristics of Digital computer.
2. To familiarize the students with Arithmetic and Logic unit as well as the concept of the Pipelining.
3. To familiarize the students with Hierarchical Memory system including Cache memories and Virtual memory.
4. To make students know the different ways of communicating with I/O devices and standard I/O Interfaces.

SYLLABUS

Module I

Data Representation in Digital System: Fundamentals of Digital Electronics: Data Types, Complements, Fixed -Point Representation, Floating-Point Representation, Other Binary Codes: Gray Code, other Decimal Codes and other Alphanumeric Codes, Error Detection Codes ([1] Chapter 3). Digital Logic Circuits: Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip – Flops: SR, D, JK, T and Edge- Triggered ([1] Chapter 1).

Module II

Digital Components: Sequential Circuits, Registers, Counters, Multiplexer, De-Multiplexer, Decoder, Encoder ([1] Chapter 2). Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus & Memory Transfer, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operation ([1] Chapter 4). Basic Computer Organization: Instruction Codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction, Input - Output & Interrupts, Complete Computer Description & Design of Basic Computer ([1] Chapter 5).

Module III

Processor and Control Unit: Hardwired vs. Micro Programmed Control Unit, General Register Organization, Stack Organization, Instruction Format, Data Transfer & Manipulation, Program Control, RISC, CISC, Pipelining ([1] Chapter 8,9). **Memory and I/O Systems:** Input-Output Organization, Peripheral Devices, I/O Interface, Data Transfer Schemes, Program Control, Interrupt, DMA Transfer ([1] Chapter 11).

Module IV

Memory Organization: Memory Hierarchy, Processor vs. Memory Speed, High-Speed Memories, Cache Memory, Associative Memory, Interleave, Virtual Memory, Memory Management ([1] Chapter 12). **Parallelism/Multiprocessors:** Multicore Processors, Time-Shared Common Bus, Multiport Memory ([1] Chapter 13).

Recommended books:

1. Computer System Architecture, M. Morris Mano, 3rd Edition, Prentice Hall.
2. Computer Organization and Design, David A. Patterson and John L. Hennessey, Fifth edition, Morgan Kauffman / Elsevier, 2014.
3. Computer Architecture: A Quantitative Approach, John L. Hennessy, David A. Patterson, 4th Edition.
4. Computer Organization and Architecture, William Stallings, Prentice Hall.

Semester	Second		
Course Name	Data Structures		
Category: Core	Code: BSC2201	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 hrs, Lab 2 hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To be familiar with fundamental Data Structures and with the manner in which these Data Structures can best be implemented, become accustomed to the description of Algorithms in both functional and procedural styles.
2. To have knowledge of Complexity of basic Operations like Insert, Delete, Search on these Data Structures.
3. Ability to choose a Data Structure to suitably model any data used in Computer Applications.
4. Design programs using various Data Structures including Hash tables, Binary and general Search Trees, Heaps, Graphs etc.
5. Ability to assess efficiency trade-offs among different Data Structure implementations.
6. Implement and know the applications of Algorithms for Sorting, Pattern-matching etc.

SYLLABUS

Module I

Basic concepts: Algorithm Specification-Introduction, Recursive Algorithms, Data Abstraction Performance analysis ([1] Chapter 1). Linear and Non Linear Data Structures. Linked Lists:Operations, Concatenating, Circularly Linked Lists-Operations for Circularly Linked Lists, Doubly Linked Lists-operations ([1] Chapter 4). Representation of Single, Two Dimensional Arrays, Sparse Matrices-Array and Linked Representations ([2] Chapter 4).

Module II

Stack: Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion implementation. Queue: Definition and Operations,

Array and Linked implementations, Circular Queues-Insertion and Deletion Operations, Deque(Double Ended Queue) Priority Queue- Implementation ([2] Chapter 6).

Module III

Trees: Representation of Trees, Binary Trees, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees, Heap-Definition, Insertion, Deletion.Search Trees: Binary Search Trees, AVL Trees- Definition and Examples. Red-Black Trees Comparison of Search Trees ([2] Chapter 7).

Module IV

Graphs: Graph ADT, Graph Representations: Adjacency Matrix, Incidence Matrix, Graph Traversals ([2] Chapter 8). Sorting Methods, Comparison of Sorting Methods.Hashing: Introduction, Hash Tables, Hash Functions, Overflow Handling ([2] Chapter 9).

Recommended books:

1. Fundamentals of Data structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson-Freed, Universities Press.
2. Lipschutz, Schaum's outline series Data structures Tata McGraw-Hi
3. Data structures and Algorithm Analysis in C, 2nd edition, M. A. Weiss, Pearson.
- 4.Data structures using C and S. Tanenbaum, Y. Langsam, and M. J. Augenstein.

Data Structures Lab

1. Write a program to perform Insertion and Deletion operations in an Array.
2. Write a program to Multiply two 2D Matrices.
3. Write a program to Display non-zero elements from Sparse Matrix.
4. WAP to convert the Sparse Matrix into non-zero form and vice-versa.
5. Write a program to Search an element from a list. Give user the option to perform Linear or Binary search.
6. WAP using templates to Sort a list of elements. Give user the option to perform sorting using Insertion Sort, Bubble sort or Selection sort.
7. Write a program to create Queue and perform Insertion and Deletion operations.
8. Write a program to create Deque and perform Insertion and Deletion operations.
9. Write a program to create Priority Queue and perform Insertion and Deletion operations.
10. Implement Linked List using templates. Include functions for Insertion, Deletion and search of a number, Reverse the list and concatenate two Linked Lists.
- 11.
12. Implement Doubly Linked-List using templates. Include functions for Insertion, Deletion and search of a number, reverse the list.
13. Implement Circular Linked List using templates. Include functions for Insertion, Deletion and search of a number, reverse the list.
14. Perform Stack operations using Linked List implementation.
15. Perform Stack operations using Array implementation.
16. Perform Queues operations using Circular Array implementation.
17. Create and perform different operations on Double-ended Queues using Linked-list implementation.
- 18.
19. WAP to calculate factorial and to compute the factors of a given no. (i) using Recursion (ii) Using Iteration.
- 20.
21. WAP to display Fibonacci series (ii) Using Recursion, (iii) Using Iteration
22. WAP to create a Binary Search Tree and include following operations in Tree:
23. Insertion (Recursive and Iterative Implementation).
24. Search a number in BST.

25. Display its pre-order, post-order and in-order traversals Recursively.
26. Display its pre-order, post-order and in-order traversals Iteratively.
27. Display its level-by-level traversals.
28. Count the non-leaf nodes and Leaf Nodes.
29. Display Height of Tree.
30. WAP to reverse the order of the elements in the Stack using additional Stack.
31. WAP to reverse the order of the elements in the Stack using additional Queue.
32. WAP to implement Lower Triangular Matrix using One-dimensional Array.
33. WAP to implement Upper Triangular Matrix using One-dimensional Array.
34. WAP to implement Symmetric Matrix using one-dimensional array.
35. WAP to Create a Threaded Binary Tree as per in-order Traversal, and Implement operations.

Semester	Second		
Course Name	Discrete Structures		
Category: Core	Code: BSC2202	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. Understand the notion of mathematical thinking, mathematical proofs and algorithmic thinking, and be able to apply the problem solving.
2. Understand the basics of combinatorics and be able to apply the methods from these subjects in problem solving.
3. Be able to use effectively algebraic techniques to analyze basic discrete structures and algorithms.
4. Understand asymptotic notation, its significance and be able to use it to analyse asymptotic performance for some basic algorithmic examples.
5. Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.

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 ([1], Chapter 2). Counting - Pigeonhole principle, permutation and combination, mathematical induction, principle of inclusion and exclusion([1], Chapter 5 and 6).

Module II:

Growth of Functions and Recurrences:Asymptotic notations, summation formulas and properties, bounding summations, approximation by integrals([1], Chapter 3),recurrence

relations, generating functions, linear recurrence relations with constant coefficients and their solution, substitution method, recurrence trees, Master theorem([1], Chapter 8).

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([1], Chapter 10).

Module IV:

Propositional Logic: Definition of propositions, Well-formed formulas, tautologies, satisfiability, contradiction, algebra of proposition, theory of inference([1], Chapter 12).

Recommended Books:

1. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition, McGraw Hill 2006.
2. T.H. Cormen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009.
3. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms, John Wiley Publication, 1988.
4. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009.
5. 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.

Semester	Third		
Course Name	Operating System		
Category: Core	Code: BSC2301	Credits: 6	L-4 T-0 P-4
Theory Exam: 3 Hrs, Lab 2 Hrs		ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.
3. Understanding of design issues associated with operating systems.
4. Understand various process management concepts including scheduling, synchronization, and deadlocks.
5. To have a basic knowledge about multithreading.
6. To understand concepts of memory management including virtual memory.
7. To understand issues related to file system interface and implementation, disk management.
8. To understand and identify potential threats to operating systems and the security features design to guard against them.
9. To have sound knowledge of various types of operating systems including Unix and Android.
10. Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve.

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, RealTime Systems. Functions of Operating System: Memory management, Process management, Device management, File management etc. ([1] Chapter 1).

Module II

Operating System Organization: System Calls and System programs ([1] Chapter 2). Process Management: System view of the Process and Resources, Process Abstraction, Process Hierarchy ([1] Chapter 3). Threads, Threading Issues, Threading Libraries ([1] Chapter 4). Process Synchronization: Concurrent Processes, Critical Sections, Methods for Inter-Process communication ([1] Chapter 3). Classical two Process and n-process Solutions, Hardware Primitives for Synchronization, Semaphores, Monitors, Classical Problems in Synchronization (Producer-Consumer, Readers-writer, Dining Philosophers etc.) ([1] Chapter 6).

Module III

Process Scheduling: Non Pre-emptive and Pre-emptive Scheduling Algorithms-FCFS, SJF, SRTF, Round Robin etc.([1] Chapter 5).Memory Management: Memory address, Physical and virtual address space.Memory Allocation Strategies –fixed and variable Partitions, Concept of Paging, Segmentation ([1] Chapter 8).Demand Paging, Virtual Memory, Page Replacement Algorithms, Virtual Memory ([1] Chapter 9).

Module IV

Deadlocks:Prevention and Avoidance, Detection and recovery ([1] Chapter 7). File and I/O Management: File Concepts, Access Methods, Directory structure, File system structure, Files Operations, Files Allocation Methods, ([1] Chapter 10). Device Management,Protection and Security, Policy Mechanism, Authentication ([1] Chapter 14).

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Operating Systems Lab

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, Fileaccessstime, 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.

Semester	Third		
Course Name	Programming in Java		
Category: Core	Code: BSC2302	Credits: 4	L-4 T-0 P-4
Exam: Theory 3 Hrs, Lab 2 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. Knowledge of the structure and model of the Java programming language,
2. Use the Java programming language for various programming technologies
3. Develop software in the Java programming language,
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements

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 ([1] Chapter 3). Operators: Arithmetic, Logical and Bitwise and Expressions, Comments, Doing Basic Program Output ([1] Chapter 4). Decision Making Constructs: Conditional Statements and Loops and Nesting ([1] Chapter 5). Java Methods: Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods ([1] Chapter 7).

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 ([1] Chapter 13).

Module III

Inheritance, Interfaces, Packages and Exceptionhandling: Inheritance: Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Packages, Package and Class Visibility, Using Standard Java Packages: util, lang, io, net ([1] Chapter 9). WrapperClasses, Autoboxing/Unboxing, Enumerations and Metadata.Exception types, Uncaught Exceptions, Throw, Built-in Exceptions, Creating your own Exceptions ([1] Chapter 10).

Module IV

Multi-Threading, Networking Basics and Database Connectivity, Applets and Event Handling: Multi-threading, creating single and multiple Threads, Thread prioritization, Suspending/resuming threads ([1] Chapter 11). 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. Introduction to AWT controls, Swing, Overview of servlets ([1] Chapter 23).

Recommended Books:

1. Herbert Schildt, "Java: The Complete Reference", Seventh Edition.
2. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
3. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.

Programming in Java Lab

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 DimensionalArray 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's 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 byZero that 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 URL and 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.

Semester	Third		
Course Name	Computer Networks		
Category: Core	Code: BSC2303	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Describe the general Principles of Data communication.
2. Describe how Computer Networks are organized with the concept of layered Approach.
3. Describe how Signals are used to transfer data between nodes.
4. Implement a simple LAN with Hubs, Bridges and Switches.
5. Learn basic routing mechanisms, IP addressing scheme and internetworking concepts.
6. Familiarize with IP and TCP Internet Protocols.
7. To understand major concepts involved in design of WAN, LAN and wireless networks.
8. Learn basics of network configuration and maintenance.
9. Know the fundamentals of network security issues.

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([1] Chapter 3-6). Computer Networks: Network Definition, Network Topologies, Network Classifications, Network Protocol, Layered Network Architecture, OSI Reference Model ([1] Chapter 1-2).

Module –II

TCP/IP Model and its Protocol Suite: Comparison of OSI and TCP/IP Models ([1] Chapter 2). 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([1] Chapter 8).Data Link Layer Functions and Protocol: Error Detection and Error Correction Techniques, Data-link Control-Framing and Flow Control, Error Recoveries Protocols- Stop and Wait ARQ, Go-back-n ARQ, Point to Point Protocol on Internet ([1] Chapter 10-11).

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([1] Chapter 12).**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([1] Chapter 19-22).

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 ([1] Chapter 23-24). Application layer Protocol: Overview of WWW, URL, HTTP, SMTP, FTP, POP, TELNET. Domain Name System, Domain Name Servers, DNS Space ([1] Chapter 25-28).

Recommended Books:

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM, 2007.
2. Computer Network and Internet by Douglas E Comer.
3. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI, 2002.
4. William Stallings, "Data and Computer Communication", Prentice Hall.

Semester	Fourth		
Course Name	Software Engineering		
Category: Core	Code: BSC2401	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Basic knowledge and understanding of the analysis and Design of Complex systems.
2. Ability to apply software engineering Principles and techniques.
3. To produce efficient, reliable, robust and cost-effective Software Solutions.
4. Ability to work as an effective member or leader of software Engineering teams.
5. To manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.

SYLLABUS

Module I

Introduction: Introduction to Software, Software Application, System Evolution of Software, Software as System, Significance of Software, Software characteristics, Changing nature of Software ([1] Chapter 1). Software Engineering as a Layered Technology, A Generic View of Software Engineering, Software Process framework, Framework and Umbrella Activities, Process Capability Maturity Model Integration (CMMI) ([1] Chapter 2).

Module II

Requirement Analysis & Specification: Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modeling Techniques: Software Process Models, Waterfall model, Prototyping, Flow Oriented Model. SRS: Need for SRS, Characteristics of SRS, Components of SRS, Software Project Management, Software Project planning, Software Monitoring and Control, Estimation in Project Planning Process ([1] Chapter 2).

Module-III

Risk Management: Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan ([1] Chapter 6). 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 ([1] Chapter 8).

Module-IV

Software Design & Testing: Design Objectives, Design Concepts, 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 ([1] Chapter 14). Software Testing Fundamentals: Strategic Approach to Software Testing, Functional Testing, Structural Testing, Testing Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing, Strategic Issues in Testing ([1] Chapter 17).

Recommended Books:

1. Roger S. Pressman, Software Engineering: A practitioner's approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, Prentice Hall India
3. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
4. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008
5. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.

Semester	Fourth		
Course Name	Database Management System		
Category: Core	Code: BSC2402	Credits: 6	
L-4 T-0 P-4	Theory Exam: 3 Hrs, Lab: 2 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Gain knowledge of Database systems and Database Management Systems software.
2. Ability to model data in applications using Conceptual Modeling tools such as ER Diagrams and Design Database schemas based on the model.
3. Formulate, using SQL, solutions to a broad range of Query and Data Update problems.
4. Demonstrate an understanding of Normalization theory and apply such knowledge to the normalization of a database.
5. Be acquainted with the basics of transaction processing and concurrency control.
6. Familiarity with Database storage Structures and Access techniques.
7. Compare, Contrast and Analyses the various emerging technologies for Database systems such as MySQL.
8. Analyze strengths and weaknesses of the applications of database technologies to various subject Areas.

SYLLABUS

Module I

Introduction to DBMS: 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 ([1] Chapter 1).

Module II

Relational and E-R model: Relational Data Model: Relational Database, Codd's Rules 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 Modeling Using the Entity-Relationship Model, Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Aggregation, Specialization and Generalization, Relational Algebra ([1] Chapter 6).

Module III

Introduction to SQL Queries: 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 ([1] Chapter 3). **Data Normalization:** Functional Dependencies, Armstrong Rules, Closure of Attributes, Normal Form up to 3rd Normal Form, BCNF, Join Dependencies, Decompositions([1] Chapter 7).

Module IV

Database Protection & Distributed Database: 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 ([1] Chapter 17). **Locking Techniques for Concurrency Control,** Concurrency Control Based on Timestamp Ordering, Multi-Version Concurrency Control Techniques ([1] Chapter 18).

Recommended Books:

1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 4th Edition, McGraw Hill, 1997.
2. Bipin Desai, "An Introduction to database Systems", Galgotia Publications, 1991
3. Date, "Database Management Systems", Pearson Education Asia.
4. Naveen Prakash, "Introduction to Database Management Systems", Tata McGraw Hill.
5. Leon, and Leon, "SQL", Tata McGraw Hill Pub. Co. Ltd.
6. Ivan Bayross, "Database Technologies", Sybex Computer Books Inc.
7. Abbey and Corey, "Oracle 8", Tata McGraw Hill Pub Co. Ltd.

Database Management System Lab:

1. Create the following tables:

I) client_master

Column_name	Datatype
client_no	varchar2
Name	varchar2
address1	varchar2
City	varchar2
State	varchar2
Pincode	NUMBER
bal_due	NUMBER

II)Product_master

Column_name	Datatype
Product_no	varchar2
Description	varchar2
Profit_percen	NUMBER
Unit_measure	varchar2
Qty_on_hand	NUMBER
Sell_pric	NUMBER
Cost_price	NUMBER

2 Insert the following data into their respective tables:

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_percentage	Unit_measure	Qty_on_hand	Sell_price	Cost_price
P07865	1.22 floppies	5	piece	100	5	500
P00001	1.44 floppies	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

3: 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 sell price is greater than 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:

a) SALES_MASTER

COLUMN NAME	CONSTRAINT
Salesman_no	Primary key
Sal_name	Not null
Address	Not null
City	
State	
pincode	
Sal_amt	Not null, cannot be 0
Tgt_to_get	Not null, cannot be 0
Ytd_sales	Not null, cannot be 0
Remarks	

b) SALES_ORDER

COLUMN NAME	CONSTRAINT
S_order_no	Primary/first letter must be 0
S_order_date	Primary key reference clientno of client_master table
Client_no	
Dely_add	
Salesman_no	Foreign key references salesman_no of salesman_master table
Dely_type	Delivery part(p)/full(f), default f
Billed_yn	default f

Dely_date	Cannot be less than s_order_date
Order_status	Values ('in process';'fulfilled';back order';'cancele

6. To implement and manipulate the structure of the table. Write SQL Queries to perform following operations.

- (a) To change the name of any existing table.
- (b) To change the name of column.
- (c) To drop a column from the current table.
- (d) To decrease the cardinality of a table if table data exist.
- (e) To add a new column to the existing tables.
- (f) To Drop a table from the database.
- (g) To change the data type of any column.
- (h) To Add Primary key constraint.
- (i) To Add Foreign key constraint.
- (j) To Drop Primary key constraint.
- (k) To Drop Foreign key constraint.

7. (a) To implement the concept of joins.

- i. Write Sql queries to implement or Joint Multiple Table (Equi Join).
- ii. Write Sql queries to implement Natural Join.
- iii. Write Sql queries to implement Cartesian product.
- iv. Write Sql queries to implement INNER JOIN.
- v. Write Sql queries to implement LEFT OUTER JOIN.
- vi. Write Sql queries to implement RIGHT OUTER JOIN.
- vii. Write Sql queries to implement FULL OUTER JOIN.

(b) Answer the following Queries

- i. Find out the product which has been sold to 'Ivan Sayross.'
- ii. Find out the product and their quantities that will have do delivered.
- iii. Find the product_no and description of moving products.
- iv. Find out the names of clients who have purchased 'CD DRIVE'
- v. 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".
- vi. Find the products and their quantities for the orders placed by 'VandanSaitwal' and "Ivan Bayross".
- vii. Find the products and their quantities for the orders placed by client_no "C00001" and "C00002".
- viii. Find the order No,, Client No and salesman No. where a client has been received by more than one salesman.
- ix. Display the s_order_date in the format "dd-mm-yy" e.g. "12- feb-96".

- x. Find the date , 15 days after 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 have 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 Sub queries.

- (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 that 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_no 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.

Semester	Fourth		
Course Name	Design and Analysis of Algorithms		
Category: Core	Code: BSC2403	Credits: 6	
L-4 T-0 P-4	Theory Exam: 3 Hrs, Lab: 2Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To learn good principles of Algorithm Design.
2. To learn how to Analyze Algorithms and estimate their Worst-Case and Average- Case behavior (in easy cases).
3. To become familiar with fundamental Data Structures and with the manner in which these.
4. Data Structures can best be implemented, become accustomed to the description of Algorithms in both functional and Procedural Styles.
5. To learn how to apply their Theoretical Knowledge in practice (via the Practical component of the course).

SYLLABUS

Module I

Introduction: Algorithm Definition and Characteristics, Design and Analysis, Notion of Algorithm, Analysis of algorithms, Designing of Algorithms ([1] Chapter 1). Growth of Functions ([1] Chapter 2). Master's Theorem ([1] Chapter 3). Advanced Design and Analysis Techniques: Iterative techniques, Divide and Conquer ([1] Chapter 3). Dynamic Programming: Matrix chain multiplication Problem, Optimal Binary search tree, ([1] Chapter 12) Knapsack 0/1, Greedy Algorithms: Fractional Knapsack ([1] Chapter 22) Amortized Analysis ([1] Chapter 25).

Module II

Searching and Sorting: Internal and External, Sorting Techniques, Elementary Sorting techniques—Bubble Sort, Insertion Sort, Merge Sort, ([1] Chapter 4) Advanced Sorting techniques

- Heap Sort, Quick Sort ([1] Chapter 6, 7). Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, ([1] Chapter 8) Searching Techniques: LinearSearch, Binary Search, complexity Analysis([1] Chapter 12).

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 ([1] Chapter 26).

Module IV

Advanced Data Structures: AVL Tree, Red-Black Trees, ([1] Chapter 13) Binomial Heaps, Fibonacci Heaps ([1] Chapter 18-19) String Matching: String Matching Algorithms: Naïve, Rabin Karp, KMP ([1] Chapter 36).

Recommended Books:

1. Udit Agarwal , Algorithms Design and Analysis, Dhanpat Rai& Co.
2. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press/McGraw-Hill, 2001.
3. Jon Kleinberg and ÉvaTardos, Algorithm Design, Pearson, 2005.
4. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.

Design & Analysis of Algorithms Lab

1. Code and analyse to sort an array of integers using merge sort
2. Code and analyse to sort an array of integers using quick sort
3. To implement maximum and minimum problem using divide and conquer strategy
4. To implement binary search using divide and conquer strategy
5. To implement program of Heap Sort.
6. WAP of minimum spanning tree using Kruskal algorithm.
7. WAP of minimum spanning tree using Prim's algorithm.
8. WAP to implement matrix chain multiplication
9. Code to find the shortest path in graph using Dijkstra's algorithm.
10. Code to find the shortest path using Bellman-Ford algorithm.
11. To implement LCS problem using Dynamic Programming.
12. To implement matrix chain multiplication problem using dynamic programming.
13. Code and analyze to find the minimum spanning tree in a weighted, undirected graph.
14. Code and analyze to find all occurrences of a pattern P in a given string S.
15. Code and analyze to do a depth-first search (DFS) on an undirected graph. Implementing an application of DFS such as
 - (i) to find the topological sort of a directed acyclic graph.
 - (ii) to find a path from source to goal in a maze.
16. Code and analyze to do a breadth-first search (BFS) on an undirected graph. Implementing an application of BFS such as
 - (i) to find connected components of an undirected graph.
 - (ii) to check whether a given graph is bipartite.

Semester	Fifth		
Course Name	Internet Technologies		
Category: Core	Code: BSC2501	Credits: 6	L-4 T-0 P-4
Exam: Theory 3 Hrs, Lab: 2Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To understand the terms related to the Internet and how the Internet is changing the world.
2. To understand how computers are connected to the Internet and demonstrate the ability to use the World Wide Web.
3. Demonstrate an understanding of and the ability to use electronic mail and other internet based services
4. Understand the design principles of Web pages and how they are created
5. To develop an ability to create basic Web pages with HTML.

SYLLABUS

Module-I:

Java and Java Script: Introduction to Core Java Programming, Use of Objects, Inheritance: Abstract Classes and Interfaces ([2] Chapter 2). Exception Handling ([2] Chapter 10). Multithreaded Programming ([2] Chapter 11). Packages and access Modifiers ([2] Chapter 9). Handling String ([2] Chapter 15). Input output Classes ([2] Chapter 13). 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 ([4] Chapter 7).

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 ([1] Chapter 8).

Module-III

JSP: Introduction to JavaServer Pages, HTTP and Servlet Basics, Problem with Servlets ([7] Chapter 4). 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 ([7] Chapter 6). Declaring Variables and Methods, Error Handling and Debugging ([7] Chapter 7). Sharing Data between JSP Pages, Requests, and Users Database Access ([7] Chapter 13).

Module-IV

Java Beans: Java Beans fundamentals, JAR Files, Introspection, Developing a Simple Bean, Connecting to Database, Enterprise Java Bean.

Recommended Books:

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.
4. Jim Keogh, The Complete Reference J2EE, TMH, , 2002.
5. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,
6. Dream Tech, Black Book "Java 8 programming".
7. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009. Phil Hanna, JSP, The Complete Reference, 2001.

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.
7. Make a dynamic page in JSP for a school.
8. Give the utility of Java Beans.
9. Show database connectivity of JSP with MYSQL.
10. Insert 20 records in Database using JSP page.
11. Create a form by using various attributes of the input tags.
12. Create a web page multiple types of style sheet used in a single page.
13. Write a CGI sample program to send output back to the user.
14. Write a Java Script program by using variables.
15. Write a java script program to multiply two numbers and display the result in separate text box.
16. Write a java script program on Form Validations.
17. Write an AJAX program checking the presence of XMLHttpRequest object.
18. Create an XML document template to describe the result of students in an examination. The description should include the student's roll number, name, three subject names and marks, total marks, percentage and results.

Semester	Fifth		
Course Name	Artificial Intelligence		
Category: Core	Code: BSC2502	Credits: 6	
L-4 T-0 P-4	Theory Exam: 3 Hrs, Lab: 2 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.
2. Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
3. Formalise a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc).
4. Implement basic AI algorithms (e.g., standard search or constraint propagation algorithms).
5. Design and perform an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.
6. Explain the limitations of current Artificial Intelligence techniques.

SYLLABUS

Module I

Introduction to Artificial Intelligence: Criteria for Success, Turing Test, Brief History of AI ([1] Chapter 1). Problem Solving and Search, Problem Formulation, Search Space, States vs. Nodes, Production Systems, Problem Characteristics ([1] Chapter 2). Heuristic Search Techniques: Generate and Test, Hill climbing, Best-first Search, Problem Reduction, Constraint Satisfaction and Means-ends Analysis ([1] Chapter 3).

Module II

Knowledge Representation Issues: Representation and mappings, Approaches to Knowledge Representation ([1] Chapter 4). Resolution using Predicate logic ([1] Chapter 5). Procedural versus Declarative Knowledge, Logic Programming, Non-monotonic Reasoning ([1] Chapter 7). Probability and Bayes Theorem ([1] Chapter 8). Semantic Nets, Frames ([1] Chapter 9). Scripts and Conceptual Dependency ([1] Chapter 10).

Module III

Introduction to Game Playing: Minimax Search Procedure, Adding Alpha-Beta Cutoffs, Iterative Deepening ([1] Chapter 12). Components of a Planning System ([1] Chapter 13). Natural language Processing: Syntactic and Semantic analysis, Discourse and Pragmatic Processing, statistical NLP ([1] Chapter 15). Parallelism in Reasoning System ([1] Chapter 16). Learning and Common Sense, Expert System, Knowledge Acquisition ([1] Chapter 20). Perception and Action ([1] Chapter 21).

Module IV

Natural language of Artificial Intelligence (Prolog): Conversion of English to Prolog Facts and Rules, Prolog Terminology, Variables, Control Structures, Arithmetic Operators, Backtracking, Recursion, Lists, Dynamic databases ([1] Chapter 25). Logic Classification: inference, Laws and Normal Forms in Propositional logic. Theory of FOPL (First Order Predicate Logic): Free and bound variables, Well Formed formula and Inferencing in first order logic ([1] Chapter 5).

Recommended Books:

1. Elaine Rich, Kevin Knight, Shivashankar B Nair, Artificial Intelligence, Third Edition, McGraw Hill Edition.
2. Russell Stuart Jonathan and Norvig Peter, Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2010.

Artificial Intelligence Lab

1. Write a prolog program to check whether a person X can eat Food Y or not. A person X can eat food Y if X likes Y, X is available and X is eatable.
2. Write a prolog program to calculate the sum of two numbers.
3. Write a prolog program to find the maximum of two numbers.
4. Write a prolog program to calculate the factorial of a given number.
5. Write a prolog program to calculate the nth Fibonacci number.
6. Given three relations *child(X, Y)* : X is a child of Y, *male(X)* : X is male and *Female(X)* : X is female. Write a program to find relations like brother(X, Y), Father(X, Y), mother(X, Y), grandfather(X, Y), ancestor(X, Y), sister(X, Y), Grandmother(X, Y) between different members of a family.
7. Given a relation player ("name", age). Store knowledge about six players of age between 12-15. Write a prolog program to find possible combination of players to organize a two player tournament.
8. Write a Prolog program to implement *sumlist(List,Sum)* so that Sum is the sum of a given list of Numbers List.
9. Write a program to perform different operations like add, mul, sub, div etc. (Implementation of switch statement).
10. Write a program to insert given item at the start of List.

Semester	Sixth		
Course Name	Theory of Computation		
Category: DSE-III	Code: BSC2601	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To provide a formal connection between Algorithmic Problem Solving and the theory of languages and Automata and develop them into a mathematical (abstract) view towards Algorithmic Design and in general computation itself.
2. The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.
3. Become proficient in key topics of Theory of Computation, and to have the opportunity to explore the current topics in this area

SYLLABUS

Module I

Languages: Alphabets, String, Language, Basic operations on Language, Concatenation, KleeneStar ([1] Chapter 1).

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 ([1] Chapter 2-4).

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. ([1] Chapter 5-7).

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, Insolvability Problems. ([1] Chapter 8-11).

Recommended Books:

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

Semester	Sixth		
Course Name	Machine Learning		
Category: Core	Code: BSC2602	Credits: 6	
L-4 T-0 P-4	Theory Exam: 3 Hrs, Lab: 2 Hrs.	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Differentiate between Supervised, Unsupervised Machine Learning approaches
2. Ability to choose appropriate Machine Learning Algorithm for solving a problem
3. Design and Adapt existing Machine Learning Algorithms to suit Applications.
4. Understand the underlying mathematical relationships across various machine learning Algorithms.

SYLLABUS

Module I

Introduction: Definition of Learning Systems, Goals and Applications of Machine Learning. Aspects of developing a learning system: Training Data, Concept Representation. Concept of Machine Learning, Applications of Machine Learning, Classification, Regression, Unsupervised Learning, Reinforcement Learning ([1] Chapter 1). Supervised Learning: Model selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm([1] Chapter 2). Bayesian Decision Theory: Losses and risks, Discriminant Functions Utility Theory, Association Rules([1] Chapter 3).

Module II

Parametric Methods: Maximum Likelihood Estimation: Bernoulli Density, Multinomial Density, Gaussian(Normal) Density. Parametric Classification, Tuning Model Complexity: Bias and Variance Dilemma, Model Selection procedures ([1] Chapter 4). Multivariate Methods:

Parameter Estimation, Estimation of missing values, Multivariate Normal Distribution, Multivariate Classification, Tuning Complexity, Multivariate Regression([1] Chapter 5).

Module III

Dimensionality Reduction: Principal Components Analysis, factor analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isomap, Locally Linear Embedding ([1] Chapter 6). Clustering and Unsupervised Learning: Learning from Unclassified Data. Clustering, Hierarchical Agglomerative Clustering, K-means Clustering, Hierarchical Clustering([1] Chapter 7). Nonparametric Methods: Histogram Estimator, Kernel Estimator, K-Nearest Neighbour Estimator, Nonparametric Classification, Condensed Nearest Neighbour([1] Chapter 8).

Module IV

Artificial Neural Networks: Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer-Perceptron, Multiclass Representation, Back Propagation Algorithm, Language Learning ([1] Chapter 11). Classification Problems in Language: word-sense Disambiguation, Sequence Labeling, Hidden Markov models (HMM's) ([1] Chapter 15).

Recommended Books:

1. Ethem Alpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.
2. Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education, 2013.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.
4. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2012.

Machine Learning Lab

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

Semester	Fifth		
Course Name	Big Data Analysis		
Category: DSE-I	Code: BSC2551	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To provide an overview of an exciting growing field of Big Data Analytics.
2. To introduce the tools required to Manage and Analyze Big Data like Hadoop, NoSql MapReduce.
3. To teach the Fundamental techniques and Principles in achieving big Data Analytics with scalability and Streaming Capability.
4. To enable students to have skills that will help them to solve Complex real-World problems in for Decision Support.

SYLLABUS

Module I

Introduction to Big Data: Introduction: ([1] Chapter 1). Hadoop distributed file System, Big Data and its Importance, Drivers for Big data ([1] Chapter 2). Big data Analytics, Big Data Applications ([1] Chapter 9). Algorithms using Map Reduce, Matrix-Vector Multiplication by Map Reduce ([1] Chapter 3).

Module II

Introduction to Hadoop: Big Data:Apache Hadoop & Hadoop EcoSystem ([1] Chapter 1) Moving Data in and out of Hadoop , Understanding Inputs and Outputs of Map Reduce, ([2] Chapter 2) Data Serialization ([2] Chapter 4).

Module III

Hadoop Architecture: Hadoop Architecture ([2] Chapter 3) Hadoop Storage: HDFS, Common HadoopShellCommands , Anatomy of File Write and Read, Name Node, Secondary Name Node,

and Data Node ([2] Chapter 3).HadoopMapReduce Paradigm, Map and Reduce tasks, Job, Task trackers ([2] Chapter 5). Cluster Setup, SSH &Hadoop Configuration, HDFS Administering , Monitoring & Maintenance ([2] Chapter 9).

Module IV

Hadoop Ecosystem and Yarn: Hadoop Ecosystem Components ([2] Chapter 11, 12, 13, 14, 15) Schedulers, Fair andCapacity, Hadoop2.0: New Features NameNode,High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN ([2] Chapter 6).

Recommended Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012. 6 IT2015 SRM(E&T).
3. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
4. VigneshPrajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
5. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
6. JyLiebowitz, "Big Data and Business analytics",CRC press, 2013.

Semester	Fifth		
Course Name	Data Analytics		
Category: DSE-I	Code: BSC2552	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. This course prepares students to gather, describe, and analyze data, and use advanced statistical tools to support Decision Making.
2. To gather sufficient relevant data, conduct data Analytics using scientific Methods, and understand appropriate connections between quantitative analysis and real - world problems.
3. Understand the Exact scopes and possible limitations of each method to provide constructive guidance in Decision Making.
4. To Use advanced techniques to conduct thorough and insightful Analysis, and interpret the results correctly with Detailed and useful Information.
5. To make better decisions by using advanced Techniques in Data Analytics.

SYLLABUS

Module I

Data Definitions and Analysis Techniques: Elements, Variables, and Data Categorization, Levels of Measurement, Data Management and Indexing ([1] Chapter 1). **Descriptive Statistics:** Measures of Central Tendency, Measures of Location of Dispersions, ([1] Chapter 1) Error Estimation and Presentation (Standard Deviation, Variance) ([1] Chapter 9). Introduction to Probability ([1] Chapter 2).

Module II

Basic Analysis Techniques: Statistical Hypothesis Generation and Testing, Chi-Square Test, T - Test ([1] Chapter 10) Analysis of Variance ([1] Chapter 13) Correlation Analysis ([1] Chapter 11) Maximum Likelihood Test ([1] Chapter 9).

Module III

Data Analysis Techniques-I: Regression Analysis, ([2] Chapter 3) Classification Techniques, ([2] Chapter 4) Clustering Techniques (K-Means, K-Nearest Neighborhood) ([2] Chapter 13). **Data Analysis Techniques-II:** Association Rules Analysis ([2] Chapter 14). Decision Trees ([2] Chapter 2).

Module IV

Introduction to R Programming: Introduction to R Software Tool ([3] Chapter 2) Statistical Computations using R (Mean, Standard Deviation, Variance, Regression, Correlation etc.) ([3] Chapter 3).

Recommended Books:

1. Probability and statistics for Engineers and Scientists (9 Edn.), Ronald E Walppole, Raymond H Myres, Sharon L. Myres and Laying Ye, Prentice Hall Inc.
2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.) Trevor Hastie Robert Tibshirani Jerome Friedman, Springer, 2014.
3. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer.

Semester	Fifth		
Course Name	System Security		
Category: DSE-I	Code: BSC2553	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Develop an understanding of Information Assurance as practiced in computer Operating Systems, Distributed Systems, Networks and Representative Applications.
2. Gain familiarity with prevalent Network and Distributed System Attacks, Defenses against them, and forensics to investigate the aftermath.
3. Develop a basic understanding of Cryptography, how it has evolved, and some key encryption techniques used today.
4. Develop an understanding of Security Policies (such as Authentication, Integrity and Confidentiality), as well as Protocols to Implement such policies in the form of message exchanges.

SYLLABUS

Module I

Cryptographic Tools- Confidentiality with Symmetric Encryption, ([1] Chapter 8) Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers, Practical Application: Encryption of Stored Data ([1] Chapter 9).

Module II

User Authentication- Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Practical Application: An Iris Biometric System, Case Study: Security Problems for ATM Systems ([1] Chapter 11).

Module III

Access Control- Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Example: UNIX File Access Control, Role - Based Access Control, Case Study: RBAC System for a Bank ([1] Chapter 14). Database Security-The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption ([1] Chapter 24).

Module IV

Malicious Software- Types of Malicious Software (Malware), Propagation– Infected Content– Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM E-mail, Trojans, Payload–Information Theft– KeyLoggers, Phishing, Spyware, Payload–Steal thing– Backdoors, Rootkits, Denial-of-Service Attacks- Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks ([1] Chapter 19).

Recommended Books:

1. M. Bishop, "Computer Security: Art and Science," Addison Wesley, ISBN: 0 -201- 44099-7, 2002.
2. M. E. Whitman and H. J. Mattord, "Principles of Information Security," 4 st Edition, Course Technology, ISBN: 1111138214, 2011.
3. M. Stamp, "Information Security: Principles and Practice," 2 st Edition, Wiley, ISBN: 0470626399, 2011.
4. G. McGraw, "Software Security: Building Security In," Addison Wesley, ISBN: 0321356705, 2006.

Semester	Fifth		
Course Name	Cloud Computing		
Category: DSE-II	Code: BSC2554	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.
2. Compare the advantages and disadvantages of various cloud computing platforms.
3. Deploy applications over commercial Cloud Computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
4. Program data Intensive Parallel applications in the Cloud.
5. Analyze the Performance, scalability, and Availability of the underlying Cloud technologies and software.
6. Identify security and Privacy issues in Cloud Computing.
7. Explain recent research results in cloud computing and identify their pros and cons.
8. Solve a real-world problem using cloud computing through group collaboration.

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 ([1] Chapter 1).

Module II

Cloud Computing Architecture: Comparison with traditional Computing Architecture (client/server) ([1] Chapter 2). 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 ([1] Chapter 2).

Module III

Information Storage in Cloud Computing: Introduction- Objectives, Storage as a Service, Storage Providers: Amazon Simple Storage Service, Nirvanix- Google Big Table Data store Mobile Me: Live Mesh, Storage Security, Merits and Demerits of Storage: Public, Private, and Hybrid Clouds: A Comparison, Examining the Economics of the Private Cloud ([1] Chapter 5).

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 ([1] Chapter 13).

Recommended books:

1. Essentials of Cloud Computing, K Chandrasekaran, CRC Press.
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
4. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
5. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010
6. Gautam Shroff, Enterprise Cloud Computing Technology Architecture Applications, Adobe Reader ebooks available from eBooks.com, 2010
7. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, McGraw Hills, 2010.
8. Dimitris N. Chorafas, Cloud Computing Strategies, CRC Press, 2010

Semester	Fifth		
Course Name	Data Science		
Category: DSE-II	Code: BSC2555	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. Demonstrate advanced skills in Data Acquisition and Management.
2. Demonstrate advanced skills in Data Analysis Techniques using Mathematics and Statistical Principles.
3. Demonstrate advanced skills in Data Presentation, Communication, and Visualization.
4. Demonstrate the ability to make Data-Driven Decisions.

SYLLABUS

Module I

R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times([1] Chapter 4), Loop functions, debugging tools; Simulation, code profiling ([1] Chapter 18).

Module II

Getting and Cleaning Data: Turning Data into Actionable Knowledge, Introduction to the tools that will be used in building Data Analysis Software. Obtaining data from the Web, from APIs, from databases and from colleagues in various formats: Basics of Data Cleaning and making data “tidy” ([1] Chapter 4).

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 ([7] Chapter 3).

Module IV

Reproducible Research: Concepts and tools behind reporting Modern Data Analyses in a Reproducible Manner. To write a document using R Markdown, Integrate live R code into a literate Statistical Program, compile R Markdown Documents using knitr and Related tools, and Organize a Data Analysis so that it is Reproducible and Accessible to Others ([7] Chapter 16).

Recommended Books:

1. R Programming for Data Science Roger D. Peng, Leanpub, 2015
2. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontline" by Schrott/O'Reilly, 2013.
3. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" by John Wiley & Sons, 2013.
4. Ian Ayres, "Super Crunchers: why Thinking-by-Numbers Is the New way to Be Smart" 1st Edition by Bantam, 2007.
5. Eric Seigel, "Predictive Analytics: The Power to Predict who will Click, Buy, Lie, or Die", 1st Edition, by Wiley, 2013.
6. Matthew A. Russell, "Mining the Social web: Data mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More", Second Edition, by O'Reilly Media, 2013.
7. John E. Freund's Mathematical Statistics with Applications Book by Irwin Miller and Marylees Miller, 1913.

Semester	Fifth		
Course Name	System Programming		
Category: DSE-II	Code: BSC2556	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
2. Describe the various concepts of assemblers and Macro-processors.
3. To understand the various phases of compiler and compare its working with assembler.
4. To understand how linker and loader create an executable program from an object module created by assembler and compiler.
5. To know various editors and debugging techniques.

SYLLABUS

Module I

Language Processors: Introduction, Language Processing Activity, Fundamental of Language Processing, Fundamental of Language Specification, Language Processor Development tool([1] Chapter 1). **Compilers:** Aspects of Compilation, various phases of a Compiler, Memory Allocation, Compilation of Expressions, Compilation of Control Structures, Code Optimization ([1] Chapter 8).

Module II

Assemblers: Elements of Assembly Language Programming, Assembly Scheme, Pass Structure of Assembler, Design of Assembler, Data structure, Format of Database, Algorithm, Look for Modularity, Table Processing: Searching and Sorting, A Single Pass Assembler for IBM PC([1] Chapter 3). **Linker and Loader:** Reallocation and Linking Concept, Design of Linker, Self Reallocation Programs, Linking of Overlays, Loader, Absolute Loader, Reallocating Loader, Direct Linking Loader, Design of Loader ([1] Chapter 5).

Module III

Macro Language and Macro Processor: Macro Instructions, Features of Macro Facility, Macro Instruction arguments, Conditional Macro Expression, Macro calls within Macros, Macro Instructions Defining Macros, Implementation of Two Pass Algorithm ([1] Chapter 4).
Programming Languages: Features and Importance of High Level Languages, Data types and Data Structures, Accessing Flexibility, Functional Modularity, Storage Allocation ([1] Chapter 6).

Module IV

Operating Systems: Multiple Processors and Interrupt Mechanisms. **Memory Management:** Single Contiguous Allocations, Partitioned Allocations, Paged Allocation, Demand Paged Allocation. **Processor Management:** Scheduler, Race Condition, Multiprocessor Systems. **Device Management Techniques,** **Information Management:** Development of File Systems, Structure and Features of a General File systems ([1] Chapter 9).

Recommended Books:

1. John J. Donovan : "System Programming", McGraw-Hill Education.
2. D. M. Dhamdhere : "System Software and Operating System", Tata McGraw- Hill
3. Leland L. Black : System Software -An Introduction to System Programming, Addison Wesley.
4. A.V. Aho, R. Sethi and J D. Ullman : Compilers-Principles, Techniques and Tools. Pearson Education

Semester	Sixth		
Course Name	Information Security		
Category: DSE-III	Code: BSC2651	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To understand basics of Cryptography and Network Security.
2. To be able to Secure a Message over Insecure channel by Various Means.
3. To learn about how to Maintain the Confidentiality, Integrity and Availability of a Data.
4. To understand various Protocols for Network Security to protect against the threats in the Networks.

SYLLABUS

Module I

Introduction and Cryptography: Security Attacks, Computer Criminals, Security Services, Security Mechanisms ([1] Chapter 1). Cryptography: Substitution Ciphers, Transpositions Cipher, Confusion, Diffusion, ([1] Chapter 3) Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption ([1] Chapter 4). Hash function, ([1] Chapter 11). Key exchange ([1] Chapter 10). Digital Signatures, Digital Certificates ([1] Chapter 13).

Module II

Program Security and Threats: Secure programs, Non malicious Program Errors, Malicious Codes Virus, Trap Doors, Salami Attacks, Covert Channels, Control Against Program ([1] Chapter 21). Threats and Protection in OS: Memory and Address Protection, Access Control, File Protection, User Authentication ([1] Chapter 15).

Module III

Database Security and Security in Networks: Requirements, Reliability, Integrity, Sensitive Data, Inference, Multilevel Security ([1] Chapter 12). Security in Networks: Threats in Networks, Security Controls ([1] Chapter 17). Firewalls ([1] Chapter 23) Intrusion Detection Systems ([1] Chapter 22). Secure E-mails ([1] Chapter 19).

Module IV

Administrating Security: Security Planning, Risk Analysis, Organizational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and Data. Information and Law ([1] Chapter 24).

Recommended Books:

1. W. Stallings, Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson.
2. Atul Kahate, Cryptography and Network Security, Second Edition, Tata McGraw-Hill.
3. C. P. Pfleeger, S. L. Pfleeger; Security in Computing, Prentice Hall of India, 2006.
4. W. Stallings; Network Security Essentials: Applications and Standards, 4/E, 2010.

Semester	Sixth		
Course Name	Digital Image Processing		
Category: DSE-III	Code: BSC2652	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To familiarize the students with the image fundamentals and mathematical transforms necessary for image processing.
2. To make the students understand the image enhancement techniques
3. To make the students understand the image restoration and re-construction procedures.
4. To familiarize the students with the image segmentation procedures.

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 ([1] Chapter 1-3).

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 ([1] Chapter 4-5).

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 ([1] Chapter 8). 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 ([1] Chapter 7).

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 ([1] Chapter 9).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. ([1] Chapter 10-11).

Recommended Books:

1. R C Gonzalez , R E Woods, Digital Image Processing, 3rd Edition, Pearson Education 2008.
2. A K Jain, Fundamentals of Digital image Processing, Prentice Hall of India.1989.
3. K R Castleman, Digital Image Processing, Pearson Education.1996
4. Schalkoff, Digital Image Processing and Computer Vision, John Wiley and Sons.1989.
5. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

Semester	Sixth		
Course Name	Internet of Things		
Category: DSE-IV	Code: BSC2654	Credits: 6	L-5 T-1 P-0
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To learn the concepts of Sensors, Wireless Network and Internet
2. To learn and Implement use of Devices in IoT Technology.
3. To learn the different IoT Technologies like Micro-controller, Wireless communication like Bluetooth, GPRS, Wi-Fi and Storage and Embedded Systems.
4. To understand how to program on embedded and mobile platforms including different Microcontrollers like ESP8266, Raspberry Pi, Arduino and Android programming.
5. To understand how to make Sensor Data available on the Internet (data acquisition) and understand how to Analyze and Visualize Sensor Data.
6. To understand, Analysis and Evaluate different Protocols used in IoT.
7. To learn basic Python programming for IoT applications
8. To learn and Design different Applications in IoT.
9. To Design, Develop and Test different Prototypes in IoT.

SYLLABUS

Module I

(Introduction to IoT Sensors and Actuators) Introduction to IoT: Definition, Characteristics, Applications, Evolution, Enablers, Connectivity Layers, Addressing, Networking and Connectivity Issues, Network Configurations, Multi-Homing, Sensing: Sensors and Transducers, Classification, Different Types of Sensors, Errors, Actuation: Basics, Actuator Types: Electrical, Mechanical Soft

Actuators. Introduction to Networking, Communication Protocols and Machine-to-Machine Communication ([1] Chapter 8).

Module II

Basics of Networking: Communication Protocols, Sensor Network, Machine to Machine Communication (IoT Components, Inter-Dependencies, SoA, Gateways, Comparison Between IoT& Web, Difference Protocols, Complexity of Networks, Wireless Networks, Scalability, Protocol Classification, MQTT & SMQTT, IEEE 802.15.4, Zigbee, Arduino Programming Interoperability in IoT, Introduction to Arduino Programming, Integration Of Sensors and Actuators with Arduino ([1] Chapter 10).

Module III

Python Programming and Raspberry Pi: Introduction to Python Programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi, Implementation of IoT with Raspberry Pi. Data Analytics and Cloud Computing: Data Handling and Analytics, Cloud Computing Fundamentals, Cloud Computing Service Model, Cloud Computing Services ([1] Chapter 5).

Module IV

Security, Sensor-Cloud Architecture: View and Dataflow. FOG Computing and Case Studies: FOG Computing: Introduction, Architecture, Need, Applications and Challenges, Industrial IoT, Case Studies: Agriculture, Healthcare, Activity Monitoring ([1] Chapter 6).

Recommended Books:

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).
2. Internet of Things: A Hands-on Approach", by A Bahga and Vijay Madisetti (Universities Press).

Semester	Sixth		
Course Name	Computer Graphics		
Category: DSE-III	Code: BSC2653	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Acquire familiarity with the concepts and relevant mathematics of computergraphics.
2. Ability to implement various algorithms to scan, convert the basic geometricalprimitives, transformations, area filling, clipping.
3. Describe the importance of viewing and projections.
4. Ability to design basic graphics application programs.
5. Familiarize with fundamentals of animation and Virtual reality technologies
6. Be able to design applications that display graphic images to givenspecifications.
7. To understand a typical graphics pipeline.

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 ([1] Chapter 1-2).

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 ([1] Chapter 3).

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 ([1] Chapter 4).

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 ([1] Chapter 5).

Recommended Books:

1. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
2. T.J.D.Foley, A.Van Dam, Feiner, Hughes Computer Graphics Principles & Practice 2 nd edition Publication Addison Wesley 1990.
3. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2 nd edition 1989.

Semester	Sixth		
Course Name	E-Commerce		
Category: DSE-IV	Code: BSC2655	Credits: 6	
L-5 T-1 P-0	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To understand the basic concepts and technologies used in the field of management information systems.
2. To have the knowledge of the different types of management information systems.
3. To understand the processes of developing and implementing information systems.
4. To be aware of the ethical, social, and security issues of information systems.

SYLLABUS

Module I

E-commerce and its Technological Aspects: Overview of Developments in Information Technology and Defining E-Commerce: The scope of E commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, Benefits and Limitations of E-Commerce([1] Chapter 1). Produce a Generic framework for E-Commerce, Architectural Framework of Electronic Commerce, Web based E- Commerce Architecture ([1] Chapter 5).

Module II

Electronic Data Interchange: Benefits of EDI, EDI technology, EDI standards, EDI communications, EDI Implementation, EDI Agreements, EDI Security. Electronic Payment Systems, Need of Electronic Payment System: Study and Examine the Use of Electronic Payment system and the Protocols used, Study Electronic Fund Transfer and Secure Electronic Transaction Protocol for Credit Card Payment ([1] Chapter 19). Digital Economy: Identify the methods of Payments on the Net – Electronic Cash, Cheques and Credit Cards on the Internet ([1] Chapter 20).

Module III

Security in E Commerce: Threats in Computer Systems: Virus, Cyber Crime Network Security: Encryption, Protecting Web server with a Firewall, Firewall and the Security Policy, Network Firewalls and Application Firewalls, Proxy Server ([1] Chapter 13).

Module IV

Issues in E Commerce: Understanding Ethical, Social and Political issues in E-Commerce: A model for Organizing the issues, Basic Ethical Concepts, Analyzing Ethical Dilemmas, Candidate Ethical principles([1] Chapter 31). Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, Governance ([1] Chapter 41).

Recommended Books:

1. Elias. M. Awad, " Electronic Commerce", Prentice-Hall of India Pvt Ltd.
2. RaviKalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.
3. Efraim Turban, Jae Lee, David King, H.Michael Chung, "Electronic Commerce A ManagerialPerspective", Addison-Wesley.
4. Elias M Award, "Electronic Commerce from Vision to Fulfilment", 3rd Edition, PHI, Judy Strauss, Adel El-Ansary, Raymond Frost, "E-Marketing", 3RDEdition, Pearson Education.

Semester	Third		
Course Name	LaTeX and HTML		
Category: SEC-I	Code: BSSE2301	Credits: 4	L-2 T-0 P-4
Exam: Theory 3 hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To use the preamble of LaTeX file to define document class and layout options.
2. To Enhance knowledge of students so that they can use nested list, tabular and array environments within a document.
3. Students will be able to use knowledge of HTML and CSS code and an HTML editor to create website.

SYLLABUS

Module I

Elements of LaTeX: Basic Syntax, Writing Equations, Mathematical Formulas, Mathematical Symbol, Arrays, Multiline Formulas, Matrix and Tables, Figure Handling.

Module II

Page Layout: Titles, Abstract, Chapters, Sections, References, Equations References, Citations. Packages: Hyperref, Amsmath, Amssymb, Algorithms, Graphics, Color. Classes: Article, Book, Report, Beamer Presentation ([1] Chapter 9-11,15).

Module III

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

Module IV

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].

Reference Books:

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).

LaTeX and HTML Lab

1. Write a HTML code to generate following output.

Country	Population (In Crores)	
	Year	Population
INDIA	1998	85
	1999	90
	2000	100
USA	1998	30
	1999	35
	2000	40
UK	1998	25
	1999	30
	2000	35

2. Create an html page containing the polynomial expression as follows
 $a_0 + a_1x + a_2x^2 + a_3x^3$
3. Write a HTML code to generate following output. Create an html page with following specifications
 - a. Title should be about mycollege
 - b. Put the image in the background
 - c. Place your College name at the top of the page in large text followed by address in smaller size
 - d. Add names of courses offered each in a different color, style and typeface
 - e. Add scrolling text with a message of your choice.
4. Design an html form to take the information of a article to be uploaded such as file path, author name , type (technical, literary, general), subject topic (to be selected from a list) etc. One should provide button to Submit as well as Reset the form contents.
5. Write a HTML code to generate following output.

Enter Name of your friend

Choose the file you want to post to your friend

What does the file contain?

Image Source code Binary code

You have Completed the Form .

6. Start new section in the document and typeset the following sentences.

“I have a little frog.

His name is ***TIM-TIM***.

I put him in the bathtub.

He had a BUBBLE in throat.”

7. Give your document a title using

`\title{Your title}`

`\author{Your Name}`

`\date{A date}`

`\maketitle`

8. Create a list using `itemize`, `enumerate`.

9. Typeset the following table.

10. Typeset the following equations

a. $c(n, r) = \frac{n!}{r!(n-r)!}$

b. $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$

c. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Semester	Third		
Course Name	Programming in MATLAB		
Category: SEC-I	Code: BSSE2302	Credits: 4	L-2 T-0 P-4
Exam: Theory 3 hrs.	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. Understand the fundamentals of procedural and functional programming.
2. Understand Matlab data types and structures.
3. Be able to set up simple real-life numerical problems such that they can be solved and visualized using basic codes in Matlab.
4. Be ready to use advanced coding in Matlab in their subsequent studies.

SYLLABUS

Module -I

Introduction to MATLAB: The MATLAB Environment; Introduction to MATLAB, The MATLAB Desktop, The Command Window, The Command History Window, The Start Button, The Edit /Debug Window, Figure Window, Docking and Un-Docking Window, The MATLAB Workspace, The Workspace Browser, Getting Help in MATLAB, The MATLAB Search Path. ([1], Chapter 1).

Module -II

Matrices and Arrays: Variables and Arrays, Creating Arrays, Working with Matrices Creating Matrices, Creating Magic Squares, Expressions, Controlling Command Window, Input and Output. Reading Data from Keyboard, Displaying Output Data, Disp() Function, Formatted Output using fprintf() function. ([1], Chapter 2).

Module-III

Introduction to MATLAB Plotting: Using simple XY Plot, Printing a Plot, Multiple Plot, Editing Plots using Functions and Plotting tools, Adding Title in Plot, Adding Legend in Plots, Modify the Graphs. Basic Plotting Functions, Creating Mesh and Surface plots. ([1], Chapter 2).

Module -IV

MATLAB Programming Techniques: Data types, Operators, Conditional Statements, Switch-Case Construct ([1], Chapter 3), Looping Statements, Cell Arrays, Creating Structures, Accessing Members of Structures, Scripts and Functions ([1], Chapter 4). Creating Graphical User Interfaces. Basics, Laying Out a GUI, Programming a GUI.

Recommend Books:

1. MATLAB Programming for Engineers by Stephen J. Chapman
2. Getting Started with MATLAB: A Quick Introduction For Scientists And Engineers, by RudraPratap.

Programming in MATLAB Lab

1. Learn how to use the MATLAB desktop, workspace and command window, command history.
2. Creating Programs like Factorial of any number, Fibonacci series, Sum of n natural numbers etc.
3. Creating MATLAB variables, Overwriting variable.
4. Miscellaneous Commands, Functions and Getting help.
5. Control flow and operators:
 - a) Control flow, The “if...end” structure
 - b) Relational and logical operators
 - c) The “for...end” loop
 - d) The “while...end” loop
 - f) Saving output to a file.
6. Matrix generation, Colon operator, Linear spacing, Colon operator in a matrix.
7. Creating a sub-matrix, deleting row or column, Dimension, Continuation, transposing a matrix, concatenating matrices, Special matrices.
8. Plotting/Graphics Overview, creating simple plots.
9. Adding titles, axis labels, and annotations.
10. Multiple data sets in one plot, Specifying line styles and colors.
11. Array operations, Matrix arithmetic operations, Array arithmetic operations.
12. Solving linear equations, Matrix inverse, Matrix functions.
13. Introduction, M-File Scripts, Script side-effects, M-File functions, Anatomy of a M-File function.
14. Input and output arguments, Input to a script file, Output commands.

Semester	Third		
Course Name	GIMP(GNU Image Manipulation)		
Category: SEC-I	Code: BSSE2303	Credits: 4	L-2 T-0 P-4
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To familiarize the students with the underlying concepts of Digital Images.
2. To make the students know how to Enhance Images and prepare them for Printing and Publishing.

SYLLABUS

Module-I

GIMP Basics: The Screen Layout, Dockable Dialogues, The Tool Box, The Single Window Interface, Image Windows Menus, Imaging Concepts and Graphic Formats; Pixel, Resolution, File Size, Image Compression, Raster & Vector Images, Color Model. Capturing and Creating Images; Saving Images, Scanning Images, Using Layers.

Module-II

Drawing in GIMP, Colouring a Drawing, Black and White Drawing, Using Layer to keep Outline Visible, Printing GIMP Image ([1] Part-I- Chapter 1). Familiarization with GIMP Interface. Settings; Foreground and Background Colors, Grid Properties ([1] Part-2- Chapter 9).

Module-III

Image Manipulations: Resizing images, Cropping Images, Moving and Copying images, Cropping Image, Resizing Image Rotating and flipping Images ([1] Part-I- Chapter 1). Working with Text: Creating and editing text, Formatting Text, Applying Text Wraps ([1] Part-I- Chapter 4).

Module-1V

Tools: Drawing Tools, Painting Tools, Animation Tools. Animation; Animated Text, Frame by Frame, Filtering All Layers, Moving Along a Path, Building an Animated GIF by Hand, Drawing a Rainbow Daisy, Animating a Still Image ([1] Part-I- Chapter 6).

Recommended Book:

1. Kay Richter, GIMP 2.8 - Buch (e-book) Olivier Lecarme and KarineDelvare, The Book of GIMP, A complete Guide to Nearly Everything, Kindle Edition

GIMP(GNU Image Manipulation Program) Lab

1. Open the home screen and see the various tool available on it.
2. Insert an Image and perform the following operations:
 - Changing the Size (Dimensions) of an Image (Scale)
 - Changing the Size (Filesize) of a JPEG
 - Crop an Image
 - Rotate or Flip an Image
 - Changing the resolution of image
3. Create your own image and perform coloring, changing background and compressing it.
4. Create Layers in GIMP and perform the following operations:
 - Fill a Layer with a Solid Color or Pattern
 - Rename Layers
 - Use Layer Masks
 - Select a Layer
5. Create a text page and perform various formatting options in it like alignment of text, wrap text, bold text etc.
6. Use drawing tools and draw an image and perform various operations same layer.
7. Use painting tools and use various painting operations at different layer.
8. Import an image and apply different animation on it.
9. Apply animation on text create/imported by you.

Semester	Third		
Course Name	Python Programming		
Category: SEC-1	Code: BSSE2304	Credits: 4	L-2 T-0 P-4
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. Develop and execute simple Python Programs.
2. Structure a Python Program into Functions and use of arguments and return values.
3. Using Python lists, tuples to represent Compound Data.
4. Develop Python Programs for File Processing.

SYLLABUS

Module I

Introduction to Python: Python, Features of Python, Execution of a Python Program, Writing Our First Python Program, Data types in Python. Python Interpreter and Interactive Mode ([3] Chapter 1) Values and Types of Variables, Expressions, Statements, Tuple Assignment, and Modules.

Module II

Functions: Function Definition and use, Flow of Execution, Parameters and Arguments ([3] Chapter 2). Operators: Input and Output, Control Statements. Functions: Return Values, Parameters, Local and Global Scope, Function Composition, Recursion ([3] Chapter 4).

Module III

Arrays in Python: Strings and Characters: Strings ([3] Chapter 9). Lists as Arrays ([3] Chapter 10). Functions, Lists and Tuples. List Operations, List Slices, List Methods, List Loop, Mutability, Aliasing, Cloning Lists, List Parameters. Tuples: Tuple Assignment, Tuple as Return Value; Dictionaries: Operations and Methods ([3] Chapter 10).

Module IV

Files and Exception:Text Files, Reading and Writing Files, Format Operator; Command Line Arguments, Errors and Exceptions, Handling Exceptions, Modules, Packages. Illustrative Programs: Word Count, Copy File ([3] Chapter 11).

Recommended Books:

1. Mark Lutz, Learning Python, 5th Edition, O'Reilly
2. Tony Gaddis, Starting Out With Python, 2nd Edition.
3. R. NageswaraRao, Core Python Programming, Dreamtech.
4. Kenneth A. Lambert, Fundamentals of Python, Cengage.

Python Programming Lab

1. Write a Python program to do arithmetical operations.
2. Write a Python program to find the area of a triangle.
3. Write a Python program to solve quadratic equation.
4. Write a Python program to swap two variables.
5. Write a Python program to generate a random number.
6. Write a Python program to convert kilometers to miles.
7. Write a Python program to convert Celsius to Fahrenheit.
8. Write a Python program to display calendar.
9. Write a Python Program to check if a Number is Positive, Negative or Zero.
10. Write a Python Program to check if a Number is Odd or Even.
11. Write a Python Program to Check Leap Year.
12. Write a Python Program to Check Prime Number.
13. Write a Python Program to print all Prime Numbers in an Interval.
14. Write a Python Program to Find the Factorial of a Number.
15. Write a Python Program to Display Fibonacci sequence Using Recursion.
16. Write a Python Program to Find Factorial of Number Using Recursion.
17. Write a Python program to print all Prime numbers between 1 and 100.
18. Write a Python program to copy all elements of one Array into another Array.
19. Write a Python program to find the frequency of each element in the Array.
20. Write a Python program to left rotate the elements of an Array.
21. Write a Python program to sort the elements of an Array in Ascending order.
22. Write a Python Program to append element in the list.
23. Write a Python Program to compare two lists.
24. Write a Python Program to create a Dictionary.
25. Write a Python Program to convert list to Dictionary.

Semester	Fourth		
Course Name	Mobile Application Development		
Category: SEC-II	Code: BSSE2401	Credits: 4	L-2 T-0 P-4
Exam: Theory 3 Hrs	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To understand Android platform and its architecture.
2. To learn about mobile devices types and different modern mobile operating systems.
3. To learn activity creation and Android User Interface designing.
4. To learn basics of Intent, Broadcast and Internet services.
5. To learn about different wireless mobile data transmission standards.
6. To understand and learn how to integrate basic phone features, multimedia, camera and Location based services in Android Application.
7. To learn about different systems for mobile application development, deployment and distribution in Mobile market place (Android, iOS).
8. To understand and carry out functional test strategies for mobile applications.

SYLLABUS

Module I

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application ([1] Chapter 1). Understanding Anatomy of Android Application, Android Manifest files ([1] Chapter 2).

Module II

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings: Using Intent Filter, Permissions ([1] Chapter 3).

Module III

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation ([1] Chapter 8). Testing Android Applications, Publishing Android Application, Using Android Preferences, Managing Application Resources in a Hierarchy, working with different Types of Resources ([1] Chapter 9).

Module IV

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers. Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World ([1] Chapter 14).

Recommended Books

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
3. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
4. Android Application Development All in one for Dummies by Barry Burd, Edition: I

Mobile Application Development lab

1. Design an application representing a simple calculator.
2. Develop an application for working with Menus and Screen Navigation.
3. Develop an application for working with Notifications.
4. Develop an application demonstrating Internal Storage to store private data on the device memory.
5. Design a simple to-do list application using SQLite
6. Develop an application for connecting to the internet and sending email.
7. Develop an application for working with graphics and animation.
8. Develop an application for working with device camera.
9. Develop an application for working with location based services.
10. Using Worker thread write Android code for a click listener that downloads an image from a separate thread and displays it in an Image View.

Semester	Fourth		
Course Name	Web Programming		
Category: SEC-II	Code: BSSE2402	Credits: 4	
L-2 T-0 P-4	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. To understand basics of the Internet and World Wide Web
2. To acquire knowledge and skills for creation of web site considering both client and server-side programming
3. To learn basic skill to develop responsive web applications
4. To understand different web extensions and web services standards
5. To understand basic concepts of Search Engine Basics.
6. To learn Web Service Essentials.
7. To learn Rich Internet Application Technologies.
8. To understand and get acquainted with Web Analytics 2.0

SYLLABUS

Module I

Introduction to World Wide Web: Internet Standards, Introduction to WWW and WWW Architecture, Internet Protocols, Overview of HTTP, HTTP request – response, Generations of dynamic web pages. Introduction to HTML and HTML5, TML Tags, Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, HTML Forms. The need for CSS, Introduction to CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style, Backgrounds, Manipulating Text, Margins and Padding, Positioning using CSS ([1] Chapter 8).

Module II

Java Programming: Java Script, Introduction, Core features, Data types and Variables, Operators, Expressions, Functions, Objects, Array, Date and Math Related Objects([1] Chapter 9). JAVA

Networking classes, TCP/IP Protocol Suite, File Transfer Protocol (FTP), Java Environment |Setup for Web Applications, JavaBean, Application Builder Tool, Bean Developer Kit (BDK), The Java Beans API, Introduction to EJB ([1] Chapter 12).

Module III

Introduction to Databases: Database Basics, SQL, MySQL, PostgreSQL, JDBC API, Driver Types, Two-Tier and Three-Tier Models([1] Chapter 6). Connection Overview, Transactions, Driver Manager Overview, Statement Overview, Result Set Overview, Types of Result Sets, Concurrency Types, Prepared Statement Overview ([1] Chapter 7).

Module IV

Java Applet and JSP: Java Web Programs and Applets, Web Application, Servlet, Servlet Life Cycle, Servlet Programming, Introduction to JSP, Life Cycle of a JSP Page, Translation and Compilation, Creating Static Content, Response and Page Encoding, Creating Dynamic Content, Using Objects within JSP Pages, JSP Programming ([1] Chapter 11). Dot Net Framework: Introduction to ASP.net, Asp.net Programming ([4] Chapter 3).

Recommended Books:

1. J2EE: The complete Reference by James Keogh.
2. Java EE and HTML5 Enterprise Application Development (Oracle Press) by John Brock, Arun Gupta, GeertjanWielenga
3. Struts: The Complete Reference, 2nd Edition by James Holmes.
4. ASP.NET Unleashed by Stephen Walther, Kevin Scott Hoffman, Nate Dudek.
5. Microsoft Visual C# 2013 Step by Step by John Sharp.

Web Programming Lab

1. Design a Web page using different Text Formatting Tags.
2. Design a Web page with links to different Pages and allow navigation between Web Pages.
3. Design a Web page demonstrating all Style sheet types.
4. Design a Web page with Image maps.
5. Design a Web page with a Form that uses all types of controls.
6. Design a Web page demonstrating different semantics
7. Design a Web page with different Tables. Design Webpages using table so that the content appears well placed.
8. Design a Web page Embedding with multimedia features.
9. Using JavaScript design, a Web page that prints Factorial/Fibonacci series/any given series.
10. Design a form and validate all the controls placed on the form using Java Script
11. Write a JavaScript program to display all prime numbers between 1 and 100.
12. Write a JavaScript program to accept a number from the user and display the sum of its digits.
13. Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).
14. Write a java script program to design simple calculator.
15. Develop an Applet that draws a circle. The dimension of the Applet should be 500 x 300 pixels. The circle should be centered in the Applet and have a radius of 100 pixels. Display your name centered in a circle (using drawOval() method).
16. Draw ten red circles in a vertical column in the center of the Applet.
17. Build an Applet that displays a horizontal rectangle in its center. Let the rectangle fill with color from left to right.
18. Develop an Applet that display the position of the mouse at the upper left corner of the Applet when it is dragged or moved. Draw a 10×10 pixel rectangle filed with black at the current mouse position.
19. Develop an Applet that contains one button. Initialize the label on the button to “start”, when the user presses the button, which changes the label between these two values each time the button is pressed.

Semester	Fourth		
Course Name	Linux / Unix Programming		
Category: SEC-II	Code: BSSE2403	Credits: 4	
L-2 T-0 P-4	Theory Exam: 3 Hrs	ESE: 60 Marks	CIA: 40 Marks

Course Learning Outcomes:

1. Understanding the basic set of Commands and utilities in Linux/UNIX systems.
2. To learn to develop Software for Linux/UNIX systems.
3. To learn the C language and get experience Programming in C.
4. To learn the Important Linux/UNIX library Functions and System Calls.

SYLLABUS

Module I: LINUX/UNIX Basics: Introduction to LINUX/UNIX, Features of LINUX/UNIX, ([2] Chapter 1) LINUX/UNIX system organization (the kernel and the shell), ([1] Chapter 2) Files and directories, ([1] Chapter 1).

Module II:Basic UNIXcommands: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. ([1] Chapter 1).

Module III: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. ([1] Chapter 1).

Module IV: Shell programing:Learning vi editor, Types of editors, Basic features, Modes of execution in vi editor, Different commands to manage vi editor, ([3] Chapter 12) Writing, Compiling and Running a C program on Unix/Linux. ([3] Chapter 23) Writing and executing shell script in Unix environment. ([3] Chapter 24).

Recommended Books:

1. Shell Programming in Unix, Linux and OS X, The Fourth Edition of Unix Shell Programming by Stephen G. Kochan, Patrick Wood, 2016.

2. Systems Programming in Unix/Linux by K. C. Wang, 2018.

3. The Linux Command Line, A Complete Introduction by William E. Shotts, William E. Shotts Jr., 2012.

Linux/Unix Programming Lab

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 a shell script to print given numbers sum of all digits.
4. Write a shell script to print the Fibonacci series.
5. Write a shell script to say Good morning /Afternoon /Evening as you log in to system.
6. Write a shell script to find whether entered year is Leap or not.
7. Write a shell script to check whether a number is palindrome or not.
8. Write a shell script to count numbers of words in a file.
9. Write a shell script to check whether a character is vowel or not using Switch-case.
10. Write a shell 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. Write a 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 program to print the patterns using for loop.
16. Write a shell program to calculating factorial of given number.

Semester	Fourth		
Course Name	Network Programming		
Category: SEC-II	Code: BSSE2404	Credits: 4	L-2 T-0 P-4
Exam: Theory 3 Hrs.	ESE: 60 Marks	CIA: 40 Marks	

Course Learning Outcomes:

1. To enhance the specialized knowledge of TCP/IP protocol suite, its layering and various protocols existed on each layer.
2. To implement Network Services (Connectionless and connection oriented) that Communicate through the Internet.
3. Demonstrate the connection management (Connection establishment/Termination) in Transmission Control Protocol.
4. Using the remote logging services and Client-Server model in Networking Applications.

SYLLABUS

Module I

Introduction: The Internet, A brief History, Communication, Need of Protocol on Communication, Protocol Standards, Problems in Computer Communication, TCP/IP Protocol Suite, TCP/IP Layers, TCP/IP Protocols ([1], Chapter 2) Internet Layer's Function and responsibilities. Internet Layer Protocols, Internet Protocol, IP Address, Classes of IP Address, IP Header ([1], Chapter 19).

Module II

Transport Layer; Overview of TCP, Transport Layer protocols, TCP, UDP, Connection Oriented Service and Connectionless Services, TCP Header, TCP Connection, Connection Establishment, Three Way Handshaking, TCP Well known ports. Responsibilities of UDP ([1], Chapter 23)

Module III

Socket: 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 ([2], Chapter 29). Client Server Model; Client and Server, Characteristics of Client and Server.([2], Chapter 30).

Module IV

Remote Logging; TELNET, Working of TELNET, REXEC, RSH ([1], Chapter 26 & 27). Network Management and Debugging; Configuring TCP/IP, PING utility, IPConfig, Inetd Daemon, Netstate, Tracing a Connection, Net Diagnosis, Pathping, NS-Lookup, Hostname ([1], Chapter 28).

Recommended Books:

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

Network Programming Lab

1. Execute the following network related commands in Linux/UNIX and diagnose the output.

```
#sudo
```

```
ifconfig
```

```
#sudoifdown
```

```
#ifconfig eth0
```

```
#sudoifup
```

```
#man tcpdump
```

```
#netstat
```

```
#dnsip
```

```
#hostname
```

```
#ping ip or hostname
```

```
#traceroute hostname or IP
```

```
#nslookup www.bbdu.ac.in
```

2. Execute the following remote login commands in Linux/UNIX and diagnose the output.

```
#rsh
```

```
#rexec
```

```
#Telnet
```

3. Troubleshoot the networking problems in Linux environment.

4. Create your own DHCP server and put the ip range (10.200.100.10-10.200.10.90) in the pool.

5. What is IPv4 address? Configure the TCP/IP in your networked machine

6. Discuss IPv4 addresses and its types.

7. Write a client server program in C language for simple data transfer between client and server using UDP.

8. Write a client server program in C language for simple data transfer between client and server using TCP.

9. Write a client server program in C language for connectionless communication between two different Unix/Linux computers in the same TCP/IP network.

10. Write a program in c language for implementing the utility similar to PING.