Scheme of Instruction & Syllabi
of
Bachelor of Technology
(Computer Science and Engineering)
With specialization in Cloud Computing

(With effective from academic session 2023-24)

(Dr. Gaurav Agarwal)   **(Prof. R.K. Shukla)**
 HOD CSE   **Dean Engineering & Technology**

(Prof. Y D S Arya)
Vice- Chancellor

Department of Computer Science and Engineering
INVERTIS UNIVERSITY
Invertis Village, Bareilly-Lucknow NH-24, Bareilly,
243123 U. P.

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UNIVERSITY BAREILLY
Established by Govt. of U.P. u/s 2F of UGC Act, 1956 vide U.P. Act 22 of 2010.

STUDY AND EVALUATION SCHEME
(With effective from academic session 2023-2024)
B. Tech. in Computer Science & Engineering
with specialization in Cloud Computing
YEAR II, SEMESTER III

Sl. No.	Category	Course Code	Course Title/ Subjects	Hours per week			Evaluation Scheme		Total	Credits
				L	T	P	CA	EE		
THEORY										
1	Basic Science Course	BCSI301	Statistics and Probability	3	1	0	30	70	100	4
2	Engineering Science Course	BCSI302	Digital Electronics	3	1	0	30	70	100	4
3	Professional Core	BCSI303	Data Structures using C	3	0	0	25	50	75	3
4	Professional Core	BCSI304	Object Oriented Programming with Java	3	0	0	25	50	75	3
5	Professional Core	BCSI305	Database Management System	3	0	0	25	50	75	3
6	Engineering Science Course	IIOT3	Smart Industrial Connectivity	4	0	0	30	70	100	4
PRACTICALS AND PROJECTS										
6	Humanities & Social Sciences including Management	BCSI306	Communication Skills	0	0	2	10	15	25	1
7	Professional Core	BCSI307	Data Structures using C Lab	0	0	2	10	15	25	1
8	Professional Core	BCSI308	Object Oriented Programming with Java Lab	0	0	2	10	15	25	1
9	Professional Core	BCSI309	Database Management Systems Lab	0	0	2	10	15	25	1
10	ST	BCSI310	Summer Project Seminar-I	0	0	2	10	15	25	1
			TOTAL	19	2	10	215	435	650	26

L-Lecture, **T-** Tutorial , **P**- Practical ,**CA**- Continuous Assessment, **EE-** End Semester Examination

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STUDY AND EVALUATION SCHEME
(With effective from academic session 2023-2024)
B. Tech. in Computer Science & Engineering with specialization in Cloud Computing
YEAR II, SEMESTER IV

Sl. No.	Category	Course Code	Course Title/ Subjects	Hours per week			Evaluation Scheme		Total	Credits
				L	T	P	CA	EE		
THEORY										
1	Professional Core	BCSI401	Design and Analysis of Algorithms	3	0	0	25	50	75	3
2	Professional Core	BCSI402	Operating System	3	0	0	25	50	75	3
3	Professional Core	BCSI403	Computer Organization and Architecture	3	0	0	25	50	75	3
4	Professional Core	BCSI404	Computer Networks	3	0	0	25	50	75	3
5	Professional Core	BCSICT401	Information Security	3	0	0	25	50	75	3
6	Professional Core	BCSICT402	Storage and Datacenter	3	0	0	25	50	75	3
7	Engineering Science Course	IIOT4	Data Analytics for IIOT	4	0	0	30	70	100	4
PRACTICALS AND PROJECTS										
7	Professional Core	BCSI405	Design and Analysis of Algorithms Lab	0	0	2	10	15	25	1
8	Humanities & Social Sciences including Management	BCSI406	Employability Skills	0	0	2	10	15	25	1
9	Professional Core	BCSI407	Computer Network Lab	0	0	2	10	15	25	1
10	Professional Core	BCSI408	Operating System Lab	0	0	2	10	15	25	1
11	Professional Core	BCSICT403	Storage and Datacenter Lab	0	0	2	10	15	25	1
			TOTAL	22	0	10	230	445	675	27

L-Lecture, **T-** Tutorial , **P**- Practical ,**CA**- Continuous Assessment, **EE-** End Semester Examination

BCSI301: STATISTICS AND PROBABILITY

L T P C
3 1 0 4

Course Objective:
• To understand the basic concepts of statistics and probability.
• To understand the description of data using statistical techniques
• To understand the statistical methods involved in hypothesis testing
• To understand the difference between parametric and non-parametric tests
• To understand the random variables, statistical expectation and its statistical and mathematical properties.
• To understand the concepts of regression and correlation analysis.

UNIT -I

Introduction to Statistics and Probability

History and evolution of statistics, types of data, important terminologies, contingency table, frequency and cross table, graphs, histogram and frequency polygon, Random variables, statistical properties of random variables, Expectation, , jointly distributed random variables, moment generating function, characteristic function, limit theorems, probability, trial, events, types of events, apriori probability, limitations of classical probability, statistical or empirical probability, axiomatic approach to probability, probability function, theorems on probabilities of events, law of probability theory, Bayes theorem, application of Bayes Theorem

UNIT- II

Measures of Central Tendency and Dispersion

Descriptive Statistics, Mean: Arithmetic, Geometric and Harmonic means, mathematical relationship among different means, median for raw data and grouped data, mode for raw data and grouped data, relationship among mean, median and mode, measure of dispersion – standard deviation, variance, covariance and its properties, coefficient of variation, quartiles, quartile deviation and mean deviation, Mean absolute deviation.

UNIT -III

Testing of Hypothesis:

Introduction to testing of hypothesis, Statistical assumptions, Level of significance, confidence level, Type I Error, Type II error, Critical value, power of the test, Application of small sample test – t and F test, Large Sample test – Z test in Data Science Industry with small use cases (application oriented).

UNIT -IV

Analysis of Variance (ANOVA):

Introduction to general linear model, assumptions of ANOVA, factors and levels in ANOVA, layout of one way ANOVA, skeleton of one way ANOVA, multiple comparison of sample means, one way analysis of variance with unequal sample sizes, two factor

analysis of variance – introduction and parameter estimation, two way analysis of variance with interaction, Post ANOVA: testing of hypothesis for significance of mean using Fishers Least Significance Difference test (lsd), Tukeys test, Dunnet test, Duncan Multiple Range test.

UNIT -V

Regression and Correlation:

Introduction to linear model, concepts of factor, effect, residuals, dependency, independency, assumptions of linear model, estimation of parameters using OLS, properties of regression coefficients, Spurious regression concepts, significance of regression coefficients using t test and F test, concepts of auto correlation, multiple linear regression analysis, multi collinearity, heteroscedasticity, significance of estimated parameters in multiple linear regression, partial test for the individual significance, correlation analysis, properties of correlation coefficients, significance of single correlation coefficient, significance of multiple correlation coefficients, concepts of multiple correlation and partial correlation.

Text Books:
1. *Fundamentals of mathematical statistics – SC Gupta and VK Kapoor, Sultan Chand & Sons Publication, New Delhi.*

Reference Books:

1. *Introduction to probability Models, Ninth Edition – Sheldon M. Ross, Elsevier Publication, Academic Press, UK*

2. *Introduction to Probability and Statistics for Engineers and Scientists, Third Edition - Sheldon M. Ross, Elsevier Publication, Academic Press, UK.*

3. *An introduction to Probability and Statistical Inference – George Roussas, Academic Press.*

Course Outcome:
• Understand the importance of statistics in different research areas.
• Understand the basic concepts of Statistics and its evolution.
• Understand the suitable statistical measures to describe and summarize the data.
• Understand the application of statistical test to appropriate research environment.
• Understand the basic concepts of probability and its applications.
• Understand the application of regression analysis in finding the expected values.

BCSI302: Digital Electronics

L T P C
3 1 0 4

Course Objective:
• Understand concepts of combinational and sequential circuits.
• Analyze the synchronous and asynchronous logic circuits.
• Understand concepts of memory, programmable logic and digital integrated circuits.
• Design Combinational and sequential systems.

UNIT -I

Basic Concepts, Boolean algebra, Theorems and Functions
Number Systems: Decimal number system, binary number system, octal number system, hexadecimal number system, BCD number system, Excess-3 code, Gray code, Alpha numeric code, error detecting and error correcting codes. Arithmetic: Arithmetic number representation, Binary arithmetic, Hexadecimal arithmetic, BCD arithmetic. Boolean algebra and Theorems: Logic gates and logic operations, Boolean theorems and postulates, SOP's & POS's, Minterms and Maxterms. Minimization of Boolean Functions: Algebraic simplification, Karnaugh map simplification, Quine-Mc Cluskey or Tabulation method.

UNIT- II

Logic Gates
Logic Families: Metal Oxide Semiconductor logic families- switching properties of NMOS and PMOS transistors, static NMOS, dynamic NMOS, Static CMOS and dynamic CMOS logic families, CMOS Transmission gate circuits, Bipolar logic families- switching properties of NPN and PNP transistors, TTL, Schottkey TTL, Comparison of MOS logic circuits(CMOS) with that of a TTL digital circuit, Tristate gates. Electrical characteristics: Meanings of speed, propagation delay, operating frequency, and power dissipated per gate, supply voltage levels, operational voltage levels of various logic families.

UNIT -III

Combinational Systems
Binary arithmetic units (Adder, Subtractor, n-bit parallel adder & Subtractor, look ahead carry generator), decoder, encoder, multiplexer, Demultiplexer, code converters, Magnitude comparators, parity generators. Implementation of combinational logic by standard IC's.

UNIT -IV

Sequential Systems
Flip-flop and Latch: SR latch, JK flip-flop, T flip-flop, D flip-flop and latch, Master-slave RS flip-flop, Masterslave JK flip-flop, asynchronous inputs. Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), universal shift register. Counters Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter, asynchronous clear, preset and load in a counter, synchronous clear, preset and load in a counter, typical IC's for counters. Synchronous (Clocked) sequential circuits: Moore and Mealey state machine circuits, Analysis & design of synchronous sequential

circuits – State machine design with SM charts.

UNIT -V

Memory and Programmable Logic

RAM, memory decoding, ROM, PROMs, PAL & PLA, Sequential Programmable Devices
(discuss three major devices without going into their detailed construction).

Text Books:
1. *Morris Mano M, Michael D. Ciletti, "Digital Design", Pearson Education, 4th Edition, 2007.*
2. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.*
3. *Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2007.*

Reference Books:
1. *Ronald J. Tocci, "Digital Systems: Principles and Applications", Pearson Education, 10th Edition, 2009.*
2. *Donald P Leach, Albert Paul Malvino, Goutam Saha, "Digital Principles and Applications", Tata McGraw Hill, 6th Edition, 2008.*

Course Outcome:
• Understand different number systems and its inter-conversions.
• Understand the concept of Boolean algebra and its different theorems, properties etc.
• Understand simplification of Boolean functions.
• Understand the construction and working of different combinational circuits etc.
• Understand different flip-flops and its applications.
• Understand different sequential logic circuits and basic design of sequential circuits and counters.
• Understand different types of memories and its applications.

BCSI303: Data Structures using C

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Course Objective:

- A data structure is a particular way of storing and organizing data in a computer so that it can be used efficiently.
- Different kinds of data structures are suited to different kinds of applications and some are highly specialized to specific tasks.
- This course covers the basic concepts of different data structures which are the basic building blocks of Programming and problem solving.

UNIT -I

Introduction to Data structures
Definition, Classification of data structures: primitive and non-primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: Malloc(), Calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages), Writing Recursive programs – Binomial coefficient, Fibonacci, GCD.

UNIT- II

Searching and Sorting
Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort.

UNIT -III

Stack and Queue
Stack – Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks. Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (DEQUE), Priority queue, Operations on all types of Queues.

UNIT -IV

Linked List
Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

Tree Graphs and their Applications:

Definition: Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Pre-order, In-order and post-order. Graphs, Application of Graphs, Depth First search, Breadth First search.

Text Books:

1. *Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001.*
2. *Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill.*
3. *Robert Kruse Data Structures and program designing using 'C'.*
4. *Trembley and Sorenson Data Structures.*

Reference Books:

1. *E. Balaguruswamy Programming in ANSI C.*
2. *Bandyopadhyay, Data Structures Using C Pearson Education, 1999*
3. *Tenenbaum, Data Structures Using C. Pearson Education, 200*
4. *Kamthane: Introduction to Data Structures in C. Pearson Education 2005.*
5. *Hanumanthappa M., Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006.*
6. *Langsam, Ausenstein Maoshe & M.Tanenbaum Aaron Data Structures using C and C++ Pearson Education.*

Course Outcome:

- Students will benefit from the knowledge of Data Structures and different operating one can perform on these like searching, sorting, stacking and etc.
- This forms a very strong foundation for programming in different languages that the students will take up in subsequent semesters or in any other course.

BCSI304: Object Oriented Programming using Java

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Course Objective:

- Object oriented programming is the most efficient and proven technique for developing reliable software.
- It provides features such as increased productivity, reusability of code, decrease in the development time, and reduces cost of production to an extent.
- There are many languages which used the object-oriented concepts and techniques to develop real time software. Such programming languages are C++, Java, Smalltalk, Objective-C, etc.
- This course provides students with an understanding of the object-oriented concepts which helps in the field of programming, management of data, etc.

UNIT -I

Introduction to Java
Introduction, installing java, JRE and JDK, Byte Code, JVM; Simple Java program. Creating Objects, Data types, Operators: Arithmetic Operators, Bitwise operators, Relational operators, Logical Operators, The Assignment Operator, ternary operator; Operator Precedence, Access specifiers. Type casting; Strings. Control Statements: conditional statements, looping statements, jumping statements, methods, static methods, and static block, Arrays

UNIT- II

Classes, Inheritance, package and Interface
Classes: Classes in Java; declaring a class; constructors, method overloading, Object Class. Inheritance: Simple Inheritance, Super class and sub class, super keyword multiple, and multilevel inheritance; Overriding.
Packages and Interfaces: Packages, Defining Packages, access protection, Importing Packages. Abstract Methods, Abstract Classes, Defining Abstract Classes, Extending Abstract Classes, Defining Interfaces, Implementing Interfaces Lambda Expressions Introducing Lambda Expressions, Lambda Expression Fundamentals, Functional Interfaces, Some Lambda Expression Examples, Block Lambda Expressions, Generic Functional Interfaces, Passing Lambda Expressions as Arguments.

UNIT -III

Thread Programming, Exceptions and I/O
Thread Programming: What are threads? Thread life cycle, Extending Thread class, implementing runnable interface, Synchronization, Deadlock, Manipulation Thread states.
Exception Handling: Fundamentals, Exception Types, try and catch, multiple catch clauses,

nested try statements, throw, and throws, finally, built in exceptions, user defined exceptions and chained exceptions.

I/O: Introduction, stream classes, Byte Streams, Character Streams, Reading Data from Keyboard, Folders and Folder Operations, Files and File Operations, Serialization and Deserialization.

UNIT -IV

Networking and JDBC

Networking: Introduction, Socket, Client/Server architecture, Reserved Sockets, Proxy Servers, Internet Addressing, Factory Methods, Instance Methods, TCP/IP Client Sockets : URL,URL Connection, TCP/IP Server Sockets, Datagrams, Datagram Sockets, Inet4Address and Inet6Address, RMI: Stub, Skelton.

Database connectivity – JDBC architecture and Drivers. JDBC API - loading a driver, connecting to a database, creating and executing JDBC statements, handling SQL exceptions. Accessing result sets: types and methods. An example - JDBC application to query a database

UNIT -V

GUI Programming with AWT and JavaFX

AWT: GUI Programming, AWT Basics, AWT package: Layouts, Label, TextField, Button, Events, TextArea, CheckBox, CheckBoxGroup, List, Canvas, Menus, Pop Menus, Panel, And Dialog. Listeners: ActionListener, MouseListener, ItemListener, KeyListener, WindowListener JavaFX: Basic Concepts, JavaFX Packages, Stage and Scene Classes ,Nodes and Scene Graphs, Layouts, Application Class and the Lifecycle Methods, Compiling and Running a JavaFX Program, JavaFX Control: Label, Buttons and Events, Event Handling, Button, ToggleButton, RadioButton, Image, ImageView, ListView, Combo-Box, Menus, Toolbar, Case Study .

Text Books:
1. *Herbert Schildt: Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.*
2. *Jim Keogh: J2EE The Complete Reference, Tata McGraw Hill, 2007.*

Reference Books:
1. *Y. Daniel Liang: Introduction to JAVA Programming, 6th Edition, Pearson Education, 2007.*
2. *Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2006.*

Course Outcome:
- Read and understand Java-based software code of medium-to-high complexity.
- Use standard and third party Java's API's when writing applications.
- Understand the basic principles of creating Java applications with graphical user interface (GUI).
- Understand the fundamental concepts of computer science: structure of the computational process, algorithms and complexity of computation.
- Understand the basic approaches to the design of software applications.
- Apply the above to design, implement, appropriately document and test a Java application of medium complexity, consisting of multiple classes.

BCSI305: Database Management System

L T P C
3 0 0 3

Course Objective:

- A database management system (DBMS) is collection of software meant to manage a Database.
- Many popular databases currently in use are based on the relational database model.
- RDBMSs have become a predominant choice for the storage of information in new databases used for financial records, manufacturing and logistical information, personnel data and much more.
- The course covers the basic concepts of databases in general with an emphasis on relational databases, modeling techniques and writing queries. Normalization techniques, Transaction processing, Concurrency Control techniques and Recovery of databases against crashes are also covered.

UNIT -I

Introduction

Purpose of Database System -– Views of data – Data Models – Database Languages —
Database System Architecture – Database users and Administrator – Entity– Relationship
model (E-R model) – E-R Diagrams -- Introduction to relational databases.

UNIT -II

Relational Model-I

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational
Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations-
SQL fundamentals. Oracle data types, Data Constraints, Column level & table Level
Constraints, working with Tables. Defining different constraints on the table, Defining
Integrity Constraints in the ALTER TABLE Command, Select Command, Logical Operator,
Range Searching, Pattern Matching, Oracle Function, Grouping data from Tables in SQL,
Manipulation Data in SQL.

UNIT -III

Relational Model-II

Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), Sub queries Union,
intersect & Minus Clause, Creating view, Renaming the Column of a view, Granting
Permissions, - Updating, Selection, Destroying view Creating Indexes, Creating and
managing User Integrity – Triggers - Security – Advanced SQL features –
Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed
Databases and Client/Server Databases.

UNIT -IV

Database Design

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First,
Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form-Multi-
valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT -V

Transactions

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery –
Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery –
Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent
Locking – Deadlock-Serializability – Recovery Isolation Levels – SQL Facilities for
Concurrency.

Text Books:
1. *Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts",
   Fifth Edition, Tata McGraw Hill, 2006*
2. *Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth
   Edition, Pearson/Addision Wesley, 2007.*

Reference Books:
1. *Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2003.*

Course Outcome:

• Students will learn how to write queries, transactions and different modeling techniques in relational
database.

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BCSI306: Communication Skills

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2 1

List of Activities:

Sl. No.	Particulars	Purpose
01	Work on Vocabulary	To have the knowledge of essential vocabulary
02	Correct Grammar	To practice the use of correct Grammar
03	Communication Circles	To highlight that there are different levels of sharing information and that you need to decide which level is the most appropriate for any given situation.
04	Circle, Square, Triangle or Z	To allow students to share a little about themselves with the group as part of the introductions to one another.
05	Colour Block	To emphasize what happens when we are presented with too many contradictory messages at the same time.
06	Power of Body Language	To enhance the importance of Non-verbal communication
07	Repeat the question	To illustrate how our expectations concerning communications can sometimes cause us to say the wrong things
08	Quick Answers	To illustrate how we sometimes jump to incorrect conclusions because of the way that information is presented to us
09	Creative Fairy Tale	To challenge the creativity of students to come up with a solution that would be acceptable to each person involved in the issue
10	Communication Shutdowns	To emphasize how certain statements can have a negative effect on any discussion or further meaningful communications that may have otherwise followed.
11	Drafting a Memo/Notice	Identify the need for good writing skills for effective communication at the workplace
12	Report Writing	Identify the need for good writing skills for effective communication at the workplace
13	Resume Writing	What and how to create an effective resume
14	Correspondence for job	How and what to write while doing correspondence related to job

BCSI307: Data structures using C Lab

L T P C
0 0 2 1

List of Experiments:
Part A
1. Use a recursive function to find GCD of two numbers.
2. Use a recursive function to find the Fibonacci series.
3. Use pointers to find the length of a string and to concatenate two strings.
4. Use pointers to copy a string and to extract a substring from a given a string.
5. Use a recursive function for the towers of Hanoi with three discs.
6. Insert an integer into a given position in an array.
7. Deleting an integer from an array.
8. Write a program to create a linked list and to display it.
9. Write a program to sort N numbers using insertion sort.
10.   Write a program to sort N numbers using selection sort.

Part B
1. Inserting a node into a singly linked list.
2. Deleting a node from a singly linked list.
3. Pointer implementation of stacks.
4. Pointer implementation of queues.
5. Creating a binary search tree and traversing it using in order, preorder and post order.
6. Sort N numbers using merge sort.

BCSI308: Object Oriented Programming with Java Lab

L T P C
0 0 2 1

List of Experiments:
Part A
1. Write a program to check whether two strings are equal or not.
2. Write a program to display reverse string.
3. Write a program to find the sum of digits of a given number.
4. Write a program to display a multiplication table.
5. Write a program to display all prime numbers between 1 to 1000.
6. Write a program to insert element in existing array.
7. Write a program to sort existing array.
8. Write a program to create object for Tree Set and Stack and use all methods.
9. Write a program to check all math class functions.
10. Write a program to execute any Windows 95 application (Like notepad, calculator etc.)
11. Write a program to find out total memory, free memory and free memory after executing garbage collector (gc).

Part B
1. Write a program to copy a file to another file using Java to package classes. Get the file names at run time and if the target file is existed then ask confirmation to overwrite and take necessary actions.
2. Write a program to get file name at runtime and display number of lines and words in that file.
3. Write a program to list files in the current working directory depending upon a given pattern.
4. Create a text field that allows only numeric value and in specified length.
5. Create a Frame with 2 labels, at runtime display x and y command-ordinate of mouse pointer in the labels.

BCSI309: Database Management Systems Lab

L T P C
0 0 2 1

List of Experiments:

1. Perform following actions using SQL statements
    a. Create a new user with name "shiva" and password "kumar@1"
    b. Assign the following privileges
        i. Create and drop tables
        ii. Create and drop users
        iii. Allow to assign above privileges to new users
        iv. List all tables in the database
        v. List all users in the database
        vi. Logout from current user and log in as "shiva"
2. Create following tables and insert minimum 10 rows in to each table
    a. Department table with following columns with appropriate data types
        i. DeptId
        ii. DeptName
        iii. DeptLoc
    b. Employee table with following columns with appropriate data types
        i. EmpId
        ii. EmpName
        iii. DOB
        iv. DOJ
        v. Job
        vi. Salary
    c. Product table with following columns with appropriate data types
        i. ProdId
        ii. ProdName
        iii. Price
    d. Sales table with following columns with appropriate data types
        i. SalesId
        ii. Date
        iii. Quantity
3. Update above tables with following features using SQL statements
    a. Make DeptId in Department table as Primary Key
    b. Make EmpId in Employee table as Primary Key
    c. Add DeptId column to the Employee table and make it foreign key from Department table and update the values
    d. Add EmpId and ProdId to the Sales table and make them foreign key from Employee and Product table and update the values
    e. Update all columns in all tables with appropriate constraint such as not null, check and so on

4. Perform the following SQL statements
   a. Create a view "EmpDeptView" from Employee and Department table which contains following columns
      i. EmpName
      ii. DOB
      iii. Salary
      iv. DeptId
      v. DeptName
      vi. Loc
   b. Retrieve all employees whose salary between 25,000 to 30,000
   c. Retrieve all employees who is working in Accounts department (If it is not there add this row to Department table)
   d. Retrieve all employees who is working other than Accounts department
   e. Retrieve all employee who is working in Sales department and Bangalore location
   f. Retrieve all employees who completed minimum 5 years
   g. Retrieve all employees who completed minimum 5 years and salary less than 30,000
5. Perform the following SQL statements
   a. Retrieve all employees whose salary more than 30,000
   b. Retrieve employee details who is getting maximum salary
   c. Retrieve employee details who is getting minimum salary
   d. Retrieve employee details who is getting 3rd maximum salary
   e. Retrieve employee details who is getting 5th minimum salary
   f. Retrieve total number of employees in each department in Bangalore location
   g. Retrieve total number of employees in each location
   h. Retrieve total number of employees in each location in Accounts department
   i. Retrieve total number of employees who complete more than 10 years in each department.
6. Write a PL/SQL Procedure to find prime number from 1 to n, n is a user input or parameter.
7. Write a PL/SQL Functions to return number of days an employee working using EmpId.
8. Write a PL/SQL Procedure to find sum of salaries of all employee working in a particular location.
9. Write a PL/SQL Function to return sum of sales by ProdId.
10. Write a PL/SQL Function to return sum of sales by EmpId.
11. Write a PL/SQL Procedure to generate Employee Report department wise as follows:

DeptName	EmpName	Job	Location	Salary	Cumulative_Salary

12. Write a PL/SQL Trigger to insert row into OldEmployee table when a employee deleted from Employee table (Create OldEmployee table).
13. Write a PL/SQL Trigger not to delete more than 2 employees at a time
14. Write a PL/SQL Trigger not to update employee salary if it cross 67000
15. Write a PL/SQL Package with following procedures and functions
    a. Procedures
       i. Print Total Quantity Sales Summary Report(SalesId, Date, Quantity and Total Quantity)
       ii. Print Total Quantity Sales Summary Report by Date wise
    b. Functions

i. Return employee name who made maximum sales till date

ii. Return product name soled maximum quantity till date

BCSI310: Summer Project Seminar-I

L T P C
0 0 2 1

Course Objective:

- The objective of Summer Project is to enable the student to take up investigative study in field of Computer application with emphasis on their specialization.
- This is expected to provide a good initiation for the student(s) in Industry practices.
- The students are expected to investigate, model and present their work either individually or in groups (to be decided by the department) to the departmental committee.

BCSI401: Design and Analysis of Algorithms

L T P C
3 0 0 3

Course Objective:
- Algorithms are core or fundamentals for design and develop any kind of software (program), algorithms gives clear picture of the program about running time and complexity of the program, these helps us to find the performance of the program.
- Algorithms basically contain steps to run the program and calculate time to run the program.
- This subject covers various design and analysis paradigms of algorithms and data structures to improve the performance of a program.

UNIT 1:

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

UNIT II:

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

UNIT III:

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT IV:

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

UNIT V:

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE.

Text Books:
1. *Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.*
2. *Fundamentals of Algorithms – E. Horowitz et al.*

Reference Books:
1. *Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.*
2. *Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.*
3. *Algorithms—A Creative Approach, 3RD Edition, UdiManber, Addison- Wesley, Reading, MA.*

Course Outcomes
- For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic- programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
- For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
- Explain the ways to analyze randomized algorithms (expected running time, probability of error).
- Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

BCSI402: Operating Systems

L T P C
3 0 0 3

Course Objective:

- The operating system is the most important program that runs on a computer. Every general- purpose computer must have an operating system to run other programs.
- Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.
- This course covers the concept of operating system and its applications.

UNIT- I

Introduction to Operating System
Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

UNIT- II

Process Management

Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. **Threads:** Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models. **Process Synchronization:** Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions **Deadlocks:** System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT- III

Storage Management

Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. **Virtual Management**: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation **File-System Interface**: File concept, Access Methods, Directory structure, File- system Mounting, File

sharing, Protection and consistency semantics.

UNIT- IV

File-System Implementation:

File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery **Disk Managemen**t: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation

UNIT- V

Protection and Security

Protection: Goals of Protection, Domain of Protection, Access Matrix, and Implementation of Acess Matrix, Revocation of Access Rights, Capability- Based Systems, and Language – Based Protection. **Security:** Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

Text Books:
1. *Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.*
2. *Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.*
3. *Silberschatz / Galvin / Gagne, Operating System,6thEdition,WSE (WILEY Publication).*

Reference Books:
1. *William Stallings, Operating System, 4th Edition, Pearson Education.*
2. *H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education.*
3. *Nutt: Operating Systems, 3/e Pearson Education 2004.*

Course Outcome:
- After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc.
- This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications and etc.

BCSI403: Computer Organization and Architecture

L T P C
3 0 0 3

Course Objective*:*

- To understand the fundamentals of computer organization and architecture and to relate these to contemporary design issues.
- Understanding the performance characteristics of computer system.

UNIT- I

Register Transfer and Micro-operation

Register Transfer Language, Register Transfer, Bus and Memory Transfer: Three state bus buffers, Memory Transfer. Arithmetic Micro-operations: Binary Adder, Binary Adder-Subtrator, Binary Incrementor, Logic Micro-operations: List of Logic micro operations, Shift Micro-operations (excluding H/W implementation), Arithmetic Logic Shift Unit.

UNIT- II

Basic Computer Organization

Instruction Codes, Computer Registers: Common bus system, Computer Instructions: Instruction formats, Instruction Cycle: Fetch and Decode, Flowchart for Instruction cycle, Register reference instructions.

UNIT- III

Micro Programmed Control Unit

Control Memory, Address Sequencing, Conditional branching, Mapping of instruction, Subroutines, Design of Control Unit, Central Processing Unit: Introduction, General Register Organization, Stack Organization: Register stack, Memory stack; Instruction Formats, Addressing Modes.

UNIT- IV

Computer Arithmetic

Introduction, Addition and Subtraction, Multiplication Algorithms (Booth algorithm), Division Algorithms, Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors.

UNIT- V

Modes of Data Transfer and Memory Organization

Modes of Data Transfer: Priority Interrupt, Direct Memory Access, Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Text Books:

1. *Computer System Architecture by Morris Mano, PHI*
2. *Computer Organization and Architecture by William Stallings, PHI*

Reference Books:
1. *Digital Computer Electronics: An Introduction to Microcomputers by Malvino, TMH.*
2. *PC Hardware in a Nutshell by Barbara Fritchman Thompson, Robert Bruce Thompson, O'Reilly, 2nd Edition , 2010.*
3. *Fundamentals of Computer Organization and Architecture by Mostafa AB-EL-BARR and Hesham EL-REWNI, John Wiley and Sons.*
4. *Fundamental Of computer Organization by Albert Zomaya, 2010.*

Course Outcome:
- Explain the use of basic concepts of Computer components.
- Discuss the Register Transfer and different Micro-operations.
- Illustrate the flowchart for Instruction cycle.
- Describe the function of Control Unit and Central Processing Unit.
- Explain the characteristics of multi-processors.
- Discuss the modes of Data transfer and Memory organization.

BCSI404: Computer Networks

L T P C
3 0 0 3

Course Objective:
- To understand the basics of networking and its underlying principles.
- This course enables learners to understand computer networking concepts, how they work, operate, communicate with ports and Protocols. Standards and models associated with networking technology and their troubleshooting mechanisms.

UNIT- I

Networking Fundamentals
Basics of Network & Networking, Advantages of Networking, Types of Networks, Types of Network Architecture, Workgroup Vs. Domain. Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology, Types of Transmission Media, Communication Modes, Wiring Standards and Cabling, media connectors, Introduction of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, Comparison between OSI model & TCP/IP model.

UNIT- II

Basics of Network Devices
Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, And Other Networking Devices, Repeater, CSU/DSU, Modem, Ethernet standards, Ethernet Components, Point-to-Point Protocol, Address Resolution Protocol, Message format, transactions, Benefits of Wireless Technology, Types of Wireless Networks, Wireless network Components, wireless LAN standards, wireless security Protocols.

UNIT- III

Basics of Network, Transport and Application Layers
Network Layer: Internet Protocol (IP), IP standards, versions, functions, The IPv4 and IPv6 Datagram Format, IPv4 addressing, IPv4 Subnetting, CIDR and VLSM, IPv6 Addressing, , Internet Control Message Protocol , Internet Group Management Protocol ,Introduction to Routing and Switching concepts, Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets, Application Layer Protocols

UNIT- IV

WAN Technology

Introduction to WAN, WAN Switching techniques, connecting to the Internet, Satellite-Based Services, Cellular Technologies, Technologies used for Connecting LANs, Remote Access Connections and technologies, Authentication and Authorization, Tunneling and Encryption Protocols, Security Appliances and Security Threats.

UNIT- V

Troubleshooting Network
Trouble Shooting Networks: Command-Line Interface Tools, Network and Internet Troubleshooting, Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution, Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools.

Text Book:
1. *CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011.*
2. *CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013.*

Reference Books:
1. *Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008*
2. *CCNA Exploration Course Booklet: Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010*

Course Outcome:
After completion of the course the student will be able to:
- Explain the types of Network and its architecture
- Identify the function of each layer in OSI and TCP/IP Models
- Describe the Ethernet and wireless standards
- Discuss the functionality of Networking devices
- Demonstrate the IPv4 and IPv6 addressing types
- List the WAN Technologies
- Practice Network troubleshooting.

BCSICT401: Information Security

L T P C
3 0 0 3

Course Objective:
- To help students understand foundational concepts of information security
- To make it possible for students to appreciate the need for securing information from threats and risks.
- To facilitate students to gain knowledge on how network infrastructure and connectivity can be secured.

UNIT- I

Introduction to Information Security

Overview of Information security, Threats, Type of Vulnerabilities and Risk, Business Requirements, Information Security Definitions – Security Policies – Tier 1 (origination Level), Tier 2 (Functional Level), Tier 3 (Application or Device Level), Procedures, Standards, Guidance. Role of Governance in Information Security, Develop a Risk Management Program, Risk Management Process, Best Practices for IT Governance, Case study.

UNIT- II

Information Asset Classification

Classification of Information, Information Assets – Owner, Custodian, User, Information Classification in terms of Secret, Confidential, Private and Public, Declassification. Retention and Disposal of Information Assets. Provide Authorization for Access – Owner, Custodian and User, Case study.

UNIT- III

Access Control

User Identity and Access Management- Account Authorization, Access and Privilege Management, System and Network Access Control. Operating Systems Access Controls, Monitoring Systems Access Controls, Intrusion Detection System, Event logging, Cryptography. Physical Security: Identify Assets to be Protected, Perimeter Security, Firewalls, Prevention and Detection Systems, Safe Disposal of Physical Assets. Email Security: PGP, MIME, IP Security: IP security overview, Case study.

UNIT- IV

Introduction to Cryptography

Introduction to Advanced Cryptography and Cryptanalysis, Classical Encryption Techniques – Substitution Techniques, Transposition Techniques, Permutation Method. Advanced Encryption Techniques and Security Issues – RC4, One-time Pad, RSA, DES, Triple DES, AES and Diffie Hellman, Case study.

UNIT- V

Conventional Encryption

Confidentiality using conventional encryption – Placement of Encryption, Traffic Confidentiality, Key Distribution and Random Number Generation. Key management – Generating Keys, Nonlinear Keyspaces, Transferring Keys, Verifying Keys, Using Keys, Updating Keys, Storing keys, Backup keys, Compromised Keys, Lifetime of Keys, Destroying Keys and Public-Key Management, Case study.

Text Book:

1. *Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)*
2. *Cryptography and Information Security by V. K. Pachghare, Prentice-Hall of India Pvt.Ltd; 2nd Revised edition edition (30 March 2015)*
3. *Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012*
4. *Cryptography and Network Security Principles and Practices, by William Stallings, Pearson Education; Seventh edition (30 June 2017)*
5. *Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008*
6. *Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)*
7. *Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 5 edition (2015)*

Reference Book:

1. *Applied Cryptanalysis – Breaking Ciphers in the Real World Stamp, Richard M.Low*
2. *Serious Cryptography: A Practical Introduction to Modern Encryption Kindle Edition by Jean-Philippe Aumasson.*

Course Outcome:

After completion of the course the student will be able to:

- Explain basic concepts and importance of information security
- Identify threats to information security, analyse their impact and propose suitable countermeasures
- Describe various aspects of securing network infrastructure and importance of classifying information.

BCSICT402: Storage & Datacenter

L T P C
3 0 0 3

Course Objective:
- To impart the basic concepts of Storage systems and Datacenter environment.
- To understand concepts about RAID techniques.
- To understand basic concepts about NAS and SAN.
- To understanding about taking backup and restoring the data with the help of Business Continuity and Disaster Recovery concepts and tools.
- To understand about Data Center Consolidation and Clustering.

UNIT- I

Introduction to Storage System
Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing.
Data Center Environment: Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application.
Data Protection (RAID): RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison.

UNIT- II

Storage Networking Technologies
Network-Attached Storage: General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance , File-Level Virtualization.
Fibre Channel Storage Area Networks: Fibre Channel Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN.
IP SAN and FCoE: iSCSI, FCIP, FCoE.

UNIT- III

Backup and Disaster Recovery
Introduction to Business Continuity: Information Availability, BC Terminology, BC

Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions.

Backup and Archive: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture.

UNIT- IV

Data Center Consolidation

Reasons for Data Center Consolidation: Reasons for Data Center Consolidation, Consolidation Opportunities.

Data Center Consolidation Phases: Phase 1: Study and Document the Current Environment, Phase 2: Architect the Target Consolidated Environment, Phase 3: Implement the New Architecture, Phase 4: Control and Administer the Consolidated.

Best Practices in IT: Defining Best Practices, Deploying Best Practices, Benefits of Best Practices, Systems Management Best Practices, Server Cluster Best Practices, Data Storage Best Practices, Network Management Best Practices, Documentation Best Practices, Network Diagram Documentation, Documentation Formats.

UNIT- V

Data Center Clusters

Cluster Architecture: Asymmetric Two-Node Clusters, Symmetric Two-Node Clusters, Complex Cluster Configurations, Failover Policies, Best Practices.

Cluster Requirements: Required Hardware Cluster Components, Cluster Software Requirements, What Happens During Service Failover, Cluster Installation Checklist.

Designing Cluster-Friendly Applications: Automating Operations, Controlling Application Failover Time, Reducing Data Loss during Failover, Minimizing Application Failures, Designing Node- Independent Applications, Minimizing Planned Downtime, Restoring Client Connections.

Text Books:
1. *Information Storage and Management (Storing Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments) 2nd Edition by Somasundaram Gnanasundaram Alok Shrivastava.*
2. *Administering Data Centers: Servers, Storage, and Voice over IP By Kailash Jayaswal ISBN- 13: 978-0471771838.*

Reference Books:
1. *Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS, ISCSI, INFINIB and FOCE by Ulf Troppens.*
2. *Storage Management in Data Centers: Understanding, Exploiting, Tuning, and Troubleshooting Veritas Storage Foundation by Volker Herminghaus and Albrecht Scriba.*
3. *Blade Servers and Virtualization: Transforming Enterprise Computing While Cutting Costs by Barb Goldworm and Anne Skamarock.*

BCSI405: Design and Analysis of Algorithms Lab

L T P C
0 0 2 1

LIST OF EXPERIMENTS:

1. Write a program to sort a set of elements by implementing Merge sort.
2. Write a program to sort the array elements recursively using the quick sort.
3. Create a Graph class to implement an adjacency list representation of a graph. Devise an appropriate input method for populating the Graph. Also implement the following method for Graph:

   BFSPath(s,t) – finds a path from node s to the node t using BFS.
4. Create a Graph class to implement an adjacency list representation of a graph. Devise an appropriate input method for populating the Graph. Also implement the following method for Graph:

   DFSPath(s,t) – same as BFS Path except that it uses DFS to look for a path.
5. Implement a program for prim's algorithm to find out the minimum cost spanning tree
6. Implement a program for kruskal's algorithm to find out the minimum cost spanning tree.
7. Write a program to implement greedy topological sorting algorithm to find a topological sequence for the completion of a set of given tasks.
8. Implement a Roadster package that has a network of nodes (locations) and edges (roads) between pairs of nodes with the distances between the end nodes as the weights. I should be able to query Roadster with any pair of nodes and it should return the shortest path between the two (Dijkstra's)
9. Write a program to implement Radix sort.
10. Implement a program for Floyds all pair shortest path algorithm and wars hall's all pair shortest path algorithm.
11. Implement a non-recursive version of the Euclid's GCD algorithm.
12. Implement Binomial co –efficient problem using the by dynamic programming.
13. Implement a program to solve knapsack problem by dynamic programming.

Course Outcome:

At the end of the course, the student will be able to:-

- Know the running time of algorithm.
- Know the implementation and comparison of problem like kruskal and prim, recursive algorithm.
- Able to understand the working of various problem

BCSI406: Employability Skills

L T P C
0 0 2 1

List of Activities:

Speaking Skills	a) Group Discussion b) Panel Discussion c) Debate d) Personal Interview
Etiquette and Mannerism	a) Professional etiquette- Etiquette at meetings, Dining, Involuntary Awkward Actions b) Technology Etiquette- Phone, Email, Social Media, Video Conferencing, Web Interview
Professional Presentations	a) Nature of Oral Presentation b) Planning a Presentation c) Preparing the Presentation d) Delivering the Presentation
Resume & Job Application	a) Resume vs CV b) What is a scannable resume; c) How to develop an impressive resume; d) Different formats of Resume; e) Job application or cover letter
Job Interviews	a) Definition of interview, Background information, Types of interviews; b) Preparatory steps for Job interviews; c) Interview Skill tips; d) Changes in the interview process, e) Frequently asked questions during interviews

BCSI407: Computer Networks Lab

L T P C
0 0 2 1

List of Experiments:

1. Switch Configuration - Basic Commands and Switch Port Security.
2. Router – Configuration and Setting up of Passwords.
3. PPP Encapsulation, PPP PAP Authentication, PPP CHAP Authentication.
4. A configuration of default, Static and Dynamic Routing.
5. VLAN Configuration.
6. Configuration of Access-lists - Standard and Extended ACLs.
7. DHCP, DHCP Relay and DHCP Exclusions.
8. Configuring Logging to a Remote Syslog Server.
9. Design and analyse network with a router, Switch and Hub to find the number of broadcast domains and collision domain using packet tracer.
10. Configure a wireless network for ad-hoc and infrastructure mode.
11. Configure point to site and site to site VPN.
12. Perform network troubleshooting using ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat.

BCSI408: Operating System Lab

L T P C
0 0 2 1

List of Experiments:

1. Installing Linux Operating System
   a. Boot, reboot, and shut down a system normally.
   b. Boot systems into different run levels manually.
2. Login to OS and monitoring the performance
   a. Use single-user mode to gain access to a system.
   b. Identify CPU and memory-intensive processes, adjust process priority with renice, and kill processes.
   c. Locate and interpret system log files
3. Manage Users and Groups
   a. Create, delete, and modify local user accounts.
   b. Change passwords and adjust password aging for local user accounts.
   c. Create, delete, and modify local groups and group memberships.
4. Working with files
   a. Archive, compress, unpack, and uncompress files using tar, star, gzip, and bzip2.
   b. Create and edit text files.
   c. Create, delete, copy, and move files and directories.
   d. Create hard and soft links.
   e. List, set, and change standard ugo/rwx permissions.
   f. Locate, read, and use system documentation including man, info, and files in/usr/share/doc.
5. List, create, delete, and set partition types for primary, extended, and logical partitions.
6. Create and remove physical volumes, assign physical volumes to volumes groups, and create and delete logical volumes
7. Create; mount; unmount; and use ext2, ext3, and ext4 file systems.
8. Create and manage access control lists (ACLs).
9. Diagnose and correct file permission problems.
10. Configure network and hostname resolution statically or dynamically

BCSICT403: STORAGE AND DATA CENTER LAB

L T P C
0 0 2 1

List of Experiments:

1. Configuring the Directly Attached Disks for Basic and Dynamic Disks
2. Creating and configuring the disk partitions and volumes for the disk in Windows/Linux System
3. Creating and Configuring the RAID 0, 1 and RAID5 in windows server 2012 R2
4. Configuring the Network Share using Windows Server 2012 R2
5. Configuring the File Server in Windows Server 2012 R2
6. Configuring NFS in Linux Server
7. Configuring the iSCSI in Windows Server 2012 R2
8. Configuring FCOE in Windows Server 2012 R2
9. Creating a System Backup and Restoring in Windows Server and Linux System
10. Creating and Restoring the Snapshot for Virtual Machines in Hyper-V
11. Installing and configuring the NLB in Windows Server 2012 R2
12. Installing and configuring Failover Clustering in Windows Server 2012 R2