Scheme of Instructions & Syllabus of

Bachelor of Computer Applications

(Cloud Computing)

1st Year

(2025-28)

Total Credit of the Program

Semester	I	II	III	IV	V	VI	Total
Credits	24	27	26	30	24	24	**155**

Dr. Akash Sanghi	**Prof. YDS Arya**	**Prof. Manish Gupta**
HOD, Computer Applications	Vice Chancellor	Dean, Computer Applications

Faculty of Computer Applications
INVERTIS UNIVERSITY
Bareilly-243123 U.P.

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications (Cloud Computing)

(Session 2025-28)

SEMESTER I, YEAR I

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAICC101	English-I	2+1+0	25	50	75	3
2	BCAICC102	Theory of Mathematics	2+1+0	25	50	75	3
3	BCAICC103	Programming in C	3+1+0	30	70	100	4
4	BCAICC104	Client-Side Scripting	3+1+0	30	70	100	4
PRACTICAL / PROJECTS							
5	IIOT1AC	Data Analytics	0+0+4	30	70	100	4
6	BCAICC153	Programming in C Lab	0+0+4	15	35	50	2
7	BCAICC154	Client-Side Scripting Lab	0+0+4	15	35	50	2
8	BCAICC151	Effective Communication Skills	0+0+2	10	15	25	1
9	BCAICC155	Office Automation Lab	0+0+2	10	15	25	1
TOTAL			**10+4+16**	**190**	**410**	**600**	**24**

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications (Cloud Computing)

(Session 2025-28)

SEMESTER II, YEAR I

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAICC201	Linux Shell Scripting	3+1+0	30	70	100	4
2	BCAICC202	Python Programming	3+1+0	30	70	100	4
3	BCAICC203	Power BI	2+1+0	25	50	75	3
4	BCAICC204	Operating Systems	2+1+0	25	50	75	3
5	BCAICC205	Environmental Studies	2+1+0	25	50	75	3
PRACTICAL / PROJECTS							
6	IIOT2AC	Advanced Data Analytics	3+1+0	30	70	100	4
7	BCAICC251	Linux Shell Scripting Lab	0+0+4	15	35	50	2
8	BCAICC252	Python Programming Lab	0+0+4	15	35	50	2
9	BCAICC253	Power BI Lab	0+0+4	15	35	50	2
TOTAL			**15+6+12**	**210**	**465**	**675**	**27**

STUDY AND EVALUATION SCHEME

Bachelor of Computer Applications (Cloud Computing)

(Session 2025-28)

SEMESTER III, YEAR II

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCAICC301	Database Management Systems	3+1+0	30	70	100	4
2	BCAICC302	Data Structures	3+1+0	30	70	100	4
3	BCAICC303	Data Communication and Computer Networks	3+1+0	30	70	100	4
4	BCACC304	Cloud Computing	2+1+0	25	50	75	3
5		Elective-I	2+1+0	25	50	75	3
PRACTICAL PROJECTS							
6	IIOT3AC	Machine Learning	0+0+4	30	70	100	4
7	BCAICC351	Database Management Systems Lab	0+0+4	15	35	50	2
8	BCAICC352	Data Structures Lab	0+0+4	15	35	50	2
TOTAL			**13+5+12**	**200**	**450**	**650**	**26**

Elective I		
S.No	**Course Code**	**Program Elective-I**
1	BCACC315	Information Security
2	BCACC316	Server Administration
3	BCACC 317	Linux Administration

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SEMESTER IV, YEAR II

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCACC401	Principles of Virtualization	3+1+0	30	70	100	4
2	BCACC402	Network Security	2+1+0	25	50	75	3
3		Elective-II	2+1+0	25	50	75	3
4	BCAIAI406	Responsive Web Design-Front End Development	3+1+0	30	70	100	4
5	BCAICC407	Java Programming	3+1+0	30	70	100	4
6	BCAICC408	Logical Reasoning and Thinking	3+1+0	15	35	50	2
PRACTICAL / PROJECTS							
6	IIOT4AC	Deep Learning	0+0+4	30	70	100	4
7	BCACC451	Principles of Virtualization Lab	0+0+4	15	35	50	2
9	BCAICC456	Responsive Web Design-Front End Development Lab	0+0+4	15	35	50	2
10	BCAICC457	Java Programming Lab	0+0+4	15	35	50	2
TOTAL			**16+6+16**	**230**	**520**	**750**	**30**

Elective II		
S.No	**Course Code**	**Program Elective-II**
1	BCACC403	Storage and Datacenter
2	BCACC404	Database security fundamentals

STUDY AND EVALUATION SCHEME

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SEMESTER V, YEAR III

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
1	BCACC501	AWS	3+1+0	30	70	100	4
2	BCACC502	Cloud Migration	3+1+0	30	70	100	4
3		Elective –III	2+1+0	25	50	75	3
4		Elective – IV	2+1+0	25	50	75	3
5		Generic Elective – I	2+1+0	15	35	50	2
PRACTICAL / PROJECTS							
6	IIOT5AC	Advanced Artificial Intelligence	0+0+4	30	70	100	4
7	BCACC551	AWS Lab	0+0+4	15	35	50	2
8		Elective – III Lab	0+0+4	15	35	50	2
TOTAL			**12+5+12**	**185**	**415**	**600**	**24**

Elective III		
S.No	**Course Code**	**Program Elective-III**
1	BCACC513	Power Shell Scripting
2	BCACC514	Infrastructure Automation

Elective III Lab		
S.No	**Course Code**	**Program Elective-III Lab**
1	BCACC553	Power Shell Scripting Lab
2	BCACC554	Infrastructure Automation Lab

Elective IV		
S.No	**Course Code**	**Program Elective-IV**
1	BCACC515	Cloud Security
2	BCACC516	Application and Web Security

Generic Elective-I		
S.No	**Course Code**	**Generic Elective-I**
1	BCACC517	IT Governance, Risk, & Information Security Management
2	BCACC518	Infrastructure Solutions on Cloud

STUDY AND EVALUATION SCHEME

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SEMESTER VI, YEAR III

S.No	Course Code	Course Title	L+T+P	CA	EE	Total	Credit
PRACTICAL / PROJECTS							
1	BCAICC651	Internship	0+0+0	180	420	600	24
TOTAL			**0+0+0**	**180**	**420**	**600**	**24**

Syllabus

Semester: I

BCAICC101: English-I						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of English Grammar and Vocabulary, Fundamental Interpersonal and Presentation Skill.

Course Objectives:

1. To enhance students' proficiency in English language skills—listening, speaking, reading, and writing—for professional contexts.
2. To develop effective verbal and non-verbal communication skills required in workplace settings, including interviews, meetings, and presentations.
3. To familiarize students with business and technical communication formats such as reports, emails, proposals, and notices.
4. To cultivate interpersonal skills, confidence, and etiquette necessary for teamwork, leadership, and cross-cultural communication.

Detailed Syllabus

Unit I:

Communication Process-What is communication? The communication model, elements of communication, Importance of effective communication skills in the business world, Components of Communication Process, practicing effective communication, good communication Vs effective communication, styles of communication, intercultural communication skills- need for attitude change and benefits

Unit II:

Types of Communication & Barriers to communication-Verbal Communication, Non Verbal Communication, Written Communication, Do's and don'ts of each type, barriers to effective communication and how to overcome them, interaction of verbal and non-verbal communication, talents of a corporate communicator, silence- merits and limitations of each type

Unit III:

Listening Skills & Reading Skills-What is listening, various types of listening – Active, passive, selective, listening and note taking, listening and comprehending, listening to speak, principles of good listening Techniques to develop effective listening skills, Reading Skills- skimming, scanning and inferring- common reading techniques, practicing smart reading.

Unit IV:

Conversation Skills-Importance of conversation skills, features of a good conversation, Tips to improve Conversation skills, importance of questioning skills, techniques to ask right questions- role play situations to practice the same, discussing issues (social, political and cultural), formal and informal conversation

Unit V:

Telephone Etiquette: Basic rules of telephone etiquette- formal vs. informal; tone, pitch and vocabulary related to formal ways of speaking over the phone, leaving voice messages; practice sessions (role plays)

Persuasive communication: What is persuasive communication, different techniques of persuasive communication, How to negotiate using persuasive communication, the act of negotiation, negotiation style and their contexts, fundamentals of negotiation, common hurdles in negotiation and how to overcome them

Text Books:

1. "Active Listening 101: How to Turn Down Your Volume to Turn Up Your Communication Skills, by Emilia Hardman, 2012
2. The Power of Communication: Skills to Build Trust, Inspire Loyalty, and Lead Effectively, by Helio Fred Garcia, 2012

Reference Books:

1. Power Listening: Mastering the Most Critical Business Skill of All, by Bernard T. Ferrari, 2012
2. Fitly Spoken: Developing Effective Communication and Social Skills, by Greg S. Baker, 2011
3. The Secrets of Successful Communication: A Simple Guide to Effective Encounters in Business (Big Brain vs. Little Brain Communication), by Kevin T. McCartney, 2011.

Course Outcomes:

CO1: Demonstrate proficiency in English language skills including listening, speaking, reading, and writing for professional and academic purposes.

CO2: Apply principles of effective verbal and non-verbal communication in interviews, group discussions, and workplace interactions.

CO3: Write clear, concise, and well-structured professional documents such as emails, reports, proposals, and notices.

CO4: Deliver effective presentations and participate confidently in meetings and public speaking situations using appropriate communication tools and techniques.

CO5: Exhibit professionalism, teamwork, and intercultural communication skills essential for career development and workplace success.

BCAICC102: Theory of Mathematics						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of High School Mathematics, Familiarity with Logical Reasoning and Problem Solving

Course Objectives:

1. To develop a solid foundation in mathematical logic, set theory, relations, functions, and proof techniques essential for theoretical computer science.
2. To enhance analytical thinking and problem-solving abilities through the study of algebraic structures, combinatorics, and number theory.
3. To provide learners with the tools to understand and apply mathematical reasoning in computer algorithms, automata theory, and programming logic.
4. To introduce concepts of matrices, linear algebra, and graph theory that are crucial for data science, machine learning, and advanced computing applications.

Detailed Syllabus

Unit I:

Sets, relations and functions-Definition of Set, Type of Sets, Operations on Sets, Venn diagram, Cartesian Product, Relations, Functions, Types of function, Some elementary functions with their graphs (Exponential, logarithmic, modulus), Limit & continuity of a function (Simple Problems).

Unit II:

Matrices and Determinants-Types of Matrices, Operations of addition, Scalar Multiplication and Multiplication of Matrices, Determinant of a Square Matrix, Minors and Cofactors, Transpose, adjoint and inverse of a matrix, solving system of linear equations, in two or three variables using inverse of a matrix.

Unit III:

Limits, Continuity and Differentiation-Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities. Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions

Unit IV:

Coordinate Geometry-2D Cartesian Co-ordinate system, Straight line: (Equation & Slope of a line), Circle: Equation of Circle, Equation to Tangent, Conic Sections: Focus, Eccentricity, Directrix, Axis of a conic section, Parabola & Ellipse: (Definitions, equations and shape of curve only)

Unit V:

Statistics and Probability-Introduction, definition, terminologies in statistics and probability, measure of central tendency and dispersion, probability distribution – continuous and discrete, Bayes theorem, testing of hypothesis, basics of ANOVA, Correlation and Regression Analysis.

Text Book:

1. Mathematics for BCA by G. C. Sharma & Madhu Jain, Oscar Publication
2. Mathematics Vol-2 by R. D. Sharma, Dhalpat Raj & Sons

Reference Books:

1. The Elements of Co-ordinate Geometry Part-I by S. L. Loney, Book Palace, New Delhi.

Course Outcome:

After completion of the course the student will be able:

CO1: Understand and apply fundamental concepts of sets, logic, and proof techniques in mathematical and computational problem solving.
CO2: Analyze relations and functions, and use them to model and solve real-life and theoretical problems in computer science.
CO3: Demonstrate proficiency in algebraic structures such as groups, rings, and fields relevant to cryptography and coding theory.
CO4: Apply combinatorics and number theory in algorithm analysis, discrete probability, and network theory.
CO5: Utilize matrices, determinants, and linear algebra in data representation, system of equations, and applications in computer graphics and data science.

BCAICC103: Programming in C						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Boolean Algebra, Number System and basic mathematical formulas

Course Objectives:

1. To learn fundamentals of C Programming, Operators and Control Statements in C.
2. To understand usage of loop statements, arrays and strings in C Programming.
3. To learn the fundamentals of pointers, usage of pointers, memory allocation and functions in C Programming.
4. To understand the visibility and scope of variables on the basis of storage classes and defining user defined data types using structure, unions and enums in C Programming.
5. To learn how to handle a file using C Programs and fundamentals of an Operating System (Linux) Programming.

Detailed Syllabus

Unit I:

Introduction to Programming Problem Solving Using Computers: Language Classification, Problem Analysis, Algorithm and Flowchart design. Algorithms: Steps in developing algorithms, advantages and disadvantages. Flowcharts: Symbols used in developing flowcharts, advantages and disadvantages. Coding, testing, debugging, Documentation and maintenance. Program development and modular design.

Unit II:

Fundamentals of C programming and Control Structures: History, Structure of a C program, C Conventions, Character Set, Identifiers, Keywords, Simple Data types, Modifiers, Variables, Constants, Operators (Arithmetic operator, relational operator, logical operator, ternary operator, unary operator, shorthand operator, bit-wise operator and arithmetic operator) Operator precedence.

Unit III:

Input and Output operation: Single character input and output, formatted input and output, Buffered input. Control Structures: Introduction, Conditional statement, if statement, if-else statement, nested if statement, else-if statement and switch statement. Goto statement. Looping statement, while statement, do-while statement, for statement, break and continue, nested for statement

Unit IV: Arrays and Functions:

Arrays: Introduction (One and multi-dimensional), Declaration of arrays, Initialization of arrays, processing with arrays. String manipulation, declaration of string arrays, string operations.

Functions: Introduction, advantages of subprograms, Function definition, function call, Actual and formal arguments, local and global variables, function prototypes, types of functions, recursive functions, arrays and functions.

Unit V:

Storage Classes, Structures, Unions and Pointers: Storage Classes, Structures and Unions: Introduction, types of storage classes, Introduction to structures, Advantages of structures, accessing elements of a structure, nested structures, array of structures, functions and structures, Unions, bit-fields, enumerated data types.

Pointers: Introduction, pointer variable, pointer operator, pointer arithmetic, pointers and arrays, pointers and strings, array pointers, dynamic allocation

Unit VI:

Files, Preprocessor, standard library and header files: Files: Introduction, File data type, opening and closing a file, file functions (getc, putc, getw, putw, fscanf, fprintf, fread, fwrite, fgets, fputs, feof).

Preprocessor: #define, #include, #undef, Conditional compilation directives, C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions

Text Book:

1. Forouzon A Behrouz, Gilberg F Richard, A Structured Programming Approach using C - 3rd Illustrated Edition, 2009.
2. Kanetkar, Yashavant: "Let Us C", 6th Edition. BPB Publications.
3. Balagurusamy, E: "Programming in ANSI C" 3rd Edition. Tata McGraw-Hill

Reference Books:

1. The C programming Language by Richie and Kernighan, 2004, BPB Publication
2. Gottfried, Byron S: "Programming with C", 1996. Tata McGraw-Hill
3. Deitel, H M and Deitel P J: "C How to Program", 2nd Edition. Prentice-Hall

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamentals of C programming, including data types, operators, expressions, and input/output operations.

CO2: Apply control structures such as decision-making, looping, and branching to solve computational problems.

CO3: Develop programs using functions, recursion, and arrays for efficient modular programming.

CO4: Utilize pointers, structures, and unions to handle complex data manipulation and memory management.

CO5: Implement file handling techniques to read from and write to files for data storage and retrieval.

BCAICC104: Client-Side Scripting						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basic Knowledge of Computer Fundamentals, Familiarity with HTML and Web Browsers

Course Objectives:

1. To introduce the fundamental concepts of client-side web development
2. To enable students to understand and implement dynamic behavior on web pages
3. To develop skills for validating forms and handling events on the client side
4. To familiarize students with modern scripting practices and debugging techniques

Detailed Syllabus

Unit I:

Introduction to the Internet and the World Wide Web: Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture, Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back-end web development. HTML, CSS, JS, XML; HTTP, secure HTTP, etc.; URL, Web Services – SOAP, REST.

Unit II:

HTML, CSS & JavaScript: Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, div tag

Unit III:

Html forms: Html forms - Input type, Text area, Select, Button, Images. Introduction to CSS, Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text & background color, Inline styles, External and Internal Style Sheets, Borders & boxing. Introduction to JavaScript: Data types, variables, operators, expressions, statements, functions, objects, arrays, date, math, error handling, flow control, loops

Unit IV:

XML and HTML5, CSS3: Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema, XML Parser, Document Object Model (DOM), XML DOM. Introduction to HTML5, CSS3, New features, Local storage, Web Sockets, Server events, Canvas, Audio & Video, Geolocation, Microdata, Drag and Drop. Browser life cycle and browser rendering stages. Service workers.

Unit V:

Practical website development: Commonly used Web Servers and browsers, Setting up a server and domain name, website types and structures, web authoring tools, Web hosting, website maintenance, generating traffic to your website.

Unit VI:

PHP Server side scripting: Introduction to PHP, Basic Syntax, Variables, constants and operators, Loops, Arrays and Strings, Environment & environment variables, responding to HTTP requests, Files, Cookies, Sessions, Examples.

Text Books:

1. Practical Web Design for Absolute Beginners, Adrian W. West. Apress 2016
2. Introducing Web Development, Jorg Krause. Apress 2017.
3. HTML & CSS: The Complete Reference, Thomas Powell. McGraw Hill, Fifth Edition, 2010
4. Creating a Website: The Missing Manual, 3rd Edition, Mathew Macdonald. O'Reilly
5. Web Technologies - HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and Ajax Black, Kogen Learning Systems (Dreamtech Press), 5th Edition 2009.

Reference Books:

1. HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010
2. HTML5 & CSS3 for the Real World, 2 Edition, Alexis Goldstein, Estelle Weyl, Louis Lazaris. Apress 2015.
3. HTML5 & CSS3 for Dummies, Andy Harris. Wiley 2014.
4. Learning PHP A Gentle Introduction to the Web's Most Popular Language, David Sklar. O'Reilly 2016.
5. Build Your Own Database Driven Web Site Using PHP & MySQL, Kevin Yank. Sitepoint , 4th Edition, 2009.

Course Outcome:

After completing the course, students will be able to:

CO1: Develop interactive and responsive web pages using HTML, CSS, and JavaScript.
CO2: Apply JavaScript to manipulate Document Object Model (DOM) elements dynamically.
CO3: Implement client-side form validation and handle user-triggered events effectively.
CO4: Use browser developer tools to debug and optimize client-side scripts.
CO5: Design user-friendly interfaces through efficient scripting practices and techniques.

Syllabus

Semester: II

BCAICC201: Linux Shell Scripting						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basic Knowledge of Operating Systems, Familiarity with Linux Command Line Interface (CLI)

Course Objectives:

1. Understand the fundamentals of Linux operating system and shell environments.
2. Learn to write, execute, and debug shell scripts for task automation.
3. Develop skills to manage files, processes, and system operations using shell commands.
4. Apply scripting techniques to solve real-world system administration problems.

Detailed Syllabus

Unit 1:

Introduction to UNIX: History of UNIX - Unix Components/Architecture - Features of Unix – UNIX Environment and UNIX Structure - Posix and Single Unix specification - The login prompt - UNIX commands – Basic commands - echo, printf, ls, who, date, passwd, cal - Combining commands
Internal and external commands – type, man, more and other commands – the user terminal, displaying its characteristics and setting characteristics - The root login - super user: sucommand - /etc/passwd and /etc/shadow files - Commands to add, modify and delete users.

Unit II:

UNIX file system: UNIX File basics - File types and Categories – File Organization – Directories - home directory and the HOME variable - Reaching required files- the PATH variable - Relative and absolute pathnames. Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent parent directories - File related commands – cat, mv, rm, cp, wc

Unit III:

File Management: File inodes and the inode structure. File links – hard and soft links – Head and tail commands Cut and paste commands - The sort command - Special files /dev/null and /dev/tty - File attributes and permissions - The umask and default file permissions - ls command - Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions

Unit IV:

UNIX Process Management: The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. Process Control: Process Creation – Signals – Process Termination – Invoking other programs – PID & PPID – Shell on a Shell.

Unit V:

Vi Editor: Introduction to Text Processing, Command & edit Mode, Invoking vi, deleting & inserting Line, Deleting & Replacing Character, Searching for Strings, Yanking, Running Shell Command Macros, Set Window, Set Auto Indent, Set No. Communicating with Other Users: who, mail, wall, send, mesg.

Unit VI:

Shell programming: Introduction – Need for Scripts – Creating and Calling the Script – The Shebang – Different ways of running a script - Using variables in Script – Reading Input – Integer Variables – Arithmetic Expressions – Read-only variables – Exporting variables – Arrays - Control Statements: If, Then, Else, While and Until, Classic For, Break and Continue, Case – Handling Script Parameters: Shift, Getopts – Shell Functions – Handling Conditional expression patterns and Regular expressions in scripts.

Text Books:

1. Sumitabha Das., UNIX Concepts and Applications. 4th Edition. Tata McGraw Hill, July 2017.
2. Behrouz A. Forouzan, Richard F. Gilberg : UNIX and Shell Programming- Cengage Learning – India Edition. 2009

Reference Books:

1. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.
2. Richard Blum, Christine Bresnahan: Linux Command Line and Shell Scripting Bible, 2nd Edition , Wiley,2014.

Course Outcomes:

After completing the course, students will be able to:

CO1: Demonstrate proficiency in using Linux commands and shell environments.
CO2: Write efficient shell scripts to automate routine system tasks.
CO3: Manage files, directories, and processes through script-based solutions.
CO4: Apply conditional statements, loops, and functions in shell programming.
CO5: Troubleshoot and debug shell scripts to ensure smooth execution.

BCAICC202: Python Programming						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basic computer skills, a problem-solving mindset, and familiarity with programming concepts

Course Objectives:

1. To know the basics of Programming
2. To construct Python programs with control structures.
3. To structure a Python Program as a set of functions.
4. To use Python data structures-lists, tuples, dictionaries.
5. To do input/output with files in Python.

Detailed Syllabus

Unit I:
Introduction to Python: Introduction: Introduction to Python, setting up the environment, Installing Python, running python program, Python's execution model, Guidelines on how to write good, The Python culture, A note on the IDEs. **Built-in Data Types:** Numbers, Immutable sequences, Mutable sequences, set types, Mapping types – dictionaries, the collections module, Final considerations **Iterating and Making Decisions:** Conditional programming, Looping, Putting this all together.

Unit II:
Advanced Concepts: Program Control Flow Conditional Statements The if Statement, The if-else Statement, The if-elif Statement, The if-elif Statement, Nested if Statements, Python Indentation, Looping and Iteration, The For Loop, The While Loop, Loop else Statement, Nested Loops, Break and Continue, The Range Function, Introduction to range(), Types of range() function, Use of range() function.
Introduction To Functions Built-In Functions, Introduction to Functions, Using a Functions, Python Function Types, Structure of Python Functions, E.g. - map, zip, reduce, filter, any, chr, ord, sorted, globals, locals, all, etc.
User Defined Functions Structure of a Python Program w.r.t. UDF, Types of Functions, Invoking UDF, Flow of Execution, Arguments and Parameters, Default Arguments, Named Arguments, Scope of Variables, Lambda function.
Recursion Function Use of recursion function.

Unit III:
Advanced Concepts: Functions, the Building Blocks of Code: Use of functions, Scopes and name resolution, input parameters, return values, Recursive functions, Anonymous functions, Function attributes, Built-in functions, importing objects. **Saving Time and Memory:** map, zip, and filter, Comprehensions, Generators, some performance considerations, Name localization, and Generation behavior in built-ins. **Advanced Concepts:** OOP, Decorators, and Iterators: Decorators, Class and object namespaces, Attribute shadowing, initializing an instance, Accessing a base class, Multiple inheritance, Static and class methods, Private methods and name mangling, The property decorator, Operator overloading, Polymorphism

Unit IV:

Web Development: The Edges – GUIs and Scripts: Scripting-The imports, Parsing Arguments, The business logic, GUI application- The import, The layout logic, The business logic, The tkinter.tixmodule, The turtle module, wxPython, PyQt, and PyGTK, The principle of least astonishment, Threading considerations. **Web Development Done Right:** Django design philosophy, The Django URL dispatcher, setting up Django, Adding the Entry model, Customizing the admin panel, Creating the form, Writing the views, tying up URLs and views, Writing the templates, writing a Flask view, Building a JSON quote server in Falcon.

Unit V:

Cloud Database with Python: Building a Web Application in Python: Getting started with applications, working with HTML with CSS, Binding data for the adduser template, Data binding for the addtweet template, **Interacting Data Services:** MongoDB terminology, initializing the MongoDB database, integrating Python with MongoDB, working with user resources.

Unit VI:

Exception Handling: Testing, Profiling, and Dealing with Exceptions: The anatomy of a test, testing guidelines, Unit testing, Test-driven development, Exceptions, Profiling Python. Debugging and Troubleshooting: Debugging with print, Debugging with a custom function, Inspecting the traceback, Using the Python debugger, Inspecting log files, Other techniques, Troubleshooting guidelines.

Text Books:

1. Learn Python Programming, 2nd Edition by Fabrizio Romano
2. Python Cookbook, 3rd Edition by David Beazley (Author), Brian K. Jones (Author)

Reference Books:

1. Python Programming: A Step-by-Step Guide For Absolute Beginners by Brian Jenkins and ATS Coding Academy
2. Python and AWS Cookbook: Managing Your Cloud with Python and Boto by Mitch Garnaat
3. Advanced Python Programming: Build high performance, concurrent, and multi-threaded apps with Python using proven design patterns by Dr. Gabriele Lanaro
4. Programming Google App Engine with Python: Build and Run Scalable Python Apps on Google's Infrastructure by Dan Sanderson

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the syntax, semantics, and basic constructs of Python programming, including variables, data types, and operators.
CO2: Apply control structures such as decision-making and loops to develop logic-based Python programs.
CO3: Develop modular programs using functions, built-in libraries, and user-defined modules.
CO4: Implement programs using data structures such as strings, lists, tuples, sets, and dictionaries.
CO5: Create file handling programs and apply object-oriented programming concepts such as classes, objects, inheritance, and polymorphism in Python.

BCAICC203: Power BI						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite:

1. Basic Knowledge of Excel and Data Handling
2. Fundamentals of Data Analysis and Visualization

Course Objective:

1. Understand data visualization principles and Power BI's role in business intelligence.
2. Learn data importing, cleaning, and transformation using Power Query.
3. Create interactive dashboards and reports for insightful data analysis.
4. Apply DAX functions for advanced calculations and data modeling.

UNIT I

Introduction to Power BI: Introduction to Power BI, Installation and setup of Power BI Desktop, Need for Power BI, Importance of Power BI, Introduction to Business Intelligence, Traditional BI vs. Power BI, Power BI vs Excel, Uses of Power BI.

UNIT II

Power BI Interface Overview: Importing and Connecting Data (Excel, CSV, databases, and cloud sources). Exploring the Fields, Visualizations, and Filters panes.

UNIT III

Data Transformation: Basic transformation, Introduction to Power Query, Use the first row as a header, Remove row, Add new columns, Add conditional columns, Remove blank/null values.

UNIT IV

Data Modeling: Understanding relationships between tables, Create relationships between multiple tables, Creating calculated columns, measures, and hierarchies, Introduction to DAX (Data Analysis Expressions),

UNIT V

Data Visualization: Types of visualizations: Tables, Charts, Maps, Cards, etc, Customizing visuals (filters, slicers,), Formatting and enhancing visual appeal, Creating dashboards with KPIs. Saving & Publishing your report

Textbooks:

1. "Mastering Microsoft Power BI" – Brett Powell, 2nd Edition (2022)
2. "Microsoft Power BI Quick Start Guide" – Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, 3rd Edition (2023)

Reference Books:

1. "Pro Power BI Desktop" – Adam Aspin, 2nd Edition (2020)
2. "Analyzing Data with Power BI and Power Pivot for Excel" – Alberto Ferrari & Marco Russo, 1st Edition (2017)

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the core concepts of business intelligence and the functionality of Power BI.
CO2: Import, clean, and transform data from various sources using Power BI tools.
CO3: Create data models and relationships to support efficient data analysis.
CO4: Design interactive dashboards and reports using various visualization techniques.
CO5: Apply DAX functions to perform complex calculations and enhance analytical capabilities.

BCAICC204: Operating Systems						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: - Programming languages, Data Structures, Microprocessor peripherals and interfacing

Course Objectives:

1. Define and list the functions of an operating system.
2. list resources involved in process creation and management.
3. Explain the use of paging and segmentation
4. Explain the function and structure of the I/O system.
5. Describe path names and directory structure visible to end users

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: 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.

Unit III:

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 IV:

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 V:

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

Unit VI:

Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, and Implementation of Access 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.

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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,6th Edition, 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 Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic concepts, functions, and types of operating systems, including system components and services.
CO2: Analyze process management techniques including process scheduling, creation, synchronization, and inter-process communication.
CO3: Apply concepts of memory management such as paging, segmentation, and virtual memory.
CO4: Understand and evaluate file systems, file access methods, and disk scheduling algorithms.
CO5: Demonstrate knowledge of deadlock detection, prevention, and recovery techniques in multi-process environments.

BCAICC205: Environmental Studies						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: - General knowledge of Ecology and Environment Biotechnology

Course Objectives:

1. Investigate the complexities of the natural environment and our relationship with it.
2. Explore the problems we face in understanding our natural environment and in living sustainability.
3. Develop scientific, interpretive and creative thinking skills.
4. Learn to apply quantitative analysis and field research techniques.
5. Use computer-based geographical information systems to study environmental change.

Detailed Syllabus

Unit I:
Introduction and natural resources: Multidisciplinary nature and public awareness, renewable and non-renewable resources and associated problems, forest, water, mineral, food, energy and land resources. Introduction to natural resources, conservation of natural resources and human role.

Unit II:
Ecosystem: Ecological concepts, concept of ecosystems, types of ecosystems, ecosystem structure and functioning, energy flow, food chains and food webs, ecological pyramids.

Unit III:
Biodiversity and Conservation: Definition, genetic species and ecosystem diversity biogeographically, classification of Indian value of biodiversity at national and local levels, India as a mega-diversity nation, treats to biodiversity and endangered and endemic species of India, need for conservation of biodiversity.

Unit IV:
Environmental pollution: Definition, causes, effect and control of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, electromagnetic pollution, nuclear hazards , human role in prevention of pollution, solid waste management, disaster management, floods , earthquake, cyclone, and landslide
Firework Safety: Combustion of firework and pollution (noise, smoke, fireworks fallout and residue pollution), heavy metal toxicity due to fireworks and associated health effects.

Unit V:

Social Issue and Environment: Unsuitable to suitable development, urban problem related to energy and water conservation, environment protection act, wild life protection act, forest conservation act, environmental issues, population explosion, and family welfare programme. Environmental and human health HIV, women and child welfare, role of information technology on environment and human health.

Corruption: definition and reasons, details of organizations/agencies working against corruption, role of individual against corruption and mode of action.

Ethics: Meaning, nature, determinants and objectives of ethics, ethics and its relation to values norms and morals, Indian ethos, Swami Vivekananda and ethics.

Text/Reference Books

1. Fundamentals of Environmental Biology, K. C. Agrawal, Nidhi Publishers (Bikaner).
2. Fundamentals of Ecology, E.P. Odum, W.B. Saunders Co. (USA).
3. Fundamentals of Ecology, E. P. Odum, Natraj Publisher (Dehradun).
4. Ecology: Principles and Applications, J. L. Chapman & , M. J. Reiss, Cambridge University Press.
5. Atmospheric pollution, W. Buch , Tata McGraw Hill(TMH)
6. Professional Ethics and Human Values, M. Govindarajan, PHI Learning Private Limited (Delhi).
7. Corruption and Reform in India, Jennifer Bussell , Cambridge University Press.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the structure and function of ecological systems and their relevance to environmental sustainability.

CO2: Analyze the causes and effects of environmental pollution and evaluate control measures to protect natural resources.

CO3: Demonstrate awareness of environmental policies, laws, and practices for sustainable development at local, national, and global levels.

CO4: Evaluate the role of biodiversity and conservation strategies in maintaining ecological balance.

CO5: Apply knowledge of renewable and non-renewable resources to suggest practical solutions for environmental challenges.

Syllabus

Semester: III

BCAICC301: Database Management System						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Computer Organization, Operating System, Data Structure, Mathematics

Course Objectives:

1. To introduce the fundamental concepts of database systems, data models, and database architecture.
2. To provide knowledge of relational databases, SQL, and techniques for effective data storage, retrieval, and manipulation.
3. To develop an understanding of database design using Entity-Relationship (ER) modeling and normalization techniques.
4. To enable students to implement and manage databases with attention to data integrity, security, and transaction management.

Detailed Syllabus:

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: The relational Model – The catalog- Types, 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 Databases: Introduction to Relational Databases and Terminology-Relation, Tuple, Attribute, Cardinality, Degree, Domain. Keys, Super Key, Candidate Key, Primary Key, Foreign Key, Relational Algebra. Operations, Select, Project, Union, Difference, Intersection Cartesian product, Join, Natural Join.

Unit IV:
SQL: 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 V:
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 VI:
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 Book:
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. 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.
3. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGraw Hill, 2003.

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts of database systems, data models, and database architecture to design efficient data storage solutions.
CO2: Apply Entity-Relationship (ER) modeling to design relational databases and convert ER diagrams into normalized relational schemas.
CO3: Construct and execute queries using Structured Query Language (SQL) to manipulate and retrieve data effectively.
CO4: Analyze and apply normalization techniques and functional dependencies to optimize database design and reduce data redundancy.
CO5: Understand and implement concepts of transaction management, concurrency control, and database recovery to ensure data integrity and consistency.

BCAICC302: Data Structures						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: - Programming languages, Data Structures, Microprocessor peripherals and interfacing.

Course Objectives:

1. Define and list the functions of an operating system.
2. list resources involved in process creation and management.
3. Explain the use of paging and segmentation
4. Explain the function and structure of the I/O system.
5. Describe path names and directory structure visible to end users

Detailed Syllabus:

Unit I:

Introduction to Data structures:Introduction: 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.

Unit V:

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: Preorder, Inorder and postorder. Graphs, Application of Graphs, Depth First search, Breadth First search.

Unit V:

Memory Management and File System:

Memory Management: Logical versus Physical Address Space, Swapping, Contiguous Allocation (Memory Allocation, Fragmentation), Paging (Basic Method, Hardware Support), Segmentation (Basic Method, Hardware). Virtual Memory: Demand Paging, Page Replacement, Page Replacement Algorithms.

File System: File Concept, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management, Protection of File System. Input/output Management. Linux Case Study.

Text Book

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'

Reference Books:

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

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts of data structures and their importance in algorithm design and software development.
CO2: Implement linear data structures such as arrays, linked lists, stacks, and queues for various computational problems.
CO3: Apply non-linear data structures like trees and graphs to solve hierarchical and network-based problems.
CO4: Analyze and compare the efficiency of different sorting and searching algorithms in terms of time and space complexity.
CO5: Choose appropriate data structures for problem-solving and develop efficient solutions using structured and modular programming techniques.

BCAICC303: Data Communication and Computer Networks						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite:

1. Familiarity with the fundamentals of Digital Electronics.
2. A network simulation method.

Course Objectives:

1. Learn how computer network hardware and software operate.
2. Investigate the fundamental issues driving network design.
3. Learn about dominant network technologies.

Detailed Syllabus

Unit I:

Networking Fundamentals: Basics of Network & Networking, Advantages of Networking, Types of Networks, Types of Network Architecture, Network Topologies, Types of Topologies, Communication Modes, Introduction of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, Comparison between OSI model & TCP/IP model,

Unit II:

Physical Layer: Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Introduction to Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching methods,

Unit III:

Data Link Layer and Medium Access sub layer: Random Access, Multiple access protocols- Pure ALOHA, Slotted ALOHA, CSMA/CD, IEEE standards, Ethernet and Token Ring, Framing, Error detection and correction codes: checksum, CRC, hamming code, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ.

Unit IV:

Basics of Network Layer: Network Devices- NIC, Hub, Switch, Bridge, Router, Gateways, Repeater, Internet Protocol (IP), IP standards, versions, functions, The IPv4 and IPv6 Datagram Format, IPv4 addressing (classful and classless addressing), IPv4 Subnetting, Internet Control Message Protocol, Internet Group Management Protocol, Routing algorithms.

Unit V:

Transport Layer: Process to Process Communication, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets, Connection management: Three-way Handshaking.

Unit VI:

Application Layer: File Transfer Protocol, Domain Name System, Electronic mail, Intro of Client server model, Hyper Text Transfer Protocol, WWW, Firewalls, Basic concepts of Cryptography.

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 Outcomes:

After completing the course, students will be able to:

CO1: Understand the basic concepts of data communication, network models, and transmission media used in modern communication systems.
CO2: Explain the functions and protocols of different layers in the OSI and TCP/IP network models.
CO3: Analyze error detection and correction techniques, as well as flow and congestion control mechanisms in reliable data transfer.
CO4: Evaluate different switching techniques, IP addressing schemes, and routing algorithms used in network communication.
CO5: Demonstrate knowledge of various network topologies, protocols, and security measures used in wired and wireless networks.

BCACC304: Cloud Computing						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite:

1. Fundamentals of Operating Systems and Virtualization.
2. Basic Knowledge of Computer Networks.

Course Objectives:

1. To introduce the fundamental concepts and architecture of cloud computing.
2. To provide knowledge about virtualization and its role in enabling cloud services.
3. To familiarize students with various cloud platforms and technologies.
4. To develop an understanding of cloud security, resource management, and cost optimization strategies

Detailed Syllabus

Unit I:

Fundamentals of Cloud Computing: Cloud Computing Basics – History of Cloud Computing, Characteristics of Cloud Computing, Need for Cloud computing, Advantages and Possible Disadvantages of cloud computing, Cloud Deployment Models – Public, Private, Hybrid, Community, Other deployment Models. Evolving Data Center into Private Cloud, Datacenter Components, Extracting Business value in Cloud Computing – Cloud Security, Cloud Scalability, Time to Market, Distribution over the Internet, Cloud Computing Case Studies.

Unit II:

Cloud Delivery Models: Introduction to Cloud Services, Infrastructure as a Service (IAAS) – Overview, Virtualization, Container, Pricing Models, Service Level Agreements, Migrating to the Cloud, IaaS Networking options, Virtual Private Cloud(VPC), IAAS Storage – File and Object storage, Data Protection, IaaS security, Benefits, Risks and Examples of IaaS. Platform as a Service (PAAS) – Overview, IAAS v/s PAAS, PAAS Examples, benefits and risks. Software as a Service (SAAS) – Introducing SaaS, SaaS Examples – Office 365, Google G Suite, Salesforce.com , Evaluating SaaS – user and vendor perspective, Impact of SaaS, Benefits and risks of SaaS. Other Services on Cloud, Cloud Delivery Models Considerations

Unit III:

Cloud Platforms: Introducing Cloud Platforms, Evaluating cloud platforms, Cloud Platform technologies – Amazon Web Services, Microsoft Azure, Google Cloud Platform, Salesforce.com, and Impact of Cloud platforms. Private Cloud Platforms – Introducing Private clouds – Microsoft Azure stack, Open stack, AWS Greengrass, Impact of Private cloudsCloud Migration: Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud., Risks:

Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies

Unit IV:

Cloud Computing - Challenges, Risk and Mitigation: Cloud Storage, Application performance, Data Integration, Security. Ensuring Successful Cloud Adoption: Designing a Cloud Proof of Concept, Vendor roles and capabilities, moving to the Cloud. Impact of Cloud on IT Service Management.
Risks and Consequences of Cloud Computing – Legal Issues, Compliance Issues, Privacy and Security.

Unit V:

Managing the Cloud: Managing and Securing Cloud Services, Virtualization and the Cloud, Managing Desktops and devices on the cloud, SOA and Cloud computing, Managing the Cloud environment, Planning for the Cloud – Economic Cost Model and Leveraging the Cloud, Cloud computing resources, Cloud Dos and Don'ts.

Text Books:

1. Kirk Hausman, Susan L. Cook, TelmoSampaio, "CLOUD ESSENTIALS CompTIA® Authorized Courseware for Exam CLO-001", John Wiley & Sons Inc., 2013
2. Judith Hurwitz , Robin Bloor , Marcia Kaufman , Fern Halper, "Cloud Computing for Dummies", Wiley Publishing Inc., 2010

Reference Books:

1. Erl," Cloud Computing: Concepts, Technology & Architecture", Pearson Education, 2014
2. Srinivasan, "Cloud Computing: A Practical Approach for Learning and Implementation "Pearson Education, 2014

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts, architecture, and service models of cloud computing.
CO2: Explain the role of virtualization in cloud environments and how it supports scalable and flexible computing resources.
CO3: Identify and compare major cloud service providers (e.g., AWS, Azure, GCP) and their core services.
CO4: Apply cloud deployment and management techniques for building, testing, and deploying cloud-based applications.
CO5: Analyze cloud security challenges and implement basic strategies for data protection, access control, and cost management in the cloud.

BCACC315 (Elective-I): Information Security						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of Computer Networks, Fundamentals of Operating Systems

Course Objective:

1. To introduce fundamental principles of information security (CIA triad).
2. To understand various security threats, attacks, and vulnerabilities.
3. To study cryptographic techniques and secure communication protocols.
4. To apply security policies and risk management strategies.

Unit I:

Introduction: Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation: Security functionality and Ease of Use Triangle

Unit II:

User Identity and Access Management: User identity and Access Management: Authentication, Account Authorization, Validation, Access Control and Privilege management. Hashing and Cryptography- Encryption and Decryption

Unit III:

System and Server Security: System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

Unit IV:

Internet Security: Internet Security: LAN Security, Email Security, Hacking attacks, preventive measures.

Unit V:

Risk Assessment and Cyber Laws: Vulnerability Assessment, Penetration Testing, Risk Assessment, Threat, Vulnerability, Cyber Laws – Indian Context

Text Book:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices - Nina Godbole, ISC2 Press, 2010
2. Mark Stamp's Information Security: Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)
3. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012
4. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
5. Cyber Security by Nina Godbole, SunitBelapure, Wiley, 2011

Reference Books:

1. Principles of Information Security by Michael E. Whitman, Cengage Learning India Private Limited; 5th Edition (2015)
2. Information Security Management Handbook, Volume 4 - Micki Krause, ISC2 Press,

Couse Outcome:

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

CO1: Understand the core principles of information security including confidentiality, integrity, and availability.
CO2: Identify and analyze various types of cyber threats, attacks, and vulnerabilities.
CO3: Apply cryptographic techniques to secure data and communication.
CO4: Implement security mechanisms and tools to protect information systems.
CO5: Evaluate and design security policies and risk management strategies for organizations.

BCACC316 (Elective-I): Server Administration						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of Operating Systems, Fundamentals of Computer Networks

Course Objective:

1. To provide foundational knowledge of server operating systems and architectures.
2. To develop skills for installing, configuring, and managing various types of servers.
3. To understand user account management, permissions, and security configurations.
4. To enable students to monitor server performance and perform troubleshooting tasks.

Unit I:

Installing and Configuring Windows Server 2012: Introduction, Selecting a Windows Server 2012 Edition, Supporting Server Roles and Features, Server Licensing, Installing Windows Server 2012: System Requirement, Performing a Clean Installation, Working with Installation Partitions, Server Core Defaults, Server Core Capabilities, Completing Post-Installation Tasks, Converting Between GUI and Server Core, Upgrade paths, Installing Windows Server Migration Tools, Configuring NIC Teaming, Configuring local storage, Configuring WDS to install OS through networking.

Unit II:

Securing Files and Disks: How to Securing Files, Encryption files with EFS, Configuring EFS, Using the Cipher Command, Sharing Files Protected with EFS with others, Configuring EFS with Group Policies, Configuring EFS Recovery Agent, Managing EFS Certificates, Encrypting Files with BitLocker, Configuring BitLocker Encryption, configuring BitLocker to Go, Configuring BitLocker Policies, Managing BitLocker Certificates.

Unit III:

Configuring File and Share Access Permissions: Designing a File-Sharing Strategy, Arranging Shares, Controlling Access, Mapping Drives, Creating Folder Shares, Assigning Permissions, Understanding the windows Permission Architecture and Basic, Advanced Permissions, Allowing and Denying Permissions, Inheriting, Permissions, Understanding Effective Access, Setting Share Permissions, Understanding NTFS Authorization, Assigning Basic NTFS Permissions, Understanding Resource Ownership, Combining Share and NTFS Permissions, Installing File Server Resource Manager, Using, creating, changing Quotas, Managing Files with File Screening, Creating File Groups, Creating a File Screen, Creating a File Screen Exception, Creating a File screen Template. Storage Reports Management.

Unit IV:

Configuring DNS Zones and Records: Understanding DNS, Understanding DNS Names and Zones, Understanding the Address Resolution Mechanism, configuring and Managing DNS Zones, Installing DNS, Configuring Primary and Secondary Zones, Configuring Active Directory-Integrated Zones, configuring Zone Delegation, configuring Stub Zones, configuring Caching-Only Servers, Configuring Forwarding and Conditional Forwarding, Configuring DNS Record types, creating and Configuring

DNS Resource Records, Start of Authority(SOA) Records, Name Server(NS) Records, Host(A and AAAA) Records, Canonical Name(CNAME) Records, Pointer(PTR) Records..

Unit V:

Implementing Patch Management and Monitoring Server Performance: Understanding windows Updates and Automatic Updates, Deploying Windows Server Update Services(WSUS), How to Install and Configure WSUS, Configuring WSUS Synchronization, Configuring WSUS Computer Groups, Configuring Group Policies for Updates, Configuring Client-Side Targeting, Approving Updates, Viewing Reports, Administrating WSUS with Commands, Troubleshooting Problems with Installing Updates. Introducing the Microsoft Management Console(MMC), Server Manager, Event Viewer, Understanding Logs and Events, Adding and Filtering Events, Managing Performance, Task Manager, Resource Monitor, Configuring Data Collector Sets (DCS), Monitoring the Network using Netstat and protocol analyzers.

Text Books:

1. Windows Server 2012: A Handbook for Professionals by Aditya Raj (Author)
2. Administering Windows Server 2012 (Certification Guide) by Orin Thomas

Reference Book:

1. Administering Widows Server 2012 by Patrick Regan
2. Mastering Windows Server 2012 R2 by Mark Minasi, Kevin Greene, Christian Booth, and Robert Butler.

Course Outcomes

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

CO1: Understand the architecture, roles, and functions of different server types.
CO2: Install, configure, and manage server operating systems and services.
CO3: Administer user accounts, permissions, and implement security policies.
CO4: Monitor server performance, apply updates, and conduct routine maintenance.
CO5: Troubleshoot common server issues and ensure system reliability and availability..

BCACC317 (Elective-I): Linux Administration						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of Operating Systems, Familiarity with Computer Hardware and Networking

Course Objective:

1. To provide foundational knowledge of the Linux operating system and its architecture.
2. To develop proficiency in using Linux command-line tools and shell scripting.
3. To train students in user, file, and process management on a Linux system.
4. To enable learners to configure, manage, and secure Linux-based servers and network services.

Unit I:

Introduction to Linux: Introduction to Operating system, Types of Operating system, Multi user operating system, Open source licensing, History of Linux, Unix Vs Linux, Flavors of Linux, Benefits and characteristics of Linux, Installation of Linux, Linux booting process, Log in and switch users in multiuser run levels, Shell and bash features, Linux kernel, sudovssu, Date and time configuration, Linux run levels.

Directories and files: Directory structure, System directory, Absolute path and relative path, Creating and removing directory, changing directory path, Creating, removing, copying and moving files, File Permissions, Links, hard link and soft link, Input and output redirection, Filters and pipes, Locate, read, and use system documentation including man page

Unit II:

Package, User and group Management: RPM, YUM, Archive, Compress, unpack and un-compress files using tar, star, gzip, and bzip2, Create, delete, and modify local user accounts, Change passwords for local user accounts, Create, delete, and modify local groups and group memberships, Changing owner and modes.

Unit III:

Configuring local storage and Files System: List, create, delete, and partition type for primary, extended, and logical partitions, Create and remove physical volumes, assign physical volumes to volume groups, Create and delete logical Volumes., Create, mount, unmount, ext2, ext3, and ext4 file systems, Mount, unmount, and LUKS, encrypted file systems, Access control list.

Unit VI:

Managing system and infrastructure services: Managing system services, shutting down, suspending and hibernating the system, controlling systemd on remote machine, Creating and modifying systemd unit files, DHCP Configuration, HTTP server Configuration, FTP server Configuration, Mail server Configuration, Samba server Configuration, NTP server Configuration, NFS server Configuration

Unit V:

OpenSSH and Linux security: OPENSSH - The SSH Protocol - Configuring OpenSSH and Starting an OpenSSH Server Key-Based Authentication in OpenSSH - OpenSSH Clients - Using the ssh Utility - scp Utility and sftp Utility - Configure firewall settings using system-config-firewall or iptables - Set enforcing and permissive modes for SELinux - List and identify SELinux file and process context.

Text Books:

1. Orsaria, Jang, "RHCSA/RHCE Red Hat Linux Certification Study Guide Exams EX200 & EX300", McGraw-Hill Education, July 2017.

Reference Book:

1. Sander Van Vugt, "Red Hat RHCSA/RHCE 7 Cert Guide: Red Hat Enterprise Linux 7 (EX200 and EX300)", Phi Learning Pvt Ltd, 2009.

Course Outcome:

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

CO1: Understand the Linux operating system structure, file system hierarchy, and basic commands.
CO2: Perform user, group, and permission management effectively.
CO3: Configure and manage system services, processes, and scheduling.
CO4: Use shell scripting to automate administrative tasks.
CO5: Secure Linux systems by implementing firewalls, backups, and access control mechanisms.

Syllabus

Semester: IV

BCACC401: Principles of Virtualization						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basic Knowledge of Operating Systems, Familiarity with Computer Hardware and Networking

Course Objective:

1. To introduce the fundamental concepts and architecture of virtualization.
2. To understand different types of virtualization: hardware, software, storage, and network.
3. To explore hypervisors, virtual machines, and container technologies.
4. To enable students to design, deploy, and manage virtualized environments efficiently.

Unit I:

Introduction: Introduction to Virtualization, Types of virtualization, Difference between cloud and virtualization, Physical infrastructure and virtual infrastructure, Virtualization approaches, Partitioning, Hosting, Isolation, Hardware independence, Virtual machine, Hypervisor, Types of hypervisor, Virtual machine manager, Introduction to datacenter virtualization Esxi, Difference between Esxi and Esx, Versions of Esxi, Installation and configuration of Esxi 6.0, vSphere 6.0

Unit II:

Components of vSphere 6.0: Components of VMware vSphere, vSphere 6.0: Overview and Architecture, Topology of vSphere 6.0 Data Center, vSphere 6.0 Configuration MaximumsvCenter Server, vCenter Server Features, Certificate Management, Alarms and Alerts, Monitoring Features, Template Management, Linked Mode Deployment, Storage Features in vSphere, Shared Storage, Storage Protocols, Datastores, Virtual SAN, Virtual Volumes, Networking Features in vSphere, Virtual Networking, Virtual Switches and its types

Unit III:

Features of vSphere and NSX: vSphere Resource Management Features, vMotion, Distributed Resource Scheduler (DRS), Distributed Power Management (DPM), Storage vMotion, Storage DRS, Storage I/O Control, Network I/O Control, vSphere Availability Features, vSphere Data Protection, High Availability, Fault Tolerance, vSphere Replication, Introduction to NSX.

Unit VI:

vSphere Solutions to Data Center Challenges and vSphere Security Challenges, Availability Challenges, Scalability Challenges, Management Challenges, Optimization Challenges, Application Upgrade Challenges, Cloud Challenges, Security, Describe the features and benefits of VMware Platform Services Controller, Configure ESXi host access and authorization, Secure ESXi, vCenter Server, and virtual machines, Upgrade ESXi and vCenter Server instances

Unit V:

Resource optimization and resource management: Network Optimization, Configure and manage vSphere distributed switches, Migrate virtual machines from standard switches to distributed switches, Explain distributed switch features such as port mirroring, LACP, QoS tagging, and NetFlow, CPU Optimization, Explain the CPU scheduler operation, NUMA support, and other features that affect CPU performance, Monitor key CPU performance metrics

Unit VI:

Memory Optimization: Memory Optimization, Explain ballooning, memory compression, and host swapping techniques for memory reclamation when memory is overcommitted, Monitor key memory performance metrics, Storage Optimization, Diagnose storage access problems, Configure VMware vSphere Flash Read Cache, Monitor key storage performance metrics

Text Books:

1. Virtualization Essentials Paperback – 26 Apr 2012 by Matthew Portnoy - wiley publications
2. VMware Cookbook Paperback – 17 Jul 2012 by Troy - Shroff/O'Reilly; Second edition (17 July 2012).

Reference Book:

1. Mastering VMware vSphere 5.5 (SYBEX) Paperback – 2014 by Scott Lowe, Nick Marshall, Forbes Guthrie, Matt Liebowitz , Josh Atwell - Wiley (2014) edition.

Course Outcome:

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

CO1: Understand the fundamental concepts, types, and architecture of virtualization.
CO2: Analyze the functionalities of virtual machines and hypervisors in various computing environments.
CO3: Evaluate performance and resource management in virtualized systems.
CO4: Demonstrate the ability to configure and manage virtual environments using standard virtualization tools.
CO5: Apply virtualization techniques for server consolidation, disaster recovery, and cloud computing solutions.

BCACC402 (Elective-II): Network Security						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic knowledge of Computer Networks, Understanding of Operating Systems and TCP/IP Protocol Suite

Course Objective:

1. To provide a comprehensive understanding of network security principles, threats, and countermeasures.
2. To explore various cryptographic techniques and their role in securing data and communication.
3. To study authentication protocols, firewalls, VPNs, and intrusion detection/prevention systems.
4. To develop the ability to design and implement secure network architectures and security policies.

Unit I:

Introduction to Network Security: Perimeter Security – Overview of Network Security, Access Control, Device Security, Security features on Switches, Firewall, Types of firewall, Access Management, Multifactor Authentication, Wireless LAN (WLAN) Security and Network Admission Control (NAC)

Unit II:

Threats, Vulnerabilities and Attacks: Threat; Vulnerabilities; Attacks – Application Attack, Network Attack and Mitigating & Deterring Attacks; Network Security – Security through network devices, Security through Network Technologies and Security through Network Design Elements, Administering a Secure Network

Unit III:

Network Security Management: Secure Socket Layer (SSL) – Introduction to SSL, Open SSL basics, Problems with SSL, Cryptography, Message Digits Algorithms, Digital Signature and Public Key Infrastructure (PKI); Data Privacy – IPsec VPN, Dynamic Multipoint VPN (DMVPN), Group Encrypted Transport VPN (GET VPN), Secure Sockets Layer VPN (SSL VPN) and Multiprotocol Label Switching VPN (MPLS VPN)

Unit VI:

Network Security Controls: Network Intrusion Prevention – Overview of Intrusion Prevention System (IPS), Intrusion Detection System (IDS), Deploying IPS and IPS high Availability; host Intrusion Prevention; Anomaly Detection and Mitigation.

Unit V:

Network Management: Security Monitoring and correlation; Security Management - Security and Policy Management and Security Framework and Regulatory Compliance; Best Practices Framework, Case Studies

Text Books:

1. Network Security Bible by Eric Cole, Wiley; Second edition (2009)
2. Network Security: Private Communication in a Public World by Charlie Kaufman, Radia Perlman, Mike Speciner, Pearson Education; Second edition (15 September 2016)
3. Network Security and Administration by Adesh K. Pandey, S.K. Kataria& Sons; Reprint 2013 edition (2013)
4. Network Security: A Beginners Guide by Eric Maiwald, McGraw Hill Education; Third edition (1 November 2012)
5. Information Security: The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)
6. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008.

Reference Book:

1. Network Security. Principles And Practice. Fifth Edition. William Stallings. Prentice Hall.
2. Cryptography and Network Security Principles and Practices, Fourth Edition. By William Stallings. Publisher: Prentice Hall
3. Network Security Assessment: Know Your Network by Chris McNab, Shroff/O'Reilly; Third edition (1 December 2017)
4. Hacking Exposed 7: Network Security Secrets and Solutions by Stuart Mcclure, Joel Scambray, George Kurtz, McGraw Hill Education; 7 edition (16 March 2012)
5. Applied Network Security Monitoring: Collection, Detection, and Analysis by Chris Sanders, Jason Smith, Syngress (20 January 2014)
6. The Network Security Test Lab: A Step–by–Step Guide by Michael Gregg, John Wiley & Sons (9 October 2015)

Course Outcome:

At the end of the course, students will be able to:

CO1: Understand the fundamental concepts of network security, including threats, vulnerabilities, and attack types.
CO2: Apply cryptographic techniques to ensure confidentiality, integrity, and authentication of data.
CO3: Analyze and implement authentication mechanisms and secure communication protocols.
CO4: Evaluate the effectiveness of security devices such as firewalls, VPNs, and intrusion detection/prevention systems.
CO5: Design secure network architectures and apply appropriate security measures to mitigate risks.

BCACC403 (Elective-II): Storage and Datacenter						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of Computer Hardware and Networking, Understanding of Operating Systems and File Systems

Course Objective:

1. To understand the fundamentals of storage technologies and data center architectures.
2. To explore various storage systems such as DAS, NAS, SAN, and cloud-based storage solutions.
3. To learn about data protection techniques, backup, recovery, and disaster recovery planning.
4. To analyze the design, implementation, and management of modern data centers including virtualization and energy efficiency.

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 RAID and Storage Networking Technologies: Implementation of RAID - Software RAID- Hardware RAID -RAID Array Component - RAID Levels - Striping -Mirroring - RAID Impact on Disk-Performance - Introduction to Direct Attached Storage – Types of DAS – Introduction to SAN – Components of SAN – FC connectivity – FC topologies – Introduction to NAS – NAS components – NAS Implementation – NAS File sharing.

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 KailashJayaswal 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.

Course Outcome:

At the end of the course, students will be able to:

CO1. Understand and explain different types of data storage systems and technologies (DAS, NAS, SAN, and cloud storage).
CO2. Analyze and evaluate storage requirements and design efficient storage solutions for various applications.
CO3. Demonstrate knowledge of data protection, backup strategies, and disaster recovery methods.
CO4. Apply concepts of data center virtualization, consolidation, and optimization techniques.
CO5. Manage and maintain storage infrastructure with considerations for scalability, security, and performance.

BCACC404 (Elective-II): Database Security Fundamentals						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of Database Management Systems (DBMS), Understanding of Fundamental Security Concepts and Principles

Course Objective:

1. To introduce the fundamental concepts of database security, threats, and vulnerabilities.
2. To understand access control models, authentication mechanisms, and encryption techniques for databases.
3. To explore methods for auditing, intrusion detection, and securing database transactions.
4. To develop skills for implementing security policies and managing compliance in database systems.

Unit I:

Concepts of Database Security Management System: Database security concept, Importance of data, Levels of data security, Authorization in databases, Issues in database security, Concept of Least Privilege in User ID for databases. Perimeter security, firewalls, intrusion detection, and intrusion prevention

Unit II:

Concepts of NoSQL: No SQL databases introduction, Differences from classical DBMS concepts with NoSQL, Advantages of NoSQL like Elastic Scaling, Big Data, Goodbye DBAs', Economics/Cost, Flexible Data models. Non/ partial applicability of ACID (Atomicity, Consistency, Isolation, Durability), BASE Properties, CAP theorem, comparison to traditional RDBMS databases. Horizontal scalability, Benefits of NoSQL Databases compared to traditional Databases. Concept of UnSQL or Unstructured Query Language, Concept of Key Value & Tuple Store Databases, Concept of Graph Databases, Concept of Multimodel Databases

Unit III:

Encryption and Permissions in SQL Server 2012: Understanding permissions, Creating and using database roles, using schemas for security, configuring cross-database security. Code and Data Encryption- Using service and database master keys, creating and using symmetric and asymmetric keys, creating and storing hash values, Authenticating stored procedure by signature

Unit IV:

Security of SQL Server 2012: User authorization, authentication and security, protecting data using permissions, roles, schemas, SQL firewall, web application firewall, securing dynamic SQL from injections, protecting SQL server from DoS and injection attacks.

Unit V:

SQL Server Auditing: Auditing – Using the profiler to audit SQL server access, using DML trigger for auditing data modification, Using DDL triggers for auditing structure modification, configuring SQL

server auditing, auditing and tracing user configurable events, policy based management, system centre advisor to analyze instances

Text Books:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008
2. Database security by SilvanaCastano, 2nd Edition, Pub: Addison-Wesley Professional, 2008
3. Microsoft SQL server 2012 Security Cookbook by Rudi Bruchez, Pub: PACKT publishing, 1st ed; 2012

Reference Books:

1. Handbook of database security: Applications and Trends Michael Gertz, SushilJajodia, Pub: Springer, 1st ed; 2008
2. Implementing database security and auditing, Ron Ben-Natan, Pub: Digital Press, 1st ed; 2005

Course Outcome:

At the end of the course, students will be able to:

CO1. Understand the key principles of database security, including threats, vulnerabilities, and risk management.
CO2. Apply access control mechanisms and authentication techniques to protect database systems.
CO3. Implement encryption and data masking techniques to ensure data confidentiality and integrity.
CO4. Analyze and design secure database architectures and transaction controls.
CO5. Evaluate and apply auditing, monitoring, and compliance strategies in real-world database environments.

BCAICC406: Responsive Web Design-Front End Development						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: HTML and CSS.

Course Objectives:

1. Understand and Apply the Fundamental Concepts of HTML, CSS, and JavaScript to Build Structured, Responsive, and Interactive Web Pages
2. Evaluate understanding of responsive design principles, advanced CSS techniques, and the use of preprocessors.
3. Design and Implement Responsive Web Interfaces Using Advanced CSS Techniques and Preprocessors to Enhance User Experience Across Devices
4. Write simple JavaScript code to manipulate the DOM and respond to user interactions.
5. Analyze and Implement Advanced JavaScript Techniques to Develop Modular, Efficient, and Maintainable Web Applications.

Module I:
Introduction to HTML:

What is HTML: Definition and purpose of HTML, Role of HTML in web development, Basic syntax and structure
Setting Up Your Development Environment: Text editors (VS Code, Sublime, Notepad++), Browser for testing HTML (Google Chrome, Firefox)
First HTML Page: Creating and saving a basic HTML document, Introduction to <!DOCTYPE html> and basic document structure, Tags: <html>, <head>, <body>
Head Section: The <meta> tag, The <title> tag, The importance of the <head> section
Body Section: Basic text elements: <h1> to <h6>, <p>, <b>, <i>, Paragraphs, line breaks, and horizontal rules, Lists: Ordered (<ol>) and unordered (<ul>) lists, list items (<li>)
Hyperlinks and Images: Creating hyperlinks with <a> tag, Attributes: href, target, title, Adding images with <img> tag, Attributes: src, alt, width, height
Forms and Input Elements: Creating forms: <form> tag, Form elements: <input>, <textarea>, <select>, <button>, Basic form attributes: action, method, name, id
Tables: Table tags: <table>, <tr>, <th>, <td>, Styling tables: border, cellspacing, cellpadding
Multimedia Elements: Embedding audio: <audio>, Embedding video: <video>, Using <source> tag for multiple file formats
Iframes and Embeds: Creating iframes with <iframe>

MODULE II:
HTML5 AND Advanced HTML5 Features:

HTML5 Overview: Introduction to HTML5 features, Key differences between HTML5 and previous versions, Benefits of HTML5 for modern web development
Semantic HTML5 Tags: Introduction to semantic tags: <header>, <footer>, <nav>, <article>, <section>, <aside>, etc.
Audio and Video Elements in HTML5: Using <audio> and <video> tags, Supporting multiple file formats and fallback methods
Forms in HTML5: New input types: email, date, number, range, url, etc., New attributes: required, placeholder, autofocus, pattern, Creating a form with new HTML5 inputs
Local Storage and Session Storage: Introduction to local storage and session storage, Storing and retrieving data with JavaScript, Use cases for local storage in web applications
HTML5 Canvas: Introduction to <canvas> element, Drawing basic shapes and graphics with JavaScript, Animation basics using canvas

MODULE-III:
Mastering CSS3:

What is CSS: Definition and purpose of CSS, The role of CSS in web development, How CSS works with HTML to style web pages
CSS Syntax and Structure: CSS rule sets: selectors, properties, and values, Basic syntax: selector { property: value; }, Inline, internal, and external CSS
How to Link CSS to HTML: Inline CSS using the style attribute, Internal CSS within the <style> tag, External CSS with the <link> tag
CSS Selectors: Element selectors (e.g., h1, p), Class selectors (e.g., .class-name), ID selectors (e.g., #id-name), Universal selector (*), Descendant, child, and sibling selectors, Attribute selectors (e.g., [type="text"])
CSS Properties: **Text styling:** color, font-family, font-size, line-height, font-weight, text-align, **Box model:** width, height, margin, padding, border, box-sizing, **Backgrounds:** background-color, background-image, background-position, background-repeat
Understanding the Box Model: Content, padding, border, and margin, Box-sizing property (content-box, border-box), Visualizing the box model using browser developer tools
Layout Techniques: Static vs. relative vs. absolute positioning, Floating elements and clearing floats, Centering elements using margin auto, Fixed positioning and sticky positioning
CSS3 Transitions: What are CSS transitions?, Transition properties: transition-property, transition-duration, transition-timing-function, transition-delay, Example: Hover effect with transitions
CSS3 Animations: Introduction to keyframes, Creating animations with @keyframes, Animation properties: animation-name, animation-duration, animation-timing-function, animation-delay, animation-iteration-count, Practical examples of animations
CSS3 Transforms: transform property: rotate, scale, translate, skew, 2D vs. 3D transforms, Transforming elements on hover (interactive effects)

MODULE-IV:
CSS3 Responsive Design:

Introduction to Responsive Web Design (RWD): What is responsive design?, Importance of mobile-first design, Viewport meta tag and its importance in mobile optimization
Media Queries: Syntax of media queries, Targeting different devices and screen sizes, Example: Mobile-friendly layout using media queries
Fluid Layouts and Flexible Boxes: Using percentages for fluid widths, Introduction to Flexbox: Basic layout with display: flex, Flexbox properties: justify-content, align-items, flex-wrap, flex-grow, flex-shrink, flex-basis

CSS Grid Layout: Introduction to the CSS Grid system, Defining grid containers with display: grid, Creating rows and columns with grid-template-rows, grid-template-columns, Aligning grid items using justify-items, align-items, and place-items, Example: Building a responsive grid layout
CSS Flexbox and Grid Combined: Combining Flexbox and Grid for complex layouts, Practical use case: Building a multi-column layout with both Flexbox and Grid
Custom Properties (CSS Variables): Introduction to CSS custom properties (variables), Defining and using variables: --primary-color, etc., Benefits of using CSS variables in themes and design consistency
Hover and Focus Effects: Styling links and buttons on hover and focus, Changing background colors, borders, and text styles, Example: Button hover effects with transitions
CSS Shadows and Glows: Box shadows: box-shadow property, Text shadows: text-shadow property, Using multiple shadows in one property, Creating glowing effects with shadows
Gradients and Patterns: Linear gradients: background: linear-gradient (), Radial gradients: background: radial-gradient(), Repeating gradients and patterns, Example: Background gradient animations
Styling Form Elements: Basic form styles: input fields, buttons, and labels, Input types and custom styles for text, password, email, number, etc., Placeholder and focus effects
Customizing Form Controls: Styling checkboxes, radio buttons, and select dropdowns, Custom form controls with appearance property, Example: Custom form controls with CSS
CSS3 Validation Styles: Styling invalid and valid form inputs, Using the: valid, invalid, required, and: focus pseudo-classes

MODULE-V:
Mastering JavaScript:

What is JavaScript: Definition and role of JavaScript in web development, JavaScript's relationship with HTML and CSS, Running JavaScript: Inline, Internal, and External JavaScript
JavaScript Syntax Basics: Variables: let, const, and var, Basic data types: string, number, boolean, null, undefined, Simple operators: +, -, *, /, %, ++, --, Comments: single-line and multi-line comments
Conditional Statements: if, else if, else, switch statement
Loops: for loop, while loop, do...while loop, for...of and for...in loops, Loop control: break, continue
Functions: Function declaration and invocation, Parameters and arguments, Return values, Function expressions and arrow functions (() => {}), Scope: Local and Global, Closures and higher-order functions
Arrays: Declaring arrays: let arr = [], Array methods: push(), pop(), shift(), unshift(), slice(), splice(), map(), filter(), reduce(), Accessing and iterating through arrays: for, forEach()
Objects: Declaring objects: let obj = { key: value }, Accessing and modifying object properties: dot notation and bracket notation, Iterating through objects: for...in loop, Object.keys(), Object.values()
Introduction to the DOM: What is the DOM? (Document Object Model), Accessing elements by ID, class, tag, and query selectors, Modifying content and attributes: innerHTML, textContent, setAttribute()
Event Handling: Adding event listeners: addEventListener(), Handling different events: click, mouseover, keydown, etc., Event propagation: event bubbling and event capturing
ES6+ Features: Let and const vs. var, Arrow functions and the this keyword, Template literals (String interpolation): `Hello, ${name}!`, Default parameters in functions, Modules: import and export
Asynchronous JavaScript: Callbacks, Promises: then(), catch(), finally(), Async/Await: Simplifying asynchronous code
Error Handling in JavaScript: try...catch block, Throwing errors with throw, Custom error messages, Handling asynchronous errors
Debugging JavaScript: Using browser dev tools (Console, Sources, Breakpoints), Common debugging techniques, Debugging asynchronous code

MODULE-VI:
Mastering Bootstrap:

What is Bootstrap: Overview of Bootstrap and its importance, Advantages of using Bootstrap for responsive web design, Installing Bootstrap (via CDN and local setup)
Setting Up Your Development Environment: Text editors: VS Code, Sublime Text, etc., Browsers and developer tools for testing, Linking Bootstrap to your project: CDN vs. downloading
Bootstrap Grid System: Understanding the 12-column grid layout, Defining rows and columns with .row and .col-*, Creating responsive layouts using grid breakpoints, Nesting grid columns for advanced layouts
Typography: Bootstrap's default typography styles (headings, paragraphs, lists), Font styles and text alignment: .text-center, .text-left, .text-right, Typography utilities: .font-weight-bold, .text-uppercase, etc.
Buttons: Button classes: .btn, .btn-primary, .btn-success, .btn-danger, Button sizes and block buttons, Button groups and toolbar buttons, Button states: active, disabled, focus, and hover
Images: Responsive images with .img-fluid, Rounded images, circles, and thumbnails with .rounded, .rounded-circle, .img-thumbnail, Image alignment and utilities
Icons with Bootstrap: Using Bootstrap Icons or integrating Font Awesome, Applying icons to buttons and links, Icon sizes and alignment
Containers: .container vs. .container-fluid, Fixed-width vs. full-width containers, Responsive containers for different screen sizes
Bootstrap Grid System in Detail: Creating multi-column layouts: .col-md-6, .col-lg-4, etc., Offsetting and ordering columns, Grid nesting and offsets for complex layouts
Spacing Utilities: Margins and paddings: .m-3, .mt-5, .px-2, Responsive spacing classes, Controlling spacing between elements with margin/padding utilities
Navigation Bar (Navbar): Creating responsive navigation bars using .navbar, Navbar components: brand, links, forms, and dropdowns, Mobile-friendly navbar using the hamburger menu, Customizing navbar background, colors, and alignments
Cards: Using .card for creating card components, Card body, header, footer, and image, Card groups and card decks for multi-card layouts, Styling cards with custom classes
Alerts: Using .alert for displaying messages, Customizing alert styles: success, warning, danger, info, Dismissing alerts with JavaScript and .alert-dismissible
Modals: Creating modal dialogs with .modal, Modal header, body, footer, and close button, Controlling modal visibility using JavaScript, Using modal for forms, notifications, and more
Forms: Creating forms with .form-control, Input groups for adding icons or buttons to form fields, Custom checkboxes, radio buttons, and selects, Form validation using Bootstrap classes and custom styles
Display and Positioning: Display utilities: .d-block, .d-inline, .d-none, etc., Visibility utilities: .visible, .invisible, Positioning utilities: .position-relative, .position-absolute, .position-fixed
Flexbox Utilities: Flexbox basics: .d-flex, .justify-content-*, .align-items-*, .flex-row, .flex-column, Flexbox utilities for centering and alignment, Flexbox ordering and wrapping
Colors and Backgrounds: Text and background color utilities, Color classes: .text-primary, .bg-success, etc., Background utilities for gradients and images
Sizing and Overflow Utilities: Width and height utilities: .w-50, .h-100, Controlling overflow: .overflow-auto, .overflow-hidden
Borders and Shadows: Border utilities: .border, .border-top, .rounded, .border-light, Box-shadow utilities: .shadow, .shadow-lg
Mobile-First Design Philosophy: Why Bootstrap is mobile-first and how it helps responsive design, Understanding responsive breakpoints (xs, sm, md, lg, xl, xxl)
Creating Responsive Layouts: Building a mobile-first, responsive webpage, Making images, tables, and forms responsive, Handling mobile navigation with collapsible menus
Carousel: Creating image carousels with .carousel, Carousel controls: next/previous buttons and indicators, Customizing carousel items and controls

INTRODUCTION TO NODE JS
INTRODUCTION TO EXPRESS JS

Project 1 – Responsive Landing Page: Build a simple, responsive landing page with navigation, hero section, and call-to-action button
Project 2 – Blog Layout: Create a responsive blog layout with cards, grid system, and a sidebar navigation
Project 3 – E-commerce Product Page: Design a product page with cards, product details, image gallery, and a modal for product options
Project 4 – Dashboard Layout: Create a responsive admin dashboard with navigation, grid-based layout, cards, and data tables

Text Book:
Introduction to frontend technology HTML, CSS and JavaScript Web Publishing language By Laura Lemay, Rafe Colburn, Jennifer kyrnin 1st Edition,2022

Reference Books:
Theory, practical and critical problem solving in frontend technology (HTML5, CSS3, JavaScript and Adv. JavaScript): Dr. T. Vasudev, Dr. Chandrajit M & Prof. Arvind G.

Course Outcomes:

After completing the course, students will be able to:

1. Students will be able to identify the different computational problems and their associated complexity.
2. Students will be able to differentiate and give examples for the different
3. types of automata like finite automata, push down automata, linear bounded automata and Turing machine.
4. To apply the techniques of designing grammars and recognizers for several programming languages.
5. Students will be able to correlate the different types of automata to real world applications.

BCAICC407: Java Programming						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite:

1. C programming
2. Object Oriented Programming using C++

Course Objectives:

1. To introduce the fundamental concepts of object-oriented programming (OOP) and how they are implemented in Java.
2. To develop the ability to write, compile, and debug Java programs using classes, objects, inheritance, polymorphism, and interfaces.
3. To familiarize students with Java's standard libraries, exception handling, file I/O, and multithreading capabilities.
4. To enable students to build GUI-based applications and real-world projects using Java frameworks and tools.

Detailed Syllabus

Unit I:

Introduction: History and Overview of Java, Object Oriented Programming, Control statements- if and for loop. Using Blocks of codes, Lexical issues - White space, identifiers, Literals, comments, separators, Java Key words, Data types - Integers, Floating point, characters, Boolean, a closer look at Literals, Variables, Type conversion and casting. Automatic type promotion in Expressions Arrays. Operators - Arithmetic operators, Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence. Control Statements – Selection Statements - if, Switch, Iteration Statements - While, Do-while, for Nested loops, Jump statements.

Unit II:

Classes: Class Fundamentals, Declaring objects, Assigning object reference variables. Methods - constructors, “this” keyword, finalize ( ) method A stack class, Over loading methods. Using objects as parameters, Argument passing, Returning objects. Recursion, Access control, Introducing final, understanding static. Introducing Nested and Inner classes. Using command line arguments. Inheritance – Basics, Using super, method overriding, and Dynamic method Dispatch, Using abstract classes and final with Inheritance.

Unit III:

Packages: Definition. Access protection importing packages. Interfaces: Definition and implementation. Exception Handling – Fundamentals, types, Using try and catch and Multiple catch clauses, Nested try Statements, throw, throws, finally. Java’s built-in exception, using Exceptions.

Unit IV:
Multithreaded Programming: Java thread model – main thread, creating single and multiple thread. Is alive ( ) and join ( ). Thread – Priorities, Synchronization, Inter thread communication, suspending, resuming and stopping threads, using multi-threading. I / O basics – Reading control input, writing control output, Reading and Writing files. Applet Fundamentals – AWT package, AWT Event handling concepts, the transient and volatile modifiers. Using instance of using assert.

Unit V:
Java Networking and GUI Application Development:
Java Networking: Concept of client and Server, Introduction of TCP, Concept of Socket, Importance of Socket, Socket programming, communication between client and server.
GUI Application Development: Introduction to AWT, AWT controls Java Applet, Layout Managers, Menus, Images, Graphics, Event Handling, Swing, Containers, Panes, Frames, Dialogue boxes, working with image controls.

Unit VI:
JAVA Database Connectivity (JDBC): 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. .

Text and Reference Books:

1. The Complete Reference Internet, Margaret Levine Young, TMH, 1999.
2. The Complete Reference JAVA 2, Naughton Schildt, TMH, 5th Edition.
3. Programming in JAVA, E. Balagurusamy E, TMH, 3rd Edition, 2006.
4. Java Black book, Steven Helzner, Dreamtech , 2002

Course Outcomes:

After completing the course, students will be able to:

CO1: Understand the fundamental concepts of object-oriented programming using Java.
CO2: Apply Java programming constructs such as classes, objects, inheritance, and polymorphism to solve real-world problems.
CO3: Develop Java applications using packages, interfaces, exception handling, and multithreading.
CO4: Implement GUI-based applications using AWT and Swing components.
CO5: Use Java for database connectivity (JDBC) and develop simple client-server applications.

BCAICC408: Logical Reasoning and Thinking						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
1	1	0	35	15	50	1

Teaching Scheme	**Examination Scheme**
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: Basic Analytical and Critical Thinking Skills, Understanding of Fundamental Mathematical and Verbal Concepts

Course Objectives:

1. To develop students' ability to analyze and evaluate arguments logically and critically.
2. To enhance problem-solving skills through various logical reasoning techniques.
3. To familiarize students with different types of reasoning such as deductive, inductive, and analytical reasoning.
4. To prepare students for aptitude tests, competitive exams, and real-world decision-making scenarios.

Detailed Syllabus

Unit I:

Verbal ability: Synonyms, Antonyms and One word substitutes, Speed, Time and Distance, Time and Work, Linear Equations, Progressions (Sequences & Series), Permutation and Combination, Probability, Functions, Set Theory, Number Systems, LCM and HCF, Percentages, Collection and Scrutiny of data: Primary data, questionnaire and schedule; secondary data, their major sources including some government publications.

Unit II:

Logical Reasoning: Number and Letter Series, Calendars, Clocks, Cubes, Venn Diagrams, Binary Logic, Seating Arrangement, Logical Sequence, Logical Matching, Logical Connectives, Syllogism, Blood Relations; concept of a statistical population and sample from a population; qualitative and quantitative data

Unit III:

Presentation of Data: Construction of tables with one or more factors of classification; Diagrammatic and Graphical representation of non-frequency data; Frequency distribution, cumulative frequency distribution and their graphical representation - histogram, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Data Interpretation – Introduction and approaches

Text Books:

1. Richard I Levin, David S. Rubin: Statistics for Management, Pearson Prentice Hall Education Inc. Ltd, NewDelhi, 5th Ed. 2007
2. Bajpai, N. Business Statistics, Pearson, 2010.

Reference Books:

1. Sharma J.K., Business Statistics, Pearson Education India, 2010.
2. Anderson; David R, Dennis J. Sweeney and Thomas A. Williams, Quantitative Methods for Business, Prentice-Hall, West Publishing Company, 1996.
3. CAT Complete course, UPKAR publications.

Course Outcome:

After completing the course, students will be able to:

CO1: Apply logical thinking to solve problems using deductive and inductive reasoning methods.
CO2: Analyze and evaluate complex arguments for validity and soundness.
CO3: Identify logical fallacies and improve critical thinking abilities in academic and professional contexts.
CO4: Demonstrate proficiency in solving puzzles, syllogisms, coding-decoding, and analytical reasoning problems.
CO5: Prepare effectively for competitive exams and aptitude-based assessments through structured logical reasoning techniques.

Syllabus

Semester: V

BCACC501: AWS						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basic Knowledge of Networking and Operating Systems, Familiarity with Cloud Computing Concepts and Virtualization

Objectives:

1. To understand the core services and architecture of Amazon Web Services (AWS).
2. To learn how to deploy, manage, and operate scalable, highly available, and fault-tolerant systems on AWS.
3. To develop skills in using AWS tools for computing, storage, networking, and database management.
4. To implement best practices for security, monitoring, and cost optimization in AWS environments.

Detailed Syllabus

Unit I:

Introduction of Cloud: Introduction of Cloud Computing, Features and benefits of cloud computing, Types of Cloud Computing deployment model, Public Cloud, Private Cloud, Hybrid Cloud **Virtualization:** An essential in cloud, Virtualization in Cloud model, Types of virtualization, **Hypervisor:** Benefits, Different types of services and its difference in Cloud computing, laaS, PaaS, SaaS, Importance of scaling in cloud computing, Types of scaling and its applications, Issues we overcome using cloud and applications, Cost model that we use in cloud computing

AWS — An overview: Features of AWS, Features of AWS marketplace, Features of Amazon Compute Services, Features of Amazon Storage Services, Features of Amazon Network Services, Features of Amazon Database services, Services in AWS, Global Infrastructure — Regions and Availability Zones, Free tier account in AWS and onboarding, AWS management console

Unit II:

Understand Identity Access Management of AWS: Protect your AWS by different authentication system, Password policies set for users, AWS User Account and Groups in detail, Creating custom policies in AWS, Introduction about Roles and its use

Creating Roles and associating policies, Creating programmatic access and management console access for users, Associating policies to the user and groups

EC2 Instance: AMI and AWS Marketplace templates, Launch a basic EC2 instance, Types of Instances Reserved, On-demand, Spot, Dedicated, Security groups and tags for EC2 instance, Public key — Private key introduction and protecting EC2 with keys, Attaching and detaching EBS volumes

Launch an ec2 instance from an AMI, Create custom AMI and working with different region

Make use of amazon EBS volume and create snapshots, Manage the configuration of your application

Deploying a new instance from the created AMI

Unit III:
Auto-scaling: Get Started with Auto Scaling Using the Console, Creating Launch configurations and make use of it for auto-scaling groups, Maintain a Fixed Number of Running EC2 Instances, Dynamic Scaling, The lifecycle of auto-scaling, Policies of auto-scaling
Load Balancing: Introduction to Load balancer (ELB), Different types of Load balancer in AWS, Application Load balancer, Network Load balancer, Classic Load balancer, Migrating classic load balancer to new load balancer, Components and types of load balancing

Unit IV:
EBS (Elastic Block Storage): Create EBS volumes, Delete EBS Volumes, Attach and detach EBS volumes with EC2 instance, Creating and deleting snapshots

Unit V:
Object Storage in Cloud: Understanding S3 durability and redundancy, Introduction about S3 Buckets, How S3 Uploading works and how to download, How to S3 Permissions, How to implement S3 Object Versioning S3 Lifecycle Policies, Storage Gateway, Import Export

Unit VI:
Cloud Front: Describing cloud front, Creating a cloud front distribution, Hosting a website of cloud front distribution, Implementing global restrictions, Configuring origins and behaviors

Text Books:
1. Amazon Web Services in Action by Michael Wittig and Andreas Wittig
2. AWS Certified Solutions Architect Official Study Guide by Joe Baron, Hisham Baz, and Tim Bixler

Reference Books:
1. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl
2. Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud by Mark Wilkins

Course Outcome:

After completing the course, students will be able to:

CO1. Understand the fundamentals of cloud computing and the AWS global infrastructure.
CO2. Deploy and manage virtual servers, storage, and databases using various AWS services.
CO3. Apply security and identity management features in AWS to protect cloud resources.
CO4. Monitor and optimize AWS services for performance, reliability, and cost-efficiency.
CO5. Design and implement scalable and fault-tolerant applications using AWS best practices.

BCACC502: Cloud Migration						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
3	1	4	70	30	4	100

Teaching Scheme	**Examination Scheme**
Credits: 4	Mid Term Exam: 12 Marks
	Teachers Assessment: 6 Marks
	Attendance: 12 Marks
	End Semester Exam: 70 Marks

Prerequisite: Basic Understanding of Cloud Computing Models and Services, Knowledge of Existing On-Premises IT Infrastructure and Applications

Objectives:

1. To understand the principles, strategies, and benefits of migrating IT resources to the cloud.
2. To learn how to assess existing infrastructure and plan an effective cloud migration roadmap.
3. To explore various tools and services used for migrating applications, data, and workloads to the cloud.
4. To develop skills in managing post-migration operations including performance optimization and cost management.

Detailed Syllabus

UNIT- I:

Introduction to Cloud Computing and Migration: Overview of cloud computing and its benefits, Introduction to cloud migration and its importance, Challenges and considerations in cloud migration, Cloud Migration Strategies and Planning, Lift and shift migration approach, Re-platforming and refactoring strategies, Migration planning process and best practices, Assessing application compatibility and dependencies

UNIT- II:

Cloud Service Selection and Configuration: Evaluation of cloud service providers, Selection criteria for choosing cloud services, Configuring and provisioning cloud resources, Integration of existing systems with cloud services, Data Migration to the Cloud, Data migration strategies and techniques, ensuring data integrity and security during migration, Data transfer methods and tools, Database migration to cloud-based solutions

UNIT- III:

Application Migration to the Cloud: Application assessment and readiness for migration, Containerization and orchestration for cloud deployment, Application migration patterns and practices, Testing and validation of migrated applications

UNIT- IV:

Cloud Migration Project Management: Project planning and resource allocation, Risk assessment and mitigation strategies, Change management and communication during migration, Monitoring and optimization of migrated systems

UNIT- V:

Performance and Scalability Considerations: Performance testing and optimization in the cloud, scaling applications and resources in the cloud, Load balancing and auto-scaling techniques, Cost optimization and resource utilization monitoring

UNIT- VI:

Security and Compliance in Cloud Migration: Data privacy and protection in the cloud, Identity and access management for cloud services, Compliance regulations and cloud governance, Cloud security best practices and threat mitigation, Case Studies and Real-world Examples, Analysis of real-world cloud migration projects, Case studies highlighting successful cloud migration strategies, Lessons learned and best practices from industry examples

Text Books:

1. The Great Cloud Migration: Your Roadmap to Cloud Computing, Big Data and Linked Data, Michael Daconta
2. A Practical Guide to Cloud Migration by Kieran Broadfoot, O'Reilly Media, Inc.

Reference Books:

1. "Cloud Migration: A Hands-On Guide to Migrating to the Cloud" by Jeff McWherter and Aaron Wright
2. "Cloud Computing: From Beginning to End" by Ray J. Rafaels
3. "Cloud Computing: Principles and Paradigms" by Rajkumar Buyya, James Broberg, and Andrzej Goscinski

Course Outcomes:

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

CO1. Understand the key concepts, strategies, and phases involved in cloud migration.
CO2. Assess and evaluate existing infrastructure to determine cloud readiness.
CO3. Apply appropriate tools and techniques for migrating applications, data, and services to the cloud.
CO4. Manage and optimize cloud resources post-migration for performance and cost-efficiency.
CO5. Ensure security, compliance, and business continuity throughout the cloud migration process..

BCACC513 (Elective III) - PowerShell Scripting						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of Windows Operating System and Command Line Interface, Understanding of Programming Fundamentals (Variables, Loops, Conditions, etc.)

Course Objectives:

1. To understand the fundamentals of PowerShell syntax, commands, and scripting structure.
2. To develop the ability to automate administrative tasks in Windows environments using PowerShell.
3. To learn how to manage system processes, services, files, and registries through scripting.
4. To gain proficiency in writing reusable scripts and modules for efficient system administration.

Detailed Syllabus

Unit I:
Introduction to PowerShell: What is PowerShell and its importance, Basic PowerShell commands and syntax, PowerShell variables and datatypes, PowerShell operators and expressions.

Unit II:
Control Structures: PowerShell conditional statements (if/else/else-if), PowerShell loops (for/foreach/while/do-while), PowerShell Switch Statements.

Unit III:
Functions: Creating and using Functions in PowerShell, Parameters in PowerShell Functions, Returning values from PowerShell functions.

Unit IV:
Modules and PowerShell Scripting: PowerShell Modules and their importance, creating and importing PowerShell modules, PowerShell scripting best practices, Writing and executing PowerShell scripts.

Unit V:
Advanced PowerShell: PowerShell Remoting, PowerShell security best practices, PowerShell Desired State Configuration (DSC), PowerShell workflows, PowerShell debugging techniques.

Text Books:

1. PowerShell Cookbook: Your Complete Guide to Scripting the Ubiquitous Object-Based Shell 4th Edition by Lee Holmes
2. Learn PowerShell in a Month of Lunches, Fourth Edition: Covers Windows, Linux, and macOS 4th Edition by Travis Plunk, James Petty, Tyler Leonhardt

Reference Books:

1. Windows Server Automation with PowerShell Cookbook: Powerful ways to automate, manage and administrate Windows Server 2022 using PowerShell 7.2, 5th Edition.

Course Outcomes:

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

CO1. Understand and apply PowerShell syntax, cmdlets, and scripting techniques.
CO2. Automate routine administrative tasks in Windows environments using PowerShell scripts.
CO3. Manage system resources such as files, services, processes, and the Windows registry through scripting.
CO4. Develop and troubleshoot reusable PowerShell scripts and functions for system management.
CO5. Implement PowerShell scripting in real-world scenarios to improve efficiency and reduce manual intervention.

BCACC514 (Elective III): Infrastructure Automation						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75
Teaching Scheme	**Examination Scheme**					
Credits: 3	Mid Term Exam: 10 Marks					
	Teachers Assessment: 5 Marks					
	Attendance: 10 Marks					
	End Semester Exam: 50 Marks					

Prerequisite: Basic Understanding of IT Infrastructure Components (Servers, Networks, Storage, etc., Familiarity with Scripting or Programming Languages (e.g., Shell, Python, or PowerShell)

Objectives:

1. To understand the concepts and benefits of automating IT infrastructure management.
2. To learn about popular infrastructure automation tools such as Ansible, Puppet, Chef, and Terraform.
3. To develop skills in writing scripts and configuration files for automated deployment and configuration.
4. To implement automated workflows that enhance scalability, consistency, and efficiency in infrastructure operations.

Detailed Syllabus

UNIT- I:

Introduction to infrastructure automation: Definition and importance of infrastructure automation Infrastructure as code (IaC) and its benefits Overview of infrastructure automation tools Infrastructure testing (e.g., integration testing, acceptance testing) Immutable infrastructure Micro services and infrastructure automation

UNIT- II:

Configuration Management: Introduction to configuration management, Configuration management tools (e.g., Ansible, Chef, Puppet) Writing and managing configuration files, Best practices for configuration management

UNIT- III:

Continuous Integration/Continuous Deployment (CI/CD): Introduction to CI/CD Overview of CI/CD tools (e.g., Jenkins, Circle, Travis CI), Writing and managing build scripts Best practices for CI/CD

UNIT - IV:

Cloud Infrastructure Provisioning: Introduction to cloud infrastructure provisioning Infrastructure as a Service (IaaS) providers (e.g., AWS, Azure, GCP) Writing and managing cloud infrastructure templates (e.g., Cloud Formation, Terra form) Best practices for cloud infrastructure provisioning

UNIT-V:

Monitoring and Logging: Introduction to monitoring and logging Monitoring and logging tools (e.g., Prometheus, ELK stack), Writing and managing monitoring and logging configurations Best practices for monitoring and logging

UNIT-VI:

Security and Compliance: Introduction to security and compliance in infrastructure automation Infrastructure security tools (e.g., HashiCorp Vault, AWS KMS) Compliance frameworks (e.g., HIPAA, PCI-DSS) Best practices for security and compliance in infrastructure automation

Text Books:

1. The Definitive Guide to AWS Infrastructure Automation: Craft Infrastructure-As-Code Solutions 1st ed. Edition, Kindle Edition
2. The Definitive Guide to AWS Infrastructure Automation Authors: Bradley Campbell

References books:

1. Mastering Infrastructure Automation by Felix Frank, Martin Alfke, Alessandro Franceschi, Jaime Soriano Pastor, Thomas Uphillis
2. Ifeachor and Jervis, "Infrastruture Automation", Pearson Education India.
3. DeFatta D J, Lucas J G and Hodgkiss W S, "Chef Infrastructure Automation cookbook", by Mattthias Marshal

Course Outcomes:

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

CO1. Understand the principles and practices of infrastructure automation and its role in modern IT operations.
CO2. Use automation tools like Ansible, Puppet, Chef, or Terraform to provision and manage infrastructure.
CO3. Develop and apply scripts or configuration files for automated deployment and system configuration.
CO4. Design automated workflows that improve consistency, reduce manual errors, and enhance scalability.
CO5. Evaluate and implement infrastructure automation strategies to support DevOps and continuous integration/continuous deployment (CI/CD) practices.

BCACC515 (Elective IV): Cloud Security						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Knowledge of Cloud Computing Models and Services (IaaS, PaaS, SaaS), Understanding of Fundamental Security Concepts and Network Protocols

Course Objectives:

1. To understand the core principles, challenges, and threats related to securing cloud environments.
2. To explore security mechanisms for protecting cloud data, applications, and infrastructure.
3. To learn about compliance standards, identity management, and access control in cloud platforms.
4. To develop skills for implementing and managing security policies across various cloud service models.

Detailed Syllabus

Unit 1:
Cloud Computing Fundamentals, Definition, Evolution, Essential characteristics, Cloud Deployment Models, Cloud Service Models, Benefits, Cloud Architecture, Virtualization in Cloud, Cloud Data Centre, SLA, Cloud Applications.

Unit 2:
Cloud Security Challenges, Cloud Information Security Objectives, Cloud Security Services, Secure Cloud Software Requirements, Cloud Security Policy Implementation, Infrastructure Security, Data Security and Storage, Privacy in Cloud.

Unit 3:
Threats and Vulnerabilities to Infrastructure, Data, and Access Control; Risk Management and Risk Assessment in Cloud, Cloud Service Provider Risks, Virtualization Security Management in the Cloud, Trusted Cloud Computing, Identity Management and Access Control.

Unit 4:
Cloud Computing and Business Continuity Planning/Disaster Recovery, Cloud Audit and Compliance: Internal Policy Compliance, Regulatory/External Compliance, Cloud Security Alliance.

Unit 5:
Standards for Security: SAML OAuth, OpenID, SSL/TLS, Encrypting Data and Key Management, Creating a Cloud Security Strategy, The Future of Security in Cloud Computing.

Text Books:

1. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
2. Buyya, Christian Vecchiola, S.Thamarai Selvi,―Mastering Cloud Computing, Tata Mcgraw Hill,2013.

Reference Books:

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley Publishing, 2010.
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, ” Cloud Security and Privacy", Published by O’Reilly Media, Inc., 2009

Course Outcomes:

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

CO1. Understand cloud security fundamentals, including risks, threats, and best practices.
CO2. Apply security controls to protect data, applications, and infrastructure in cloud environments.
CO3. Implement identity and access management (IAM) policies for secure cloud usage.
CO4. Analyze and ensure compliance with cloud security standards and regulations.
CO5. Design and deploy secure cloud architectures using industry-recommended tools and techniques.

BCACC516 (Elective IV): Application and Web Security						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
2	1	2	50	25	2	75

Teaching Scheme	**Examination Scheme**
Credits: 3	Mid Term Exam: 10 Marks
	Teachers Assessment: 5 Marks
	Attendance: 10 Marks
	End Semester Exam: 50 Marks

Prerequisite: Basic Understanding of Web Technologies (HTML, HTTP, JavaScript, etc.), Fundamental Knowledge of Networking and Operating System Concepts

Course Objectives:

1. To understand the common threats, vulnerabilities, and attacks on web applications.
2. To learn techniques for securing web applications through secure coding practices.
3. To explore tools and methodologies for vulnerability assessment and penetration testing.
4. To develop skills in implementing authentication, authorization, and session management mechanisms.

Detailed Syllabus

UNIT1:
Introduction- Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security and CIA triad, Need for Web Security, Threats to Information Systems, Information Assurance and Security Risk Analysis, Cyber Security.

UNIT II:
Application Security- (Database, E-mail and Internet), Data Security Considerations-(Backups, Archival Storage and Disposal of Data), Security Technology-(Firewall , VPNs, Intrusion Detection System), Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack.

UNIT III:
Introduction to E-Commerce, Threats to E-Commerce, Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Cryptography Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets.

UNIT IV:
Security Policies- Why policies should be developed, Policy Review Process, Publication and Notification Requirement of policies, Types of policies – WWW policies, Email Security policies, Corporate Policies, Sample Security Policies. Case Study – Corporate Security

UNIT V:
Information Security Standards-ISO, IT Act, Copyright Act, IPR. Cyber Crimes, Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law, Copy Right Law , Semiconductor Law and Patent Law , Software Piracy and Software License.

Text Books:

1. "Web Application Security: A Beginner's Guide" by Bryan Sullivan and Vincent Liu
2. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto

Reference books:

1. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
3. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
4. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.

Course Outcomes:

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

CO1. Identify and analyze common web application vulnerabilities such as SQL injection, XSS, and CSRF.
CO2. Apply secure coding practices to mitigate security risks in web applications.
CO3. Use tools for vulnerability assessment, penetration testing, and security auditing.
CO4. Implement effective authentication, authorization, and session management techniques.
CO5. Design and deploy secure web applications in compliance with industry standards and best practices.

BCACC517 (Generic Elective I): IT Governance Risk and Information Security Management

L	T	P	Theory	Internal	Practical	Total Marks
Hours						
1	1	0	35	15	50	1

Teaching Scheme	Examination Scheme
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: Basic Knowledge of Information Technology Systems and Infrastructure, Understanding of Fundamental Security Concepts and Risk Management Principles

Course Objectives:

1. To understand the principles and frameworks of IT governance and their role in organizational success.
2. To learn the methodologies for identifying, assessing, and managing IT-related risks.
3. To explore strategies for implementing effective information security management systems (ISMS).
4. To develop the ability to align IT governance, risk management, and security practices with business objectives and compliance requirements.

Detailed Syllabus

UNIT I:

Governance, Risk & Compliance GRC–Definitions–Governance Risk, Compliance Risk Threshold, Risk Modeling, Risk Appetite, Governance Standards. Best Practices for IT Governance–ITIL - ISO/IEC 27001 - Control Objectives of Information and Related Technology (COBIT) – The Information Security Management Maturity Model - Capability Maturity Model – latest standards and compliance technologies.

Information Security Governance: Effective Information Security Governance - Importance of Information Security Governance - Outcomes of Information Security Governance - Strategic alignment – Risk Management - Performance Measurement - Information System Strategy - Strategic Planning - Steering Committee- Policies and Procedures.

UNIT II:

Information Security Management Practices-Personnel Management: Financial Management–Quality Management - Information Security Management - Performance Optimization - Roles and Responsibilities - Auditing IT Governance Structure - Evaluation Criteria & Benchmark - Assessment Tools -Case Study Analysis - Risk Management framework–COSO - The Internal environment - Objective Setting -Event Identification - Risk assessment - Risk Response - Control activities - Information & communication–Monitoring–NIST - Risk Assessment - Risk Mitigation - Evaluation & Assessment - Case Study Analysis.

Compliance: Introduction-Information Technology and security - Evolution of Information systems - Roles and responsibilities - Audit, Assessment and review - The Role of the Compliance Officer - The duties and responsibilities of the compliance officer and the function of compliance - Compliance officer activities - The requirements of a Compliance Officer - Drafting compliance reports – Designing an Internal Compliance System -Regulatory principles–Issues - Developing high-level compliance policies - Defining responsibility for compliance- The compliance function - Specific internal compliance

control issues–Information System Audit - Scope of System Audit - Audit Planning - Audit Manual - Audit check lists - Audit Reports - Best Practices for IT compliance and Regulatory Requirements.

UNIT III:

Security Policies- Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Evolving Technology Security – Mobile, Cloud, Outsourcing, SCM

Information Security Standards: ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

Case Study – Corporate Security

Text Books:

1. V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi
2. Anshul Kaushik, Cyber Security, Khanna Publishing House
3. Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House

Reference Books:

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, “Analysing Computer Security”, Pearson Education India.
2. V.K.Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India.
3. Dr.Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla ,”Introduction to Information Security and Cyber Law” Willey Dreamtech Press.
4. Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage
5. Mike Chapple and David Seidl "Cyberwarfare: Information operations in a connected world" Jones & Bartlett Learning
6. Schou, Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw Hill.
7. CHANDER, HARISH,” Cyber Laws and It Protection”, PHI Learning Private Limited, Delhi

Course Outcomes:

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

CO1. Understand and apply the principles of IT governance and its alignment with business goals.
CO2. Identify, assess, and manage IT risks using standard risk management methodologies.
CO3. Implement information security management practices based on industry frameworks like ISO/IEC 27001.
CO4. Evaluate and ensure compliance with legal, regulatory, and organizational security requirements.
CO5. Design and integrate governance, risk, and security strategies to enhance enterprise IT resilience and performance.

BCACC518 (Generic Elective I): Infrastructure Solution and Cloud						
L	**T**	**P**	**Theory**	**Internal**	**Practical**	**Total Marks**
Hours						
1	1	0	35	15	50	1

Teaching Scheme	**Examination Scheme**
Credits: 2	Mid Term Exam: 6 Marks
	Teachers Assessment: 3 Marks
	Attendance: 6 Marks
	End Semester Exam: 35 Marks

Prerequisite: Basic Understanding of Networking, Servers, and Virtualization Concept, Fundamental Knowledge of Cloud Computing Models and Services (IaaS, PaaS, SaaS)

Course Objectives:

1. To understand the components and architecture of IT infrastructure and cloud computing.
2. To learn how to design and implement scalable infrastructure solutions using cloud platforms.
3. To explore various cloud service models (IaaS, PaaS, SaaS) and deployment models (Public, Private, Hybrid).
4. To develop skills in managing, monitoring, and securing cloud-based infrastructure solutions.

UNIT I:

Cloud Computing fundamentals: Essential characteristics, Architectural Influences, Technological Influences, and Operational Influences.Cloud Computing Architecture: Cloud Delivery models, The SPI Framework, Cloud Software as a Service (SaaS) , Cloud Platform as a Service(PaaS), Cloud Infrastructure as a Service(IaaS), Cloud deployment models, Public Clouds, Community Clouds, Hybrid Clouds, Alternative Deployment models, Expected benefits. Cloud Computing Software Security fundamentals: Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development practices, Approaches to Cloud Software Requirement Engineering, Cloud Security Policy Implementation.

UNIT II:

Cloud Computing Risk Issues: The CIA Triad, Privacy and Compliance Risks, Threats to Infrastructure, Data and Access Control, Cloud Access Control Issues, Cloud Service Provider Risks. Cloud Computing Security challenges: Security Policy Implementation, Policy Types, and Computer Security Incident Response Team (CSIRT).

Cloud Computing Security Architecture: Architectural Considerations, General Issues, Trusted Cloud Computing, Secure Execution environments and Communications, Micro architectures, Identity Management and Access Control, Autonomic Security.

UNIT III:

Governance in the Cloud: Industry Standards Organizations and Groups associated with Cloud Computing, need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging 9 SUB and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations

Text and Reference Books:

1. Hausman, K. K., Cook, S. L., & Sampaio, T. (2013).
2. Cloud Essentials: CompTIA Authorized Courseware for Exam CLO-001.
3. John Wiley & Sons. Hurwitz, J. S., & Kirsch, D. (2020).
4. Cloud computing for dummies. John Wiley & Sons. Thomas, E., Zaigham, M., & Ricardo, P. (2013).
5. Cloud Computing Concepts, Technology & Architecture. Srinivasan, A. (2014).
6. Cloud Computing: A practical approach for learning and implementation. Pearson Education India.
7. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A comprehensive Guide to secure Cloud Computing" Wiley.

Course Outcomes:

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

CO1. Understand the architecture and key components of IT infrastructure and cloud environments.
CO2. Design and implement infrastructure solutions using various cloud service and deployment models.
CO3. Apply best practices for provisioning, configuring, and managing cloud-based resources.
CO4. Ensure the performance, scalability, and security of cloud infrastructure solutions.
CO5. Evaluate and select appropriate cloud services to meet specific business and technical requirements.