ST. TERESA'S COLLEGE, ERNAKULAM

(AUTONOMOUS)

Affiliated to Mahatma Gandhi University, Kottayam

CURRICULUM FOR

BACHELOR'S PROGRAMME

IN

COMPUTER APPLICATIONS –

CLOUD TECHNOLOGY AND

INFORMATION SECURITY MANAGEMENT

Under Choice Based Credit & Semester System
& Outcome Based Education

(2018 Admissions)

BCA (Cloud Technology and Information Security Management)

PROGRAM SPECIFIC OUTCOMES

PSO1: Describe the concepts and organization of computer, network and data management system incorporating security practices.

PSO2: Integrate critical thinking, mathematical, statistical and collaborative learning skills to solve abstract to complex problems using high-level programming languages.

PSO3: Identify the cloud computing concepts and technologies and apply these in a cloud platform.

PSO4: Apply cyber security policies and strategies to protect and investigate malpractices against digital assets.

PSO5: Develop solutions to real world problems by coalescing computer technologies and risk management principles in multidisciplinary environment and communicate it effectively.

SEMESTER I

Course Code	Course Title	Credits	Course Type
EN1A01B18	Fine-tune Your English	4	Common Course
BCA1B02B18	Programming in C	3	Core Course
BCA1B03B18	Introduction to Unix and Shell Scripting	3	Core Course
BCA1BP01B18	Software Lab- I	2	Core Course
BCA1B01B18	Computer fundamentals & organization	4	Complementary Course
ST1C01B18	Descriptive Statistics	4	Complementary Course

SEMESTER I

Common Course

EN1A01B18 – Fine-tune Your English

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1. Recognize the basics of English grammar

CO2. Choose the appropriate word classes

CO3. Identify common errors in the use of English language in various contexts

CO4. Apply the rules of grammar to comprehend, speak, and write grammatically correct English

CO5. Compose materials for business communication

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	2	1	1	1	2
CO2	1	1	1	1	1
CO3	2	1	1	1	2
CO4	2	1	1	1	2
CO5	3	1	1	1	3

Syllabus Content

Module 1 **(18 Hours)**

The Sentence and its Structure

How to Write Effective Sentences – Phrases:What are They? – The Noun Clauses – The Adverb Clause – "If All the Trees Were Bread and Cheese" – The Relative Clause – How Clauses are Conjoined

Module 2 **(18 Hours)**

Word-Classes and Related Topics

Understanding the Verb – Understanding Auxiliary Verbs – Understanding Adverbs – Understanding Pronouns – The Reflexive Pronoun – The Articles I – The Articles II – The Adjective – Phrasal Verbs – Mind your Prepositions

Module 3 **(18 Hours)**

To Err is Human

Concord – Errors – Common and Uncommon

Spelling and Pronounciation

Pronunciation: Some Tips – More Tips on Pronunciation – An awesome Mess? – Spelling Part II

Module 4 **(18 Hours)**

Tense and Related Topics

'Presentness' and Present Tenses – The 'Presentness' of a Past Action – Futurity in English – Passivisation

Interrogatives and Negatives

Negatives – How to Frame Questions – What's What? – The Question Tag

Module 5 **(18 Hours)**

Conversational English

Some time expressions – Is John There Please?

Miscellaneous and General Topics

Reading

Letter Writing

In addition there will be an essay question on a general topic.

SEMESTER I

CORE COURSE

BCA1B02B18–Programming in C

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss computer based problem solving methods and explain programming environment. .

CO2: Create programs using basic, advanced and file concepts in C.

CO3:Test and debug the programs.

CO4: Develop software applications using dynamic data structures.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	1	1	2
CO2	2	3	2	2	3
CO3	2	2	2	2	3
CO4	2	3	2	2	3

Syllabus Content:

Module I: (10 hrs)

Overview of Programming: Introduction to computer based problem solving, Program design and implementation issues- Flowcharts & Algorithms, Top down design & stepwise refinement, Programming environment – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters.

Module II: (16 hrs)

Fundamentals of C programming: Overview of C, Data Types, Constants & Variables, Operators & Expressions, Control constructs-if then, for, while, Arrays- single & multidimensional arrays, Functions-fundamentals – general form, function arguments, return value, Basic I/O-formatted and Unformatted I/O, Advanced features- Type modifiers and storage class specifiers for data types, Bit operators, ? operator, & operator, * operator, Type casting, type conversion.

Module III: (16 hrs)

Advanced programming techniques: Control constructs- Do while, Switch statement, break and continue, exit() function, go to and label, Scope rules- Local & global variables, scope rules of functions, Functions-parameter passing, call by value and call by reference, calling functions with arrays, argc and argv, recursion- basic concepts, ex-towers of Hanoi.

Module IV: (15 hrs)

Dynamic data structures in C: Pointers- The & and * operator, pointer expression, assignments, arithmetic, comparison, malloc vs calloc, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions, function returning pointers, Structures- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers, arrays and structures within structures, Unions – Declaration, uses, enumerated data-types, typedef.

Module V: (15 hrs)

Additional features: File Handling – The file pointer, file accessing functions, fopen, fclose, puc, getc, fprintf, C Preprocessor- #define, #include, #undef, Conditional compilation directives, C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions.

SEMESTER I

CORE COURSE

BCA1B03B18–Introduction to Unix and Shell Scripting

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Explain the history and features of UNIX OS, the common Unix Commands, & management of user accounts.

CO2: Associate Unix File management, file commands, file and directory permissions.

CO3: Collaborate Process Management in UNIX, Text Processing using VI Editor and communication with other users.

CO4: Operate shell scripting concepts, its parameters, functions and expression patterns.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**2**	**2**	**2**	**2**
CO2	**2**	**2**	**2**	**2**	**2**
CO3	**2**	**2**	**2**	**2**	**3**
CO4	**2**	**2**	**2**	**2**	**2**

Syllabus Content:

Module I: (15 hrs)
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 - theuser 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.

Module II: (16 hrs)
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, rmdircommands. The dot (.) and double dots (..) notations to represent parent directories - File related commands – cat, mv, rm, cp, wc - 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

Module III: (16 hrs)
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.

Module IV: (10 hrs)
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.

SEMESTER I

CORE COURSE

BCA1BP01B18–Software Lab- I

Credits: 2

Total Lecture Hours: 4 hrs. per week

Course Outcomes:

CO1: Develop diverse programs for a single problem using basic and advanced programming techniques in C and Linux.

CO2: Validate programs by testing and debugging processes.

CO3: Employ Linux commands for basic and file processing operations.

CO4: Experiment shell scripts for simple applications.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	2	3
CO2	2	3	2	2	3
CO3	2	2	2	2	2
CO4	2	2	2	2	2

Syllabus Content:

I. Introduction to Linux (2 hrs. per week)

1. Execute 25 basic commands of UNIX.

2. Basics of functionality and modes of VI Editor.

3. Program that accepts user name and reports if user is logged in.

4. WAP which displays the following menu and executes the option selected by user: 1. ls 2. Pwd 3. ls –l 4. ps –fe

5. Program to print series.

6. Program to replaces all "*.txt" file names with "*.txt.old" in the current.

7. Program that echoes itself to stdout, but backwards.

8. WAP that takes a filename as input and checks if it is executable, if not make it executable.

9. WAP to take string as command line argument and reverse it.

10. Program to create a data file in the given format and to perform some operations on the file, such as displaying, sorting, storing etc.

II. Programming in C (2 hrs. per week)

1. Programs to print different series

2. Programs using Arrays

3. Programs using Functions

4. Programs using String

5. Programs using Structures

6. Programs using Union

7. Programs using Pointers

8. Programs using Files

SEMESTER I

COMPLEMENTARY COURSE

BCA1B01B18 –Computer fundamentals & organization

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Explain the basic organization and evolution of computers.

CO2: Compare the types of computer memory.

CO3: Distinguish between computer hardware and software.

CO4: Recognise the different logic gates and number system conversions in digital computing.

CO5: Design documents and power point presentations using Microsoft Office tools.

CO6: Identify the types of networks and discuss internet and related technologies.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**2**	**2**
CO2	**3**	**2**	**2**	**2**	**2**
CO3	**2**	**2**	**2**	**2**	**2**
CO4	**2**	**1**	**1**	**1**	**2**
CO5	**1**	**1**	**1**	**1**	**3**
CO6	**3**	**1**	**2**	**2**	**2**

Syllabus Content:

Module I: (15 hrs)
General features of a computer: Generation of computers, Personal computer, workstation, mainframe computer and super computers. Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.

Module II: (16 hrs)
Computer organization: central processing Module, computer memory – primary memory and secondary memory. Secondary storage devices – Magnetic and optical media. Input and output Modules. OMR, OCR, MICR, scanner, mouse, modem.

Module III: (16 hrs)
Computer hardware and software: Machine language and high level language. Application

software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS. Computer arithmetic, Binary, octal and hexadecimal number systems. Algorithm and flowcharts, illustrations, elements of a database and its applications. Basic Gates (Demorgans theorems, duality theorem, NOR,NAND,XOR,XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions

Module IV: (10 hrs)
MS Office: Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWERPOINT

Module V: (15 hrs)
Introduction to networking: Network of computers. Types of networks, LAN, Intranet and Internet. Internet applications. World wide web, E-mail, browsing and searching, search engines, multimedia applications.

SEMESTER I

COMPLEMENTARY COURSE

ST1C01B18–Descriptive Statistics

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1 :Describe the basic concepts of Statistics

CO2 : Manage raw data by constructing tables and express them by diagrams an graphs.

CO3 :Illustrate the fundamental characteristics of data

CO4 :Evaluate the different types of Index numbers

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	1	2
CO2	1	2	1	1	2
CO3	1	2	1	1	1
CO4	1	2	1	1	1

Syllabus content :

Module I (20 hours)

Introduction to Statistics, Population and Sample, Collection of Data, Various methods of data collection, Census and Sampling. Methods of Sampling – Simple Random Sampling– stratified sampling – systematic sampling (Method only), Types of data – quantitative, qualitative, Classification and Tabulation, Frequency Table, Diagrammatic representation – Bar diagram, pie diagram; pictogram and cartogram.

Module II(20 hours)

Measures of Central Tendency – Mean; Median; Mode; Geometric Mean; Harmonic Mean and Properties, Partition values- Quartiles, Deciles, Percentiles, Absolute and Relative measures of Dispersion – Range, Quartile Deviation, Box Plot, Mean Deviation, Standard Deviation, Coefficient of Variation. Graphical representation – histogram, frequency polygon, frequency curve, ogives and stem and leaf chart.

Module III(16 hours)

Raw Moments, Central Moments, Inter Relationships (First Four Moments), Skewness – Measures – Pearson's, Bowley's and Moment Measure; Kurtosis- Measures of Kurtosis – Moment Measure, Measure based on partition values.

Module IV(16 hours)

Index Numbers – definition, limitations, uses, Simple Index Numbers; Weighted Index Numbers – Laspeyer's, Paasche's and Fisher's Index Numbers, Test of Index Numbers, Construction of Index Numbers, Cost of Living Index Numbers – Family Budget Method, Aggregate Expenditure Method.

SEMESTER II

Course Code	Course Title	Credits	Course Type
EN2A03B18	Issues that Matter	04	Common course
BCA2B05B18	OOPS with C++	03	Core course
BCA2B06B18	Data structures using C	03	Core course
BCA2BP02B18	Software lab-II	02	Core course
BCA2B04B18	Operating system	04	Complementary course
MT2C04B18	Fundamentals of mathematics	04	Complementary course

SEMESTER II

COMMON COURSE

EN2A03B18 - ISSUES THAT MATTER

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1. Identify the major issues of contemporary significance

CO2. Discuss the consequences of war and refugee crisis with respect to the psychological dimension

CO3. Employ theoretical learning in classrooms to current developments in the world

CO4. Critique the diverse experiences both historical and contemporary to create a more informed vision of the future

CO5. Develop oneself as a conscious, concerned, conscientious human being

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	1	1	1	1
CO2	1	1	1	1	1
CO3	1	2	1	1	3
CO4	1	2	1	1	2
CO5	1	2	1	1	3

Syllabus Content

Module 1 **(18 hours)**

"The Unsurrendered People" – Kenzaburo Oe

"The Old Prison" – Judith Wright

"War" – Luigi Pirandello

Module 2 **(18 hours)**

Persuasions on the Power of the Word:

"On Censorship" – Salman Rushdie

"Peril" – Toni Morrison

"The Burning of the Books" – Bertolt Brecht

"The Censors" – Luisa Valenzuela

Module 3 **(18 hours)**

"The Poisoned Bread" – BandhuMadhav

"A Trip Westward" – Zitkala-Sa

"The Pot Maker" – TemsulaAo

Module 4 **(18 hours)**

"Does it Matter?" – Richard Leakey

"On Killing a Tree" – Gieve Patel

"Hagar: A Story of a Woman and Water" (Gift in Green (chapter 2)) – Sarah Joseph

Module 5 **(18 hours)**

"Understanding Refugeeism: An Introduction to Tibetan Refugees in India" – Mallica Mishra

"Refugee Blues" – W.H Auden

"The Child Goes to the Camp" (from Palestine's Children) – GhassanKanafani

SEMESTER II

CORE COURSE

BCA2B05B18–OOPS with C++

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the basic concepts of object oriented programming.

CO2: Apply the concepts of constructors, operator overloading, inheritance and polymorphism with C++ programming**.**

CO3: Illustrate file manipulation using C++.

CO4: Develop generic programming with templates in C++.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**1**	**1**	**2**
CO2	**2**	**3**	**1**	**1**	**3**
CO3	**2**	**3**	**2**	**1**	**3**
CO4	**2**	**3**	**1**	**1**	**3**

Syllabus Content:

Module I: (12 hrs)

Introduction: Evolution of programming methodologies-Procedure oriented versus Object Oriented Programming-characteristics of OOP, Basics of OOP, Merits and Demerits of OOP.

Data Types: Different data types, operators and expressions in C++, Keywords in C++.

Input and Output: Comparison of stido.h and iostream.h, cin and cout.

Decision and loop: Conditional statement - if-else statement, nested if-else statement, switch, break, continue, and goto statements, Looping statements- for loop, while loop, Do-while loop.

Arrays, String and Structures : Fundamentals-Single dimensional, multi-dimensional arrays, fundamentals of strings, different methods to accept strings, different string manipulations, array of strings, Basics of structures-declaring and defining structure- Accessing structure members, array of structures, Unions difference between structures and Unions, Enumerated data types-declaration and their usage.

Module II: (15 hrs)

Class: Definition-defining the class, defining data members and member functions, Access specifier-private, public, protected, objects as function arguments, returning objects from the function, scope resolution operator, member function defined outside the class, difference between class and structure, array as class member data, Array of objects.

Functions in C++ : Function definition, function declaration, Built-in functions, user defined functions, calling the function, passing parameter-actual and formal, different methods of calling the function call by value, call by reference using reference as parameter and pointer as parameter, overload function-different types of arguments-different number of arguments, inline function, default argument, storage classes-automatic, external, static, register.

Constructor and Destructor: Constructors-constructor with argument, constructor without arguments, constructor with default arguments, Dynamic constructor, constructor overloading, copy constructor, destructors, Manipulating private data members.

Module III: (15 hrs)

Operator overloading: Defining operator overloading, overloading unary operator, overloading binary operator, manipulation of string using overloaded operator, rules for overloading operator.

Data conversion: conversion between Basic types, conversion between objects & Basic types, conversion between objects of different classes.

Inheritance: Base Class & derived class, defining derived classes, protected access specifier, public inheritance and private inheritance-member accessibility, constructors and destructors in

derived classes, Level of inheritance-single inheritance, multiple inheritance, multi-level inheritance, hierarchical inheritance, hybrid inheritance.

Module IV: (15 hrs)

Pointer: Pointer declaration and Access, Pointer to void, pointer and arrays, pointer constant and pointer variable, pointer and functions, pointer, call by pointer arrays, array of pointers to string, printer sort, memory management-new and delete, pointer to object-referencing members using pointers, self containing class, this pointer, returning values using this pointer

Virtual function: Normal member functions accessed with pointers, virtual member function access, late binding, pure virtual function, abstract class, virtual base class

Friend functions and static function: Purpose, defining friend functions, friend classes, static function, accessing static function numbering positive objects.

Module V: (15 hrs)

Templates and Exception Handling: Introduction to templates, class templates, function templates, Member function templates, Template arguments, Exception handling.

Console IO Operator :C++ stream and C++ stream classes, unformatted I/O operators, formatted I/O operators-manipulators-user defined manipulators.

Files: Class for file stream operators, opening and closing a file, file nodes, writing an object to disk, reading an object from disk, binary versus character files, I/O with multiple object, stream class, file pointer-specifying the position, specifying the object, tellg() function, seekg() function. Command line arguments.

SEMESTER II

CORE COURSE

BCA2B06B18–Data Structures Using C

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Understand the basic data structures and their classifications, memory allocation, and recursive functions.

CO2: Illustrate different searching and sorting techniques.

CO3: Differentiate stack, queue, linked lists, tree and graph data structures, its types, applications and operations performed on it.

CO4: Write programs in C to implement basic data structures and to perform operations on it.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	2	3	1	1	3
CO3	3	2	1	1	2
CO4	2	3	1	1	3

Syllabus Content:

Module I: (10 hrs)
Introduction to Data structures: Definition, Classification of data structures: primitive and non-primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. 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 in C (advantages), Writing Recursive programs – Binomial coefficient, Fibonacci, GCD.

Module II: (15 hrs)
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.

Module III: (15 hrs)
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.

Module IV: (16 hrs)
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.
Module V: (16 hrs)

Tree, Graphs and their Applications:
Tree: 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: Graphs, Application of Graphs, Depth First search, Breadth First search.

SEMESTER II

CORE COURSE

BCA2BP02B18–Software Lab- II

Credits: 2

Total Lecture Hours: 4 hrs. per week

Course Outcomes:

CO1: Design programs in C++ which deals with file manipulation.

CO2: Develop programs in C++ to solve problems using object oriented concepts.

CO3: Develop programs in C to implement basic data structures and its operations.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	1	1	3
CO2	2	3	1	1	3
CO3	2	3	1	1	3

Syllabus Content:

I. OOPS WITH C++ - LAB (2 hrs per week)

1. Basic C++ programs using operators, control statements and loops.
2. Programs to implement Arrays, Strings and Structures.
3. Program to implement class.
4. Program to implement functions.
5. Program to implement constructor and destructor
6. Program to implement operator overloading.
7. Program to implement all types of inheritance.
8. Program to implement pointer.
9. Program to implement virtual function.
10. Program to implement friend functions and static function.
11. Program to implement templates and exception handling.
12. Program to implement files.

II. DATA STRUCTURES USING C – LAB (2 hrs per week)

1. Program to implement Arrays
2. Program to implement Recursive Functions
3. Program to implement Pointers
4. Program to implement Searching Techniques
5. Program to implement Sorting Techniques
6. Program to implement Stack
7. Program to implement Queue
8. Program to implement Linked List
9. Program to implement Trees
10. Program to implement Graph

SEMESTER II

COMPLEMENTARY COURSE

BCA2B04B18–Operating System

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Explain the Operating System, objectives, functions, components and services.

CO2: Illustrate the concept of Process, its scheduling and CPU scheduling.

CO3: Discuss the concept of Process Synchronization, thread handling and deadlocks

CO4: Illustrate the Physical and Virtual Memory management techniques along with storage management using files and Disk management**.**

CO5: Choose appropriate security techniques for attaining a highly secure system.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	2	2	2
CO2	2	2	2	1	3
CO3	3	2	2	1	2
CO4	2	1	2	2	3
CO5	2	1	2	3	3

Syllabus Content:

Module I: (15 hrs)
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.

Module II: (15 hrs)
Process Management: Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems.
Threads: Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues.
CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.
Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions
Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Module III: (16 hrs)
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

Module IV: (10 hrs)
Storage Management: **File-System Interface:** File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics
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

Module V: (15 hrs)

Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Acess Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection

Security: Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

SEMESTER II

COMPLEMENTARY COURSE

MT2C04B18 - FUNDAMENTALS OF MATHEMATICS

Credits : 4 Credits

Total Lecture Hours: 72 (4 hours /week)

Course Outcomes:

CO1: Solve the system of linear equations using matrices.

CO2: Analyze the extreme values of a function using derivatives.

CO3: Solve first order partial differential equations using Lagrange's method.

CO4: Compute the Laplace transform and inverse Laplace transform of a function and find the solution of differential equations.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	1	1	2
CO2	1	3	1	1	2
CO3	1	3	1	1	2
CO4	1	3	1	1	2

Syllabus Content:

Module 1 : Matrices (17 hrs)

A quick review of the fundamental concepts, Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of a Non-Singular Matrix, Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogeneous Equations, Characteristic equation of a matrix.. (proof of all the theorems are to be excluded.)

MODULE II: Differential Calculus: (20hrs)

A quick review of limits of function, rules for finding limits, extensions of limit concepts, derivative of a function, differentiation rules, chain rule, rate ofchange and simple applications of the rules. Extreme values of a function Rolle‟s Theorem, Mean Value Theorem. (Excluding proofs of theorems)

MODULE III: Partial Differential Equations (15 hrs)

Introduction, formulation of Partial Differential Equation by elimination of arbitrary constants and by elimination of arbitrary function. Solution of first order equations using Lagrange‟s method.

MODULE IV: Laplace Transforms (20 hrs)

Definitions- transforms of elementary functions, properties of Laplace transforms, inverse transforms- convolution theorem (no proof).

SEMESTER III

Course Code	Course Title	Credits	Course Type
BCA3B07B18	Information Security Fundamentals	04	Core course
BCA3B08B18	Software Engineering	04	Core course
BCA3B10B18	RDBMS	03	Core course
BCA3B11B18	Programming in Java	03	Core course
BCA3BP03B18	Software Lab III	02	Core course
BCA3B09B18	Computer Networks	04	Complementary Course

SEMESTER III

CORE COURSE

BCA3B07B18-Information Security Fundamentals

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the basic concepts, principles and business needs of information security.

CO2: Differentiate various cyber attacks.

CO3: Discuss the risk management Process.

CO4: Identify control measures for network infrastructure security.

CO5: Explain information asset classification.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	2	2	2
CO2	3	2	2	2	2
CO3	2	2	2	2	2
CO4	3	1	2	2	2
CO5	3	1	2	2	2

Syllabus Content

Module I: (14 hrs)

Know the Basics about the Information Security: Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System; Balancing Information Security and Access; implement IT Security, The system Development Life cycle, Security professional in the organization.

Module II: (14 hrs)

Gain Skills on the Need of Information Security: Business Needs-Protecting the functionality, Enabling the safe operations, Protecting the data, safe guarding the technology assets; Threats-compromises to Intellectual property, deliberate software attacks, Espionage and trespass, sabotage and vandalism; Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering.

Module III: (15 hrs)

Identify how the Risk Management Performs: Definition of risk management, risk identification, and risk control, Identifying and Accessing Risk, Assessing risk based on probability of occurrence and likely impact, the fundamental aspects of documenting risk via the process of risk assessment, the various risk mitigation strategy options, the categories that can be used to classify controls.

Module IV: (15 hrs)

Know the detailed descriptions on Network Infrastructure Security and Control: Understanding Infrastructure Security- Device Based Security, Media-Based Security, Monitoring and Diagnosing; Monitoring Network- Firewall, Intrusion Detection System, Intrusion Prevention system; OS and Network Hardening, Application Hardening; Physical and Network Security- Policies, Standards and Guidelines.

Module V: (14 hrs)

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

SEMESTER III

CORE COURSE

BCA3B08B18 –SOFTWARE ENGINEERING

Credits: 4

Total Lecture Hours:72

Course Outcomes:

CO1: Describe various life cycle models of software development process.

CO2: Identify requirements of software development project**.**

CO3: Discuss the principles and techniques involved in software design.

CO4: Distinguish types of software testing.

CO5: Compare the metrics and measurements of software project management.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	2	1	2
CO3	3	2	2	2	2
CO4	3	2	2	2	2
CO5	3	1	1	1	2

Syllabus Content:

MODULE I: (10 hrs)

Software Product And Process: Introduction – S/W Engineering Paradigm – Verification – Validation – Life Cycle Models – System Engineering – Computer Based System – Business Process Engineering, Overview – Product Engineering Overview.

MODULE II: (16 hrs)

Software Requirements: Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary.

MODULE III: (16 hrs)

Analysis, Design Concepts And Principles: Systems Engineering - Analysis Concepts - Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Real Time Software Design – System Design – Real Time Executives – Data Acquisition System – Monitoring And Control System.

MODULE IV: (15 hrs)

Testing: Taxonomy Of Software Testing – Types Of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based On Data Flow Mechanisms – Regression Testing – Module Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques

MODULE V: (15 hrs)

Software Project Management: Measures And Measurements – ZIPF's Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools

SEMESTER III

CORE COURSE

BCA3B10B18 –RDBMS

Credits: 3

Total Lecture Hours:

Course Outcomes:

CO1: Describe the concept of relational database management system.

CO2: Illustrate use of SQL queries to manage a relational database**.**

CO3: Explain how various normal forms are achieved in database design.

CO4: Discuss the concepts of transaction processing.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	2	2	3	3	2
CO3	3	1	2	2	2
CO4	3	1	2	2	2

Syllabus Content:

MODULE I: (15 hrs)

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

MODULE II: (10 hrs)

The relational Model: The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations-Oracle data types, Data Constraints, Column level & table Level Constraints

MODULE III: (16 hrs)

SQL fundamentals: 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.

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

MODULE IV: (15 hrs)

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

MODULE V: (16 hrs)

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.

SEMESTER III

CORE COURSE

BCA3B11B18–PROGRAMMING IN JAVA

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss the basic concepts of Java programming.

CO2: Illustrate basic Java programs using Object oriented concepts.

CO3: Develop user-interface applications using advanced java programming concepts.

CO4: Examine JDBC Connectivity in java.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	2	2	1	1	2
CO3	2	2	2	1	2
CO4	2	2	2	3	2

Syllabus Content:

Module I: (16 hrs)

I**ntroduction**: History, Overview of Java, Object Oriented Programming, A simple Programme, Two control statements - if statement, 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, The 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.

Module II: (16 hrs)

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:** Inheritance basics, Using super, method overriding, Dynamic method Dispatch, using abstract classes, using final with Inheritance.

Module III: (15 hrs)

Packages: Definition, Access protection importing packages, Interfaces: Definition implementing interfaces.**Exception Handling**: Fundamental, Exception types, Using try and catch, Multiple catch clauses, Nested try Statements, throw, throws, finally, Java's Built - in exception, using Exceptions.

Module IV: (15 hrs)

Multithreaded Programming: The Java thread model, The main thread, Creating a thread, Creating multiple thread, Creating a thread, Creating multiple threads, Using isalive() and Join(), **Thread** - Priorities, Synchronization, Inter thread communication, suspending, resuming and stopping threads, using multi threading. 1/0 basics, Reading control input, writing control output, Reading and Writing files, Applet Fundamentals, the AWT package,AWT Event handling concepts The transient and volatile modifiers, using instance of using assert.

Module V: (10 hrs)

JAVA Database Connectivity (JDBC): JDBC architecture, JDBC Drivers, the JDBC API: loading a driver, connecting to a database, Creating and executing JDBC statements, Handling SQL exceptions, Accessing result sets: Types of result sets, Methods of result set interface. An example JDBC application to query a database.

SEMESTER III

CORE COURSE

BCA3B03PB18 –Software Lab III

Credits: 2

Total Lecture Hours:

Course Outcomes:

CO1: Design a database with multiple tables and relationships between them.

CO2: Create and manipulate a relational database with SQL.

CO3: Develop advanced java programs to solve problems using Object oriented conceptsand AWT Packages

CO4: Build java programs using the connectivity between frontend and backend with various JDBC drivers.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	1	1	3
CO2	2	2	2	2	3
CO3	2	3	1	1	3
CO4	2	3	2	2	3

Syllabus Content:

I.RDBMS - LAB (2hrs per week)

Syllabus Content:

1. SQL Commands
    1. Data Definition Language commands,
    2. Data Manipulation Language commands,
    3. Data Control Language commands and
    4. Transaction Control Language commands
2. Select Statements with all clauses/options
3. Nested Queries
4. Join Queries
5. Views
6. High level programming language extensions (Control structures, Procedures and Functions)
7. Database Design and implementation (Mini Project)

II.PROGRAMMING in JAVA – LAB (3hrs per week)

Syllabus Content:

1. Program implementing basic operators.
2. Program to implement control statements and loops.
3. Program to implement methods, recursion, overloading.
4. Program to implement inheritance and overriding.
5. Program using Abstract classes.
6. Program to implement exception handling
7. Program to implement threads.
8. Program to implement interfaces.
9. Program to implement Applet and AWT package.
10. Program to implement JDBC.

SEMESTER III

COMPLEMENTARY COURSE

BCA3B09B18–COMPUTER NETWORKS

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Discover the fundamentals of networks, its working and Network Operating Systems.

CO2: Discuss about networking devices, wireless and WAN technologies.

CO3: Interpret IP addressing, header formats and Network security.

CO4: Examine different protocols, standards and the models associated with networking technology and their troubleshooting mechanisms.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	2	2
CO2	3	1	2	2	2
CO3	2	2	3	3	2
CO4	2	2	3	3	2

Syllabus Content:

Module I: (10 hrs)
Networking Fundamentals: Basics of Network & Networking, Advantages of Networking, Types of Networks, Network Terms- Host, Workstations, Server, Client, Node, Types of Network Architecture- Peer-to-Peer & Client/Server, Workgroup Vs. Domain. Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology, Types of Transmission Media, Communication Modes, Wiring Standards and Cabling- straight through cable, crossover cable, rollover cable, media connectors (Fiber optic, Coaxial, and TP etc.) Introduction of OSI model, Seven layers of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, TCP, UDP, IP, ICMP, ARP/RARP, Comparison between OSI model & TCP/IP model. Overview of Ethernet Addresses.

Module II: (17 hrs)
Basics of Network Devices: Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, And Other Networking Devices, Repeater, CSU/DSU, and modem, Data Link Layer: Ethernet, Ethernet standards, Ethernet Components, Point-to-Point Protocol (PPP),PPP standards, Address Resolution Protocol, Message format, transactions, Wireless Networking: Wireless Technology, Benefits of Wireless Technology, Types of Wireless Networks: Ad-hoc mode, Infrastructure mode, Wireless network Components: Wireless Access Points, Wireless NICs, wireless LAN standards: IEEE 802.a, IEEE 802.b, IEEE 802.g, wireless LAN modulation techniques, wireless security Protocols: WEP,WPA, 802.1X, Installing a wireless LAN.

Module III: (17 hrs)
Basics of Network, Transport and Application Layers: Network Layer: Internet Protocol (IP), IP standards, versions, functions, IPv4 addressing, IPv4 address Classes, IPv4 address types, Subnet Mask, Default Gateway, Public & Private IP Address, methods of assigning IP address, IPv6 address, types, assignment, Data encapsulation, The IPv4 Datagram Format, The IPv6 Datagram Format, Internet Control Message Protocol (ICMP), ICMPv4, ICMPv6, Internet Group Management Protocol (IGMP),Introduction to Routing and Switching concepts, Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets, Application Layer: DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3/IMAP, NTP.

Module IV: (15 hrs)
WAN Technology: What Is a WAN?, WAN Switching, WAN Switching techniques Circuit Switching, Packet Switching etc., Connecting to the Internet : PSTN, ISDN, DSL, CATV, Satellite-Based Services, Last Mile Fiber, Cellular Technologies, Connecting LANs : Leased Lines, SONET/SDH, Packet Switching, Remote Access: Dial-up Remote Access, Virtual Private Networking, SSL VPN, Remote Terminal Emulation, Network security: Authentication and Authorization, Tunneling and Encryption Protocols, IPSec, SSL and TLS, Firewall, Other Security Appliances, Security Threats.

Module V: (13 hrs)

Network Operating Systems and Troubleshooting Network: Network Operating Systems: Microsoft Operating Systems, Novell NetWare, UNIX and Linux Operating Systems, Macintosh Networking, Trouble Shooting Networks: Command-Line interface Tools, Network and Internet Troubleshooting, Basic Network Troubleshooting : Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution, Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools.

SEMESTER IV

Course Code	Course Title	Credits	Course Type
BCA4B12B18	Basics of Server Operating System	04	Core course
BCA4B13B18	Database Security Fundamentals	04	Core course
BCA4B14B18	Principles of Virtualization	04	Core course
BCA4B15B18	Introduction to Cloud Technology	03	Core course
BCA4B16B18	Ethical Hacking Fundamentals	03	Core course
BCA4BP04B18	Software Lab-IV	02	Core course

SEMESTER IV

CORE COURSE

BCA4B12B18–Basics of Server Operating System.

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss Server operating system and its concepts.

CO2: Practice the installation and secure configuration of Server Operating System and Networks.

CO3: Examine the configuration and management of Active Directory Domain services.

CO4: Describe the various group policy management services in Windows Server.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2

Syllabus Content:

Module I: (10 hrs)

Introduction: History of Server OS, Introduction to windows server 2003 & 2008, Overview of Windows Server 2008 Installing and Configuring Windows Server 2008: Installing Windows Server 2008, Managing Server Roles and Features, Configuring and Managing Windows Server 2008 Server Core

Module II: (15 hrs)

Choosing a Deployment Technology, Deploying Windows Server 2008, Introduction and Creation of Users accounts Configuring Networking and Network Services: Configuring IPv6 Addressing, Migrating from IPv4 to IPv6

Module III: (15 hrs)

DHCP and DNS Enhancements in Windows Server 2008, Configuring zones, Configuring DNS server settings, Configuring zone transfer and Replication, Configuring and Managing Windows Firewall with Advanced Security.

Module IV: (16 hrs)

Configuring and Managing Active Directory Domain Services: Active Directory Enhancements in Windows Server 2008 and 2008 R2, Installing and Configuring Domain Controllers, Configuring Read-Only Domain Controllers, Configuring Fine-Grained Password Policies, Sites and Global Catalog, Managing Active Directory Objects with Windows PowerShell, Active Directory Database Management, Replication between the Domain Controllers.

Module V: (16 hrs)

Managing Group Policy in Active Directory Domain Services: Group Policy Enhancements in Windows Server 2008, Managing Security with Group Policy, Managing Clients with Group Policy Preferences, Server Management in Windows Server 2008: Managing Windows Server with Server Manager, Managing Server Updates by Using WSUS, Managing Backup and Restore by Using Windows Server Backup, Managing Event Logs and Auditing, Performance and Resource Management.

SEMESTER IV

CORE COURSE

BCA4B13B18–Database Security Fundamentals

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Distinguish between various Database Management Systems.

CO2: Explain SQL Injection attacks and its countermeasures.

CO3: Determine the various aspects of remote access and protective measures for Oracle & SQL databases.

CO4: Discuss the vulnerability management techniques in the database.

CO5: Describe data warehousing concepts and patch management.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	1	3	2
CO3	3	2	3	2	2
CO4	3	2	2	2	2
CO5	3	2	3	2	2

Syllabus Content:

Module I : (16 hrs)

Introduction to Database & DBMS Architecture: Hierarchical Database Management Systems, Network Database Management Systems, Relational Database Management Systems, Object-Oriented Database Management Systems, End-User Database Management Systems, Spreadsheets, Hardening the Database Environment.

Module II :(13 hrs)

Introduction to Database Interface Languages: Concepts of Database Interface Languages, Basic Security measures in Oracle and SQL, Database Integrity, Triggers and Event, Configuring the Server auditing

Module III :(12 hrs)

SQL injection attacks and Countermeasures: SQL Injection, Prevention of SQL Injection, Open Connectivity Database and Object Linking and Embedding.

Module IV : (15 hrs)

Introduction to Accessing Databases through the Internet: Concept of Accessing Databases through the Internet, the three tier approach, securing a Web server and a Database server, Remove Unnecessary Services if not needed to the business operation, Remote access, Development and Security testing, monitoring the events.

Module V : (16 hrs)

Introduction to Data Warehousing concepts: The concept of Data Warehousing, Metadata and Online Analytical Processing (OLAP)Data mining, Database Vulnerabilities and threats, Vulnerability Scanners, Monitoring and Baselining, Patch management, Procedure for Patch management.

SEMESTER IV

CORE COURSE

BCA4B14B18–Principles of Virtualization

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss about Virtualization and its different technologies.

CO2: Identify how to Deploy, Manage and Access Desktop and Application Virtualization.

CO3: Explain different vendor technologies available in the field of Virtualization.

CO4: Construct a virtual environment by installing and Configuring Virtual Machines.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	2
CO2	3	2	2	2	2
CO3	3	2	3	3	3
CO4	3	2	3	3	3

Syllabus Content:

Module I: (17 hrs)
Basics of Virtualization: Understanding Virtualization, Need of Virtualization and Virtualization Technologies: Server Virtualization, Storage Virtualization, I/O Virtualization, Network Virtualization, Client Virtualization, Application virtualization, Desktop virtualization, Understanding Virtualization Uses: Studying Server Consolidation, Development and Test Environments , Helping with Disaster Recovery.

Module II:(9 hrs)
Deploying and Managing an Enterprise Desktop Virtualization Environment: Configure the BIOS to support hardware virtualization; Install and configure Windows Virtual PC: installing Windows Virtual PC on various platforms (32-bit, 64-bit), creating and managing virtual hard disks, configuring virtual machine resources including network resources, preparing host machines; create, deploy, and maintain images

Module III: (17 hrs)
Deploying and Managing a Presentation Virtualization Environment: Prepare and manage remote applications: configuring application sharing, package applications for deployment by using RemoteApp, installing and configuring the RD Session Host Role Service on the server.

Module IV: (16 hrs)
Access published applications: configuring Remote Desktop Web Access, configuring role-based application provisioning, configuring Remote Desktop client connections. Configure client settings to access virtualized desktops: configuring client settings.

Module V: (13 hrs)
Understanding Virtualization Software: List of virtualization Software available .Vmware-introduction to Vsphere, ESXi, VCenter Server andVsphere client. Creating Virtual Machine. Introduction to HYPER-V role. Create Virtual Machines. Create Hyper-v virtual networking, Use virtual Machine Snapshots. Monitor the performance of a Hyper-v server, Citrix XENDesktop fundamentals.

SEMESTER IV

CORE COURSE

BCA4B15B18–Introduction to Cloud Technology

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe Cloud Computing concepts.

CO2: Practice migration approaches in Cloud.

CO3: Determine the best practices, risks and mitigation in cloud services.

CO4: Discuss Cloud applications and Governance of cloud services.

CO5: Examine cloud platforms, services and its providers.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	3	3	2

Syllabus Content:

Module I: (15 hrs)
Introduction: Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private Public and hybrid clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, , Cloud computing delivery models and services (IaaS, PaaS, SaaS), obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, Practical applications of cloud computing.

Module II: (16 hrs)
Cloud Computing Companies and Migrating to Cloud: Web-based business services, 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

Module III: (16 hrs)
Cloud Cost Management and Selection of Cloud Provider: Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, Selecting the right scalable application. Considerations for selecting cloud solution. Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration

Module IV: (15 hrs)
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 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

Module V: (10 hrs)
Ten cloud do and do not's: Don't be reactive, do consider the cloud a financial issue, don't go alone, do think about your architecture, don't neglect governance, don't forget about business purpose, do make security the centerpiece of your strategy, don't apply the cloud to everything, don't forget about Service Management, do start with a pilot project.

SEMESTER IV

CORE COURSE

BCA4B16B18–Ethical Hacking Fundamentals

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Illustrate the concepts and techniques in Ethical Hacking.

CO2: Examine different cyber-attacks and it's countermeasures.

CO3: Discuss web application vulnerabilities and hacking in different platforms.

CO4: Illustrate vulnerability mitigation & it's reporting.

CO5: Describe the liabilities & legal systems related to cyber security.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	3	3	2
CO3	3	2	3	3	2
CO4	3	2	2	2	2
CO5	3	2	2	2	2

Syllabus Content:

Module I: (10 hrs)

Introduction to Ethical Hacking: Ethical Hacking, why is it necessary, scope and limitations, skills required, phases of ethical hacking, tools and techniques, Black Box, Gray Box and White Box techniques, differences between vulnerability assessment, ethical hacking and penetration testing, Reverse engineering, Ethical hacking terminology, Exploit, Vulnerability – Zero-day, manual PT, Case Studies on data breaches and cybercrimes involving hacking.

Module II: (15 hrs)

Ethical Hacking through Attacks and Exploits: EH methodology, attacks, exploits, Denial of Service, Sniffers, malware, Session Hijacking and ethical hacking of Web Servers and applications, Password Cracking, KeyLogger, Hash Injection attack, replay and man-in-the-middle attacks, rainbow table attack, distributed network attack, spoofing, phasing, spyware, rootkits, hiding files, counter measures

Module III: (16 hrs)

Web and Network Hacking: Enumeration and scanning, host discovery, type of scanning – TCP SYN, ACK, XMAS & UDP Port scanning, SQL Injection, Social Engineering, Buffer Overflows, Input data validation, physical penetration attacks, Hacking Wireless Networking, Hacking mobile platforms, Windows and Linux Hacking, Evading IDS, Firewalls and Honeypots, DDoS attacks, using metasploit, counter measures

Module IV: (16 hrs)

Report Writing & Mitigation: Introduction to Report Writing & Mitigation, requirements for low level reporting & high-level reporting of Penetration testing results, Demonstration of vulnerabilities and mitigation of issues identified including tracking, CVSS scoring for vulnerabilities, rating and prioritization, impact of these in reporting

Module V: (15 hrs)

Ethical Hacking and Legal System: Overview of India's Information Technology Amendment Act 2008 (IT Act 2008), hacker vs cracker, liabilities – civil and penal, cyber theft and IPC sec 378, IT Act 2008 – sections 43, 65 and 66, how to file a complaint of suspected hacking, Case Studies, understanding how hacking is legally dealt with among BRICS countries.

SEMESTER IV

CORE COURSE

BCA4BP04B18–Software Lab-IV

Credits: 2

Total Lecture Hours: 72

Course Outcomes:

CO1: Examine various cyber attacks and construct security tools.

CO2: Devise the phases in ethical hacking.

CO3: Simulate the services of AWS and Google Cloud.

CO4: Design web applications in cloud.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	3	2
CO2	2	3	2	2	3
CO3	2	2	3	3	2
CO4	2	3	2	2	3

Syllabus Contents

I. INTRODUCTION TO CLOUD TECHNOLOGY – LAB (2 hrs per week)

1. Study the basic cloud architecture and represent it using a case study

2. Enlist Major differences between SAAS PAAS &Iaas and also submit research done on various companies in cloud business and the corresponding services provided by them, tag them under SAAS ,Paas&Iaas.

3. Present a report on google cloud and other cloud services

4. Present a report on obstacles and vulnerabilities in cloud computing on generic level

5. Present a report on Amazon cloud services.

6. Present a report on Microsoft cloud services.

7. Present a report on cost management on cloud

8. Enlist and explain legal issues involved in the cloud with the help of a case study

9. Explain the process of migrating to the cloud with a case study.

10. Study various services available on AWS cloud platform.

II. ETHICAL HACKING (3 hrs per week)

1. Explore the knowledge on Passive Reconnaissance using "Who is" and Online tools

2. Understand about the Active Reconnaissance using "Sam pad" and website details

3. Understand about the Full Scan, Half Open Scan and Stealth scan using "nmap"

4. Understand about the UDP and Ping Scanning using "Advanced LAN Scanner" and "Superscan"

5. To gain knowledge on Packet crafting using "Packet creator" tools

6. Gain exposure on Exploiting NetBIOS vulnerability

7. To gain knowledge on Password Revelation from browsers and social networking application

8. Gain exposure on Creating and Analyzing spoofed emails

SEMESTER V

Course Code	Course Title	Credits	Course Type
BCA5B17B18	IT, Environment & Human Rights	04	Core course
BCA5B18B18	Cryptography Fundamentals	04	Core course
BCA5B19B18	Computer Forensics and Investigation Management	03	Core course
BCA5B20B18	Linux Administration	03	Core course
BCA5D01aB18	Security Threats and Trends	03	Open Course
BCA5D01bB18	Hactivism, Cyberwarfare and Cyberterrorism	03	Open Course
BCA5BP05B18	Software Lab – V	02	Core course

SEMESTER V
CORE COURSE
BCA5B17B18- IT, Environment & Human Rights

Credits: 4
Total Lecture Hours: 72
Course Outcomes:

CO1: Discuss the scope and importance of natural resources and ecosystems.

CO2: Explain the biodiversity, its conservation, environmental issues and its solutions.

CO3: Observe the integration of internet in education.

CO4: Discover the impact and opportunities of information technology on society.

CO5: Identify the effectiveness of human rights practice on national, international and environmental facet.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	1	1	1	2
CO2	1	1	1	1	2
CO3	3	1	2	2	2
CO4	3	1	2	2	2
CO5	1	1	1	1	2

Syllabus Content

Module I: (18 hrs)
Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness.
Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of individual in conservation of natural resources. Equitable use of resources for sustainable life styles.
Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids., Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

Module II: (26 hrs)
Biodiversity and its conservation: Introduction, Biogeograhical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values., India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India (8 hrs)
Environmental Pollution: Definition, Causes, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes., Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides. (8 hrs)
Social Issues and the Environment: Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns. Case studies.
Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies, Consumerism and waste products, Environment Protection Act , Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Module III: (10 hrs)
Internet as a knowledge repository, academic search techniques, creating cyber presence. Academic websites, open access initiatives, opens access publishing models, Introduction

to use of IT in teaching and learning -Educational software, Academic services– INFLIBNET, NPTEL, NICNET, BRNET .

Module IV: (10 hrs)
IT & Society- issues and concerns- digital divide, IT & development, the free software movement, IT industry: new opportunities and new threats, software piracy, cyber ethics, cyber crime, cyber threats, cyber security, privacy issues, cyber laws, cyber addictions, information overload, health issues- guide lines for proper usage of computers, internet and mobile phones. e-wastes and green computing, impact of IT on language & culture-localization issues- Unicode-IT and regional languages, Green Computing Concept.

Module V: (8 hrs)
Human Rights– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).
Human Rights and United Nations – contributions, main human rights related organs - UNESCO, UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights. Human Rights in India – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities
Environment and Human Rights - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment Conservation of natural resources and human rights: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasthurirengan report. Over exploitation of ground water resources, marine fisheries, sand mining etc.

SEMESTER V

CORE COURSE
BCA5B18B18-CRYPTOGRAPHY FUNDAMENTALS

Credits: 4
Total Lecture Hours: 72

Course Outcomes:

CO1:Describe the methodologies, practices and uses of cryptography.

CO2: Examine the various Cryptographic algorithms.

CO3: Determine the key management process, and its applications in cryptography.

CO4: Discuss the security vulnerabilities of a cryptosystem and its counter measures.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	2	2
CO2	3	2	2	3	2
CO3	2	2	2	3	2
CO4	3	1	2	2	2

Syllabus Content

Module I: (10 hrs)

Introduction to Cryptography: The Confidentiality, Integrity & Availability (CIA) Triad, Cryptographic concepts, methodologies &practices, Symmetric& Asymmetric cryptography, public& private keys.

Module II: (15 hrs)

Cryptographic Algorithms: Cryptographic algorithms and uses, Construction& use of Digital signatures**,** The basic functionality of hash/crypto algorithms (DES, RSA, SHA, MD5, HMAC, DSA) and effects on key length concepts in Elliptical Curve Cryptography & Quantum Cryptography.

Module III: (15 hrs)

Key Management: The basic functions involved in key management including creation, distribution, verification, revocation and destruction, storage, recovery and life span and how these functions affect cryptographic integrity

Module IV: (16 hrs)

Application of Cryptography: Major key distribution methods and algorithms including Kerberos, ISAKMP etc.

Module V: (16 hrs)

Vulnerability analysis: Vulnerabilities to cryptographic functions.

Use and functions of Certifying Authorities (CAs),Public Key Infrastructure (PKI) and System architecture requirements for implementing cryptographic functions.

SEMESTER V

CORE COURSE
BCA5B19B18- COMPUTER FORENSICS AND INVESTIGATION

Credits: 3
Total Lecture Hours: 72

Course Outcomes:

CO1: Identify the importance of Computer Forensics and investigation procedure.

CO2: Practice Cyber Forensics Tools and Techniques.

CO3: Discuss the data recovery processes in storage devices.

CO4: Review cyber laws and IT Act.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	2	2	2
CO2	3	2	2	3	2
CO3	3	1	2	2	2
CO4	2	1	2	2	2

Syllabus Content

Module I: (10 hrs)
Understand the Importance of Computer Forensics.
Computer Forensics: Introduction to Computer Forensics, Forms of Cyber Crime, First Responder Procedure- Non-technical staff, Technical Staff, Forensics Expert and Computer Investigation procedure

Module II: (15 hrs)
Learn to identify and trace Passwords, E-mail using Forensics Tools.
Storage Devices & Data Recover Method, Storage Devices- Magnetic Medium, Non-magnetic medium and Optical Medium. Working of Storage devices-Platter, Head assembly, spindle motor. Data Acquisition, Data deletion and data recovery method and techniques

Module III: (15 hrs)
Acquire skills to perform how Data works on Storage Devices & the Recovery Devices.
Forensics Techniques: Windows forensic, Linux Forensics, Mobile Forensics, Stegnography, Application Password cracking-Brute force, Dictionary attack, Rainbow attack. Email Tacking – Header option of SMTP, POP3, IMAP.

Module IV: (16 hrs)
Corporate espionage, Evidence handling procedure, Chain of custody, Main features of Indian IT Act 2008 (Amendment)

Module V: (16 hrs)
Gain Knowledge about Cyber Laws. Cyber Law sections.

SEMESTER V
CORE COURSE
BCA5B20B18- LINUX ADMINISTRATION

Credits: 3
Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the fundamentals of Linux and Shell commands.

CO2: Illustrate the installation and administration of LINUX OS.

CO3: Practice basic networking and naming services in Linux.

CO4: Examine the UNIX file system.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	2	2	2	2
CO2	3	2	3	3	2
CO3	3	2	3	2	2
CO4	3	1	3	2	2

Syllabus Content:

Module I: (10 hrs)
Fundamentals of Linux: Development of Linux, Linux Distributions. Structure of Linux Operating System, Logging In and General Orientation, The X Window System, KDE, GNOME. Navigating the File Systems, Managing Files, File Permission and Access, Shell Basics, Shell Advanced Features, File Name Generation. Common Unix commands.

Module II: (15 hrs)
Administration of Linux OS: Installing Linux, Configuring Disk Devices, Creating and Managing File Systems, File System Backup, Kickstart Installation, Linux Boot Loaders, Linux Kernel Management, Managing User Accounts, Understanding File Listing, Ownership and Permission, Managing Software using RPM, Connecting to Network, Linux Network Services, Setting up a Printer.

Module III: (15 hrs)
Input and Output Redirection: Input Redirection, Output Redirection, Error Redirection, Filter, Pipes. Networking in Linux: Network Connectivity, IP address, Accessing Remote system, Transferring files, and Internet configuration. Process Control: Identifying Process, Managing Process, Background Processing, Putting jobs in Background. Offline File Storage: Storing files to Media Booting process and User.

Module IV: (16 hrs)
Linux Basic networking and naming service: Introduction to Networking, Networking, Internet Network Services, Dynamic DNS, Electronic Messaging, Apache , NIS and Network File Sharing: NIS, Network File Sharing, SAMBA. Security: Defining System Security Policies, System Authentication Services and Security, Securing Services, Securing Data and Communication.

Module V: (16 hrs)
The Unix File System: Inodes - Structure of a regular file – Directories - Conversion of a path name to an inode - Super block - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open – Read - Write - Lseek – Close - File creation - Creation of special files - Changing directory and root - changing owner and mode – stat and fstat - pipes - Dup - Mounting and Unmounting file systems - Link and Un link.

SEMESTER V
OPEN COURSE
BCA5D01aB18- SECURITY THREATS AND TRENDS

Credits: 3
Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss virus, worms and its control mechanisms.

CO2: Describe malware,botnets,honeypots and its control mechanisms

CO3: Discuss trojans ,rootkits and its control mechanisms

CO4: Identify the advanced persistent threats and threat welfare ,its working and security implications.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	1	2	2
CO2	3	1	1	2	2
CO3	3	1	1	2	2
CO4	3	1	1	2	2

Syllabus Content

Module I: (12 hrs)
Understand about the viruses & worms: Introduction to Viruses &Worms, the concept of how Viruses & Worms work, the various types of Viruses &Worms, the infection vectors of Viruses &Worms, managerial, technical & procedural controls to address Viruses & Worms.

Module II: (15 hrs)
Understand about the malware & botnets: Introduction to Malware & Botnets, the concept of how Malware, Trojans & Botnets work, the concept of Honeynets and Honeypots, Managerial, technical& procedural controls to address Malware, Trojans & Botnets.

Module III: (15 hrs)
Understand about the trojans & rootkits: Introduction to Remote Access Trojans & Rootkits, concepts, their working methods, their security implications and the managerial, technical and procedural controls to address RATs.

Module IV: (15 hrs)
Learn to identify the advanced persistent threats & threat warfare: Introduction to Advanced Persistent Threats &Information Warfare, concepts, their working methods, their security implications and the managerial.

Module V: (15 hrs)
Learn how to address threats and possible attacks: Technical and procedural controls to address these threats

SEMESTER V
OPEN COURSE
BCA5D01bB18- HACKTIVISM, CYBERWARFARE AND CYBERTERRORISM

Credits: 3
Total Lecture Hours: 72

Course Outcomes:

CO1: Describe hacktivism, cyber warfare , cyber terrorism and its impacts

CO2: Discuss current trends in hacktivism and its defensive strategies

CO3: Identify the nature and types of Cyber warfare

CO4: Review the history and current trends in cyber warfare and cyber terrorism

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	1	1	2	2
CO2	3	1	1	2	2
CO3	3	1	1	2	2
CO4	3	1	1	2	2

Syllabus Content:

Module I: (12 hrs)

Introduction of Hacktivism, Cyber warfare & cyber terrorism: Introduction to Hacktivism, Cyber warfare and Cyber terrorism, Define Hacktivism, Define Cyber warfare, Define Cyber terrorism, Impact of hacktivism, cyber warfare and cyber terrorism to society and business. Types of Information warfare strategies and activities, Economic Impact of Information warfare.

Module II: (15 hrs)

Gain knowledge about the current trends in Hacktivism: Current Trends in Hacktivism
Current trends in hacktivism including wiki leaks, anonymous and lulz movements, Political natures of Hacktivism, Players involved in hacktivism and discuss the recent incidents, Countermeasures to protect against such incidents. Defensive strategies for Private Companies, Surviving Offensive Ruinous and Containment.

Module III: (15 hrs)

To understand about the nature of Cyber warfare: Nature of Cyber warfare, 5 types of modern warfare including cyber warfare, Strategic nature of cyber warfare, Computer Network Attack (CNA) and Computer Network Exploitation (CNE), How to deploy CNA and CNE assets within a strategic context in support of obtaining a kinetic goal.

Module IV: (15 hrs)

Review history and current trends: Review historic attacks and learn new cyber warfare models that can be used to analyze a state-sponsored attack, Current trends in Cyber warfare and Cyber terrorism including the players and groups involved, Analyze the resent incidents of Cyber warfare and Cyber terrorism.

Module V: (15 hrs)

Learn to identify the Defensive measures: Defensive measures, Defense in Depth and real-life examples of how to apply it to network defense. Why information assurance of computer equipment is critical to defend the network from nefarious attacks. Use Defense tools.

SEMESTER V
CORE COURSE
BCA5BP05B18- SOFTWARE LAB-V

Credits: 2

Course Outcomes:
CO1: Illustrate shell & UNIX Commands.

CO2: Practice the installation and administration of LINUX OS.

CO3: Practice Cyber Forensics Tools and Techniques.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	2
CO2	3	2	3	2	2
CO3	3	2	3	3	2

Syllabus Content:

. **LINUX ADMINISTRATION – LAB** (2 hrs per week)
1. Shell script for command line file browsing.
2. Setting and Changing File permissions
3. Managing Users and Groups
4. Setting up shared directories
5. Creating Symbolic and hard links to files
6. Configure your system that boots to run level 3 by default.
7. Devise a ps command that does the following. (Hint: sort/ps/top)
(a) List all processes.
(b) For each process, prints the information which displays the percentage of CPU usage, the process ID & name of the command that created it.
(c) The output is sorted by the %cpu value from highest to lowest

9. Explain the suid, sgid & sticky bit permission with example
10. Configure given tasks for package management: (Hint: use rpm command)
(a) Check whether ftp package is installed or not.
(b) If it is not installed, install it & verify it.
(c) Display the configuration files available through this package.
(d) Be sure that ftp service must be enabled at startup.
11. Prepare a cron job that take the backup of /home at 5:00pm on every Saturday.
12. Change your system date to 1:00pm March 1990.
13. Configure ftp server such that anonymous can download and upload the data to ftp server.

14. Create a RAID level 1 on /dev/md0 device by creating two equal partitions of 100MB size and mount it on /data. The RAID device must be mounted at the time of system startup.

II. COMPUTER FORENSICS AND INVESTIGATION - LAB (3hrs per week)

Module 1

Understand the Physical Collection of electronic evidence using forensic standards and to gain knowledge about the Dismantling and re-building PCs in order to access the storage media safely

Module 2

To know about Boot sequence and Power OnSelf Test mode analysis and to understand about the Examination of File systems of Windows, Linux and Mac

Module 3

To gain knowledge about the Analysing Word processing and Graphic file format and to understand the basic Network data sniffing and analysing

Module 4

To know about the Password and encryption techniques and get enough skills how to perform Internet forensic and Malware analysis

Module 5

To know on how Data recovery techniques for hard drive and attain skills of how to execute Data recovery techniques for Pen drive and CD

SEMESTER VI

Course Code	Course Title	Credits	Course Type
BCA6B21B18	IT Governance, Risk, & Information Security Management	04	Core course
BCA6B22B18	Mobile, Wireless and VOIP Security	04	Core course
BCA6B23B18	Introduction to Windows Azure	04	Core course
BCA6B24aB18	Virtualization and cloud Security	04	Choice Based Core Course
BCA6B24bB18	Cloud Web Services	04	Choice Based Core Course
BCA6B24cB18	Fundamentals of Data center	04	Choice Based Core Course
BCA6B24dB18	Fundamentals of ITIL	04	Choice Based Core Course
BCA6BSB18	Seminar	02	Core Course
BCA6BPRB18	Project	03	Core Course
BCA6BVB18	Viva Voce	01	Core course

SEMESTER VI

CORE COURSE

BCA6B21B18-IT GOVERNANCE, RISK, & INFORMATION SECURITY MANAGEMENT

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Explain the concepts in IT Governance and associated concepts.

CO2: Illustrate the Risk Management Process.

CO3: Discuss about Information Security Management.

CO4: Identify the frameworks ISACA and COBIT.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2
CO2	3	2	2	2	2
CO3	3	2	2	2	2
CO4	3	1	2	1	2

Syllabus Content

Module I: (16 hrs)

IT Governance*:* Introduction & Concepts, Role of Governance in Information Security, Best Practices for IT Governance Role of IT Strategy Committee, Standard IT Balanced Scorecard. Val-IT framework of ISACA

Module II: (14 hrs)

Information Systems Strategy: Role of Strategic Planning for IT, Role of Steering committee, Policies and Procedures

Module III: (16 hrs)

Risk Management Program: Develop a Risk Management Program. Risk Management Process, Risk Analysis methods

Module IV: (12 hrs)

Information Security Management: Introduction, Performance Optimization, IT Security roles & responsibilities, Segregation of Duties.

Module V:(14 hrs)

Frameworks – ISACA, COBIT: Risk-IT Framework of ISACA, Description of COBIT and other Frameworks

SEMESTER VI

CORE COURSE

BCA6B22B18: MOBILE, WIRELESS AND VOIP SECURITY

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss the concepts in Mobile communication.

CO2: Understand the inherent vulnerabilities and control measures in wireless networks.

CO3: Describe vulnerabilities and control measures in VoIP.

CO4: Illustrate mobile forensics investigation process.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2
CO2	3	2	2	2	2
CO3	3	2	2	2	2
CO4	3	2	2	2	2

Syllabus Content

Module I:(18 hrs)

Introduction to Mobile communication: Mobile & Telecommunication protocols and their vulnerabilities, Gain knowledge of managerial, technical and procedural controls to address Mobile & Telecommunication vulnerabilities

Module II: (18 hrs)

Wireless Security: Wireless protocols and their vulnerabilities, Gain knowledge of managerial, technical and procedural controls to address Wireless vulnerabilities

Module III: (18 hrs)

Voice over Internet Protocol (VOIP) Security: VOIP concepts, protocols and vulnerabilities, Gain knowledge of managerial, technical and procedural controls to address VOIP vulnerabilities

Module IV: (18 hrs)

Mobile Forensics & Data Extraction: Mobile forensics process including seizure, data acquisition types like Physical, Logical, Manual, External & Internal memory,storage, analysis using tools; techniques

SEMESTER VI

CORE COURSE

BCA6B23B18- INTRODUCTION TO WINDOWS AZURE

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Illustrate the creation and configuration of Virtual Machines in Azure.

CO2: Discuss the various networking concepts in Azure.

CO3: Identify the different storage services and automation mechanisms in Azure.

CO4: Describe the importance and configuration of SQL DB in Azure.

CO5: creation of websites in Azure.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**2**	**2**
CO2	**3**	**2**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**2**	**2**
CO4	**3**	**2**	**2**	**2**	**2**

Syllabus Content:

Module I: (14 hrs)

Introduction: Introduction to MS. Azure, Virtual Machines: Creating Virtual Machines, Difference Between Basic and Standard VMs,Logging in to a VM and Working, Attaching an empty Hard Disk to VM, Hosting a Website in VM , Configuring End Points, Scaling up and Down, Creating a custom Image from VM,Creating a VM from a custom Image, Shut down VM without Getting Billed,VM Pricing.

Module II: (16 hrs)

Managing Infrastructure in Azure: Managing Infrastructure in Azure: Azure Virtual Networks, Highly Available Azure Virtual Machines, Virtual Machine Configuration Management, Customizing Azure Virtual Machine Networking. Load Balancing: Creating Cloud Services, Adding Virtual Machines to a Cluster, Configuring Load Balancer.

Module III: (16 hrs)

Windows Azure: Azure Storage: What is a Storage Account,Advantages, Tables, blobs, queues

and drives, Azure Appfabric: Connectivity and Access control Automation: Introduction Windows Power Shell ,Creation of Runbooks, Uploading a Shell Script, Authoring a Shell Script.

Module IV: (14 hrs)

SQL Azure: Creating a SQL Server, Creating a SQL DB, Creating Tables, Adding Data to the Tables, View Connection Strings, Security Configurations, Migrating on premise DB to SQL Azure.

Module V: (12 hrs)

Websites: Creating a Website, Setting deployment credentials, Choosing a platform, Setting up Default page for website, Scaling ,Auto Scaling by Time, Auto Scaling by Metric, Difference between Free, Shared, Basic and Standard websites, Creating a website using Visual studio.

SEMESTER VI

CHOICE BASED CORE COURSE

BCA6B24aB18 – Virtualization and cloud Security

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the basic concepts, threats, vulnerabilities and its security in Cloud Computing.

CO2: Discuss about the basic Concepts and security concerns in the Virtualization environment.

CO3: Explain Cloud Trust protocol and transparency.

CO4: Illustrate Cloud Control Matrix, Trusted Cloud Initiative architecture and reference model.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**2**	**2**
CO2	**3**	**2**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**2**	**2**
CO4	**3**	**2**	**2**	**2**	**2**

Syllabus Content:

Module I: (12 hrs)

Introduction to Cloud: Cloud computing concepts, Private cloud Vs Public cloud, IAAS, PAAS & SAAS concepts.

Module II: (13 hrs)

Introduction to Virtualization: Virtualization concepts, Virtualization security concerns, Hypervisor Security, Host/Platform Security, Security communications, Security between Guest instances, Security between Hosts and Guests.

Module III: (16 hrs)

Cloud Security: Cloud Security vulnerabilities and mitigating controls, Cloud Trust Protocol, Cloud Controls Matrix. Complete Certificate of Cloud Security Knowledge (CCSK).

Module IV: (16 hrs)

Cloud Trust Protocol & Transparency: Introduction to Cloud Trust Protocol & Transparency, Cloud Trust Protocol and Transparency, Transparency as a Service, Concepts, Security, Privacy & Compliance aspects of cloud.

Module V: (15 hrs)

Cloud Controls Matrix &Top Cloud Threats: Introduction to Cloud Controls Matrix & Top Cloud Threats, Cloud Controls Matrix, Trusted Cloud Initiative architecture and reference model, requirements of Security as a Service model and Top Security threats to the cloud model.

SEMESTER VI

CHOICE BASED CORE COURSE

BCA6B24bB18-CLOUD WEB SERVICES

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss the concepts of AWS and its various services.

CO2: Observe the Security principles in AWS.

CO3: Explain the various storage and network services in AWS.

CO4: Describe the benefits and challenges of Cloud Applications.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**2**	**2**
CO2	**3**	**2**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**2**	**2**
CO4	**3**	**2**	**2**	**2**	**2**

Syllabus Content:

Module I: (13 hrs)

Introduction to AWS: Definition of Cloud Computing, IAAS PAAS & SAAS, Private & Public Cloud, AWS Business hierarchy, The AWS Infrastructure, AWS Strategy, AWS Ecosystem, AWS Benefits, AWS Competitors.AWS Management Console: Setting up AWS Account, Accessing AWS Services, S3 Bucket, Case Studies.

Module II: (15 hrs)

AWS Management Console and Security: AWS Management Console: Setting up AWS Account, Accessing AWS Services, S3 Bucket, Case Studies. Boundaries of Cloud, Security, AWS Security Groups, Security groups for Application Partitioning – Concept, Amazon Virtual Private Cloud.

Module III: (15 hrs)

AWS Storage, Elasticity and AWS Networking: Amazon Storage, S3 Storage Basics, Managing Voluminous Information with EBS, Glacier Storage Service, AWS Networking: Networking Basics, VLAN Basics, Basics of AWS VLANs, AWS Network IP Addressing and Mapping. Case Studies

Module IV: (16 hrs)

AWS Services: Cloud Front, Relational Database Service, AWS Service Integration, AWS Platform Services: Cloud Search, Simple Queue Service, Simple Notification Service, Simple Email Services, Simple Workflow Service, AWS Management Services: Managing AWS Applications, Monitoring with Cloud watch, Auto-Scaling in AWS, AWS Cloud Formation, Case Studies

Module V: (13 hrs)

AWS and Applications on Cloud & AWS Costs: Salient Features of AWS, Cloud Application Designing Principles, AWS Costing, Advantages of Cost Utilization Tracking, working Principles, Managing AWS Costs, Case Studies.

SEMESTER VI

CHOICE BASED CORE COURSE

BCA6B24cB18: FUNDAMENTALS OF DATACENTER

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe data center concept, goals and infrastructure facilities.

CO2: Identify the prerequisites and considerations in data center design.

CO3: Explain data center topology and distinguish various topology layers.

CO4: Discuss business continuity and disaster recovery concepts and techniques.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**2**	**2**
CO2	**3**	**1**	**2**	**2**	**2**
CO3	**3**	**1**	**2**	**2**	**2**
CO4	**3**	**1**	**2**	**2**	**2**

Syllabus Content:

Module I: (15 hrs)

Overview of Data Centers: Data Centers Defined, Data Center Goals, Data Center Facilities, Roles of Data Centers in the Enterprise, Roles of Data Centers in the Service Provider Environment, Application Architecture Models. The Client/Server Model and Its Evolution, The n-Tier Model, Multitier Architecture Application Environment, Data Center Architecture.

Module II: (15 hrs)

Data Center Requirements: Data Center Prerequisites, Required Physical Area for Equipment and Unoccupied Space, Required Power to Run All the Devices, Required Cooling and HVAC, Required Weight, Required Network Bandwidth, Budget Constraints, Selecting a Geographic Location, Safe from Natural Hazards, Safe from Man-Made Disasters, Availability of Local Technical Talent, Abundant and Inexpensive Utilities Such as Power and Water, Selecting an Existing Building (Retrofitting), tier standard

Module III: (12 hrs)

Data Center Design: Characteristics of an Outstanding Design, Guidelines for Planning a Data Center, Data Center Structures, No-Raised or Raised Floor, Aisles, Ramp, Compulsory Local Building Codes, Raised Floor Design and Deployment, Plenum, Floor Tiles, Equipment Weight and Tile Strength, Electrical Wireways, Cable Trays, Design and Plan against Vandalism,

Module IV: (16 hrs)

Introduction to Server Farms: Types of server farms and data centre, internet server farm, intranet server farm, extranet server farm , internet data center, corporate data center, software defined data center, data center topologies, Aggregation Layer, Access Layer, Front-End Segment, Application Segment, Back-End Segment, Storage Layer, Data Center Transport Layer, Data Center Services, IP Infrastructure Services, Application Services, Security Services, Storage Services.

Module V: (14 hrs)

Business Continuity and Disaster Recovery fundamentals: Business continuance infrastructure services, the need for redundancy,, Information availability , BC terminology , BC planning life cycle , BC technology solutions , backup and recovery considerations , backup technologies , Uses of local replicas , Local replication technologies , Restore and restart considerations , Modes of remote replications , remote replication technologies .

SEMESTER VI

CHOICE BASED CORE COURSE

BCA6B24dB18 – Fundamentals of ITIL

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe the basic concepts of ITIL and its service strategy.

CO2: Discover Service Design, Service Transition and management processes of ITIL.

CO3: Discuss service operation of ITIL and the processes involved in it.

CO4: Explain Continual Service Improvement and the principles and processes involved in it.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**2**	**2**
CO2	**3**	**1**	**2**	**2**	**2**
CO3	**3**	**1**	**2**	**2**	**2**
CO4	**3**	**1**	**2**	**2**	**2**

Syllabus Content:

Module I: (14 hrs)

ITIL Overview and Service Strategy: ITIL History, Components of the ITIL Library, IT Service Management, Organizing for IT Service Management, Technology and Architecture, Overview of HPSM and OTRS as service management tool, Service Strategy: Service Strategy Lifecycle Stage, Service Portfolio Management, the Demand Management Process, the IT Financial Management Process, Introduction to ISO 20000 Standards

Module II: (16 hrs)

Service Design: Service Design Lifecycle Stage, The Service Catalog Management Process, The Service Level Management Process, The Availability Management Process, The Capacity Management Process, The Information Security, Management Process, The IT Service Continuity, Management Process, The Supplier Management Process

Module III: (16 hrs)

Service Transition: Service Transition Lifecycle Stage, the Change Management Process, the Release and Deployment Management Process, the Service Asset and Configuration Management Process, Knowledge Management

Module IV: (12 hrs)

Service Operation, Continual Service Improvement: Service Operation Functions : Service Operation Lifecycle Stage, The Service Desk Function, The Technical Management Function, The Application Management Function, The IT Operations Management Function Service Operation Processes :The Event Management Process, The Incident Management Process, The Request Fulfillment Process, The Access Management Process, The Problem Management Process,

Module V: (14 hrs)

Continual Service Improvement: Continual Service Improvement principles - CSI and organizational change, Ownership, Role definitions , External and internal drivers , Service Level Management , The Deming Cycle, Service measurement ,Knowledge Management, Benchmarks, Governance, Frameworks, models, standards and quality systems Continual Service Improvement processes : 7step improvement process, Service reporting, Service management, return on in investment for CSI, business questions for CSI, Service level management

SEMESTER VI

CORE COURSE

BCA6BSB18 – Seminar

Credits: 1

Total Lecture Hours: 36

Course Outcomes:

CO1: Design communication, documentation and presentation skills.

CO2: Devise a recent technology from the domain of study.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	2	3
CO2	3	2	3	3	2

SEMESTER VI

CORE COURSE

BCA6BPRB18 – Project

Credits: 3

Total Lecture Hours: 126

Course Outcomes:

CO1: Develop communication, documentation and presentation skills.

CO2: Analyze a problem and its technical solutions from the domain of study.

CO3: Develop solution to the identified problem.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	2	3
CO2	3	2	3	3	2
CO3	3	3	3	3	3

SEMESTER VI

CORE COURSE

BCA6BVB18 – Viva Voce

Credits: 1

Course Outcomes:

CO1: Summarize the major concepts of computer fundamentals, programming languages, cloud technology and information security.

Mapping of Course Outcomes with Program Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	2	2