J. C. Bose University of Science and Technology, YMCA,

Faridabad, Haryana

Department of Computer Applications
(Faculty of Informatics and Computing)

Scheme and Syllabus

BCA (Data Science)

(Semester I – II)

W.e.f. 2023

Scheme
(Semester I & II)

BCA (Data Science)- I Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCA-23-101	Fundamentals of Computers	4	-	4	25	75	100	4
2	Discipline Specific-Major	BCA-23-103	Programming in C	3		3	25	75	100	3
3	Discipline Specific-Minor	BCA-23-105	Digital Electronics-I	3	-	3	25	75	100	3
4	Multidisciplinary	BCA-23-107	Mathematics	3	-	3	25	75	100	3
5	Ability Enhancement courses	AEC-101-N1	Writing Skills and the Art of Rhetoric (WSAAR)	2	-	2	25	75	100	2
6	Value Added Course	VAC-111-N1	Quantitative Reasoning	2	-	2	25	75	100	2
7	Discipline Specific Lab	BCA-23-111	C Programming Lab	-	2	2	15	35	50	1
8	Discipline Specific Lab	BCA-23-113	Digital Electronics-1 Lab	-	2	2	15	35	50	1
9	Skill Enhancement Courses	BCA-23-115	Workshop I (Hardware)	-	6	6	15	35	50	3
Total						**27**	**195**	**555**	**750**	**22**

BCA (Data Science)- II Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCA-23-102	Introduction to Operating System	3	-	3	25	75	100	3
2	Discipline Specific-Major	BCA-23-104	Computer Networks	4		4	25	75	100	4
3	Discipline Specific-Minor	BCA-23-106	Digital Electronics-II	3	-	3	25	75	100	3
4	Multidisciplinary	BBA/GN/104	Microeconomics	3	-	3	25	75	100	3
5	Ability Enhancement courses	AEC-102-N1	Communication, Mediation and Resolution (CMR)	2	-	2	25	75	100	2
6	Value Added Course	VAC-101-N1	Environmental Science-I	2	-	2	25	75	100	2
7	Discipline Specific Lab	BCA-23-108	OS Lab	-	2	2	15	35	50	1
8	Discipline Specific Lab	BCA-23-110	Digital Electronics-II Lab	-	2	2	15	35	50	1
9	Skill Enhancement Courses	BCA-23-112	Workshop II (Networking)	-	6	6	15	35	50	3
Total						**27**	**195**	**555**	**750**	**22**

SEMESTER I

BCA-23-101
Fundamentals of Computer
BCA(Data Science)-I Semester

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand the major components of computer system, the types and functions of memory.
2 To learn about the difference between software and hardware in a computer system along with the fundamentals of Operating systems and its types.
3 To understand the concept of programming languages and their corresponding Translators
4 To learn about the basic types of Networks, Internet and computer viruses.

Syllabus:

UNIT – I: Computer Fundamentals
Generations of Computers, Definition, Block Diagram along with its components, characteristics & classification of computers, Limitations of Computers, Human-Being VS Computer, Applications of computers in various fields. **Memory:** Concept of primary & secondary memory, RAM, ROM, types of ROM, Cache Memory, flash memory, Secondary storage devices: Sequential & direct access devices viz. magnetic tape, magnetic disk, optical disks i.e. CD, DVD, virtual memory.

UNIT – II: Computer hardware & software
I/O devices, definition of software, relationship between hardware and software, types of software. **Overview of operating system:** Definition, functions of operating system, concept of multiprogramming, multitasking, multithreading, multiprocessing, time-sharing, real time, single-user & multi-user operating system.

UNIT – III: Computer Languages
Analogy with natural language, machine language, assembly language, high-level languages, fourth generation languages, compiler, interpreter, assembler, Linker, Loader, History and Characteristics of a good programming language, Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in

programming, Documentation, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming, Advantages and disadvantages of Structured programming.

UNIT IV: Overview of Networking

An introduction to computer networking, Network types (LAN, WAN, MAN), Network topologies, Modes of data transmission, Forms of data transmission, Transmission channels(media),OSI model, Introduction to internet and its uses, Applications of internet, Hardware and Software requirements for internet, Intranet, Applications of intranet. **Computer Virus:** Definition, types of viruses, Characteristics of viruses, anti-virus software.

Course Outcomes:

At the end of program the student will be able to:

1. Understand about the major components of computer system, the types and functions of memory.
2. Differentiate between software and hardware in a computer system along with the fundamentals of Operating systems and its types.
3. Learn the concept of programming languages and their corresponding software tools.
4. Analyse about the basic types of Networks, Internet and computer viruses.

Text/ Reference Books:

1 Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.

2 Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill.

3 Norton, Peter, Introduction to Computer, McGraw-Hill

4 Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World

5 Rajaraman, V., Fundamentals of Computers, PHI

BCA-23-103

Programming in C

BCA(Data Science)-I Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1. To understand the fundamentals of C language.
2. To learn different statements like sequential, decision making, iterative such as if-else, loops.
3. To understand functions and its types in c along with the concept of recursion and storage classes.
4. To learn about the concept of Arrays, Strings and Pointers.

UNIT I: Overview of C

Characteristics of C programming language, C identifiers, keywords, Constants and Variables, Data types, Assignment statement, Symbolic constant, Structure of a C Program, inbuilt functions.

Operators & Expression: Arithmetic, relational, logical, bitwise, unary, assignment, shorthand assignment operators, conditional operators and increment and decrement operators, Arithmetic expressions: concept of l-value and r-value, evaluation of arithmetic expression, type casting (implicit and explicit) and type conversion, operator hierarchy & associativity.

UNIT II: Decision making & branching

Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, Switch statement, goto statement.

Decision making & looping: For, while, and do-while loop, jumps in loops, break, continue statement, Nested loops.

UNIT III: Functions and Pointers: Definition of functions,Standard Mathematical functions, Input/output: Unformatted & formatted I/O function in C, Input functions viz. getch(), getche(), getchar(), gets(), output functions viz., putch(), putchar(), puts(), random(), system().

User defined functions: Function prototype, Local and global variables, Storage classes: auto, extern, register and static their scope, storage& lifetime, passing parameters and returning value, recursion.
Pointers: Understanding Pointers, Accessing the address of a variable, Declaring Pointer Variables, Initialization of Pointer Variables, Accessing a variable through its pointer, Pointer Arithmetic.

UNIT IV: Arrays and User defined Structures
Arrays: Definition, types, initialization, storage and addressing, searching and sorting in arrays, passing arrays to functions, Declaration and initialization of string, Input/output of string data, inbuilt string manipulation functions, Array of Strings.
Structures: Structures, Union and Enumerations, File Handling.

Course Outcomes:
At the end of program the student will be able to:

1. Acquire knowledge about building blocks of C language like variables, data types, managing I/O etc.
2. Solve basic problems using different statements like sequential, decision making, iterative such as if-else, loops and derived data types like arrays and structures.
3. Apply the concept of functions and pointers to solve problems and also understand about various storage classes
4. Create programs using the concept of arrays, strings, structures and file handling.

Text/ Reference Books:

1.The C programming language, Dennis M. Ritchie,Pearsons Educations.

2. Gottfried, Byron S., Programming with C, Tata McGraw Hill

3.Let us C, YashwantKanetker, BPB Publications.

4. Pointers in C,YashwantKanetker, BPB Publications.

5. Balagurusamy, E., Programming in ANSI C, 4E, Tata McGraw-Hill

6. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.

7. Jeri R. Hanly& Elliot P. Koffman, Problem Solving and Program Design in C, Addison Wesley.

BCA-23-105

Digital Electronics-I

BCA(Data Science)-I Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To introduce the fundamentals of digital electronics.
2. To familiar the students about the design and analyze various combinational
3. circuits.
4. To give exposure to the students about design and analyze various sequential circuits.
   To introduce various converters.

Syllabus:

UNIT- I: Fundamentals of Digital Systems

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal, hexadecimal number, binary arithmetic, one's and two's complements arithmetic,

UNIT-II: Combinational Digital Circuits

Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders.

UNIT-III: Sequential Circuits and Systems

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K, T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter.

UNIT-IV: Digital to Analog Converters

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit,.

Course Outcomes:

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

1. Design and analyse combinational logic circuits.
2. Acquire basic knowledge of digital logic families & semiconductor memories.

3. Design & analyse synchronous sequential logic circuits.
4. Design various converters

Text/ Reference Books:

1. Millman and Halkias, Integrated Electronics, Pearsons Education
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
3. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

BCA-23-107

Mathematics

BCA(Data Science)-I Semester

No. of Credits:			3
L	T	P	Total
3	0	0	3

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1. To understand Sets, Relations and functions along with their properties,types and operations on them.
2. To understand Propositions, its basic operations, types and applications.
3. To learn about the concept of recurrence and recurrence relations
4. To make the students understand Regular expressions, Regular Language and their conversions, conversion of automata machines

UNIT- I: Sets Theory

Definition of Set, Representation of Sets, Operations on sets, Laws of Sets, Cartesian Products, Partially Ordered Set, Relation between Boolean algebra and set theory.

Relations and Functions: Relations and its types, Binary Relation, Properties of Binary relation, Matrix representation of relations, Equivalence Relation, Partial Ordering Relation, Hasse diagram, well ordered set, Lattices, Properties of lattices, Bounded lattices, Complemented and Distributive lattices

Functions and its Types, Composition of function, Inverse and Composite Function, Recursively defined function.

UNIT–II: Propositional Logic

Boolean algebra, Propositions, logical operations, Tautologies, Contradictions, Logical implication, Logical equivalence, Normal forms: CNF, DNF, PCNF, PDNF, Theory of Inference and deduction. Predicate Calculus: Predicates and quantifiers, Mathematical Induction.

UNIT-III: Recursion and Recurrence Relation

Linear recurrence relation with constantcoefficients, Homogeneous solutions, Particular solutions, Total solution of a recurrence relation using generating functions.

UNIT–IV: Theory of Automata

Definition of grammar and language, Chomsky Hierarchy of Grammars, NFA, DFA,Conversion of NFA to DFA, Regular expressions, conversion of regular expression to Finite Automata, FA with output: Moore machine, Mealy machine, Conversions, introduction to Turing machine.

Course Outcomes:

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

1. Apply set theory, functions, relations and lattices to solve computational problem.
2. Design propositions and apply operations on them.
3. Design solutions to the problems using recursive functions.
4. Understand different models of computation.

Text/ Reference Books:

1. C.L.Liu: Elements of Discrete Mathematics McGraw Hill.
2. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series.
3. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi.
4. Trembley, J.P. & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
5. Kenneth H. Rosen : Discrete Mathematics and its applications, TMH.
6. Theory of Computer Science; K.L.P. Mishra. N. Chandrasekaran

AEC-101-N1
Writing Skills and the Art of Rhetoric (WSAAR)
BCA(Data Science)-I Semester

No. of Credits:			2		
L	T	P	Total	Sessional:	25 Marks
2	0	0	2	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

Unit-I: Narration and Writing
Define, Describe, Narrate and Argue; Articulating Questions and Innovative Thoughts; Narration: chronological order and a chronological order; first-person, second-person and third person point of view in narration; key elements: plot, character, pov, setting and conflict; Storytelling, event news stories and Corporate Storytelling; problem-solution structures.
Exercise: *Ekphrasis*, Pictures: Describing scenes; Creating Stories out of words and pictures.

Unit-II: Reasoning and Rhetoric: Rhetoric, the art of persuasion; *ethos, logos* and *pathos*, Aristotle's triangle; Freytag's pyramid; reasoning; organizing; articulating; Synthesis; *Antanagoge; Hypophora.*
Recognize and evaluate the strength of an argument and its impact.

Exercise: Rhetorical and Oratorical Skills: Techniques for effective public speaking, both prepared and extemporaneous; Brainstorm ideas for your own short speech.

Unit-III: Writing Features and Articles: Writing Features and Articles, , Op-Eds (Opinions and Editorials), Features; Articles; Topical Issues, Memes; Backgrounders; Memes; Idioms, Proverbs; Using Literary Devices and Figurative Language.
Exercises: Building Memes and Feature Writing
Unit: IV: Performance and Drills
Reading Drills; Speaking Drills; Team-Performance Drills; Solo Performance Drills; Apply the elements of rhetoric you have learned so far in the final draft of your op-ed and discussion.

Course Outcomes:

After completion of the course student will be able to :

1. Understand the concept of soft skills including communication skills, listening skills, positive thinking and also will be able to enhance own personality.

2. Able to write business letters.
3. Able to write reports.
4. Able to make effective resume and will also be able to present himself/herself in interview, speeches, presentations, talks etc.

Text/ Reference Books:

1. Butterfield, Jeff. Soft Skills for Everyone. New Delhi: Cengage Learning. 2010.
2. Chauhan, G.S. and Sangeeta Sharma. Soft Skills. New Delhi: Wiley. 2016.
3. Goleman, Daniel. Working with Emotional Intelligence. London: Banton Books. 1998.
4. Hall, Calvin S. et al. Theories of Personality. New Delhi: Wiley. rpt. 2011.
5. Holtz, Shel. Corporate Conversations. New Delhi: PHI. 2007.
6. Kumar, Sanajy and PushpLata. Communication Skills. New Delhi: OUP. 2011.
7. Lucas, Stephen E. The Art of Public Speaking. McGraw-Hill Book Co. International Edition, 11th edition**.**

VAC-111-N1
Quantitative Reasoning
BCA(Data Science)-I Semester

No. of Credits: 2

L	T	P	Total
2	0	0	2

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To Understand the basic concepts of quantitative ability
2. To learn the basic concepts of logical reasoning Skills
3. To acquire satisfactory competency in use of reasoning
4. To understand the problems for campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

Syllabus:

UNIT I Quantitative Aptitude:

Periods Numerical computation: Applications based on Numbers, Chain Rule, Ratio Proportion, Time and work, Time and Distance, Percentages, Profit Loss and Discount

Unit II Quantitative Analysis:

Simple interest and Compound Interest Partnerships, Shares and dividends, Data interpretation Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams

Unit III Critical Reasoning:

Understanding Critical Reasoning – Basic Terminology in CR (Premise, Assumption, Inference and Conclusion) – Sequencing of Sentences (Rearranging Jumbled Paragraphs) – Cloze Passages.

Unit IV Numerical Reasoning:

Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test. Combinatory: Counting techniques, Permutations, Combinations and Probability Syllogisms and data sufficiency

Course Outcome:

On successful completion of the course the students will be able to:

1. Understand the basic concepts of quantitative ability
2. Understand the basic concepts of logical reasoning Skills
3. Acquire satisfactory competency in use of reasoning
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

Text books & References:

1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
2. Analytical and Logical reasoning By Sijwali B S
3. Quantitative aptitude for Competitive examination By R S Agarwal
4. Analytical and Logical reasoning for CAT and other management entrance test by Sijwali B S
5. Quantitative Aptitude by Competitive Examinations by AbhijitGuha 4 th edition
6. https://prepinsta.com/
7. https://www.indiabix.com/
8. https://www.javatpoint.com/

BCA-23-111
C Programming Lab
BCA(Data Science) -I Semester

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1.Write programs to give introduction to basic C I/O instructions, variables and constants : a)To print Hello World. b) To perform arithmetic operations on varaibles:+,-,/,* etc. c) To calculate area and perimeter of a circle. d) To find average of five numbers.
2. Write programs to implement if-then-else, nesting if else: a) To find the larger between two numbers. b) To calculate gross salary giving basic salary, da,hra. c) To find the largest between three numbers. d) To find whether a number entered by user is leap year or not.
3. Write programs to implement loops:
a) To print even numbers from1 to 50 b) To print odd numbers from 1 to 100 .c) To generate table of number d) To find reverse of a number e) to print different patterns . f) To calculate sum of n numbers using do-while loop. (for statement) g) To find the average mail height & average female heights in the class (input is in the form of gender code, height).
4. Write a program to find roots of a quadratic equation using functions and switch statements.
5. Write programs to implement arrays:
a) To calculate Sum of all the elements of an array b)To implement Linear search c) To implement Binary Search d) To implement basic Sorting algorithms(Selection/Bubble) e) To find the largest and second largest number out of given 50 numbers.
6. Write programs to implement the concept of 2-D arrays(Matrices)
a) to add two matrices b) Write a program to multiply two matrices. c)Write a program to transpose a given matrix.
7. Write programs for string operations
a) various string inbuilt functions b) to read a string and write it in reverse order. c) Write a program to concatenate two strings of different lengths. d)Write a program to calculate length of a string without using string inbuilt function.
8. Write program for basic pointer arithmetic.

9. Write a program to swap two numbers using pointers.
10. Write programs to implement functions:
a) to find factorial of a number using function. b) Write a program to calculate a^b using function. c) Write a program to print Fibonacci series using recursion
11. Write programs for implementing Structures.
12. Write Programs for File Handling

BCA-23-113
Digital Electronics-I Lab
BCA(Data Science)-I Semester

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1.Fabrication of all the gates using Diode & transistors and verification of truth table.
2.To design & realize combinational circuit using K-map & logic simplification
3.To verify the operation of Multiplexer & to implement any given function with a MUX
4.To verify the operation of DEMUX & decoder.
5. To design a Bi-stable latch using basic transistors
6.To verify the truth table of SR, JK, D & T Flip-Flop & conversion of one Flip-Flop to another FF.
7. To verify the function of 4- bit shift register.
8. To design serial to parallel and parallel to serial converters
9.To design 4 bit DAC

BCA-23-115
Workshop 1
BCA(Data Science)-I Semester

No. of Credits: 6

L	T	P	Total
0	0	6	6

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1. Set date and time of the windows and change screensaver and appearance.
2. Manage files and folders.
3. To study various components of PC such as keyboard, mouse, CPU, RAM, motherboard and SMPS.
4. To assemble a PC.
5. To study, remove and replace floppy disk drive, hard disk and CD ROM drive .
6. Printer Installation and Servicing and troubleshooting.
7. Study various operations on Hard Disk such as formatting, logical partitioning, error checking, defragmentation etc..
8. Installation of various Operating Systems
9. Handling registry file, automatic update, security settings.

SEMESTER II

BCA-23-102
Introduction to Operating systems
BCA(Data Science)-II Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand evolution and types of OS and to understand the structure, components and functions of OS.
2. To learn about Processes, threads and various Scheduling policies.
3. To understand the principle of Deadlocks and various memory management
4. schemes
   To understand virtual memory management, Disk management, I/O management and File system

Syllabus:

UNIT – I : Fundamentals of Operating System
Introduction to Operating System, its need and operating System services, Early systems, Structures - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems.
Process Management: Process concept and context, Process Control Block, Operation on processes, Threads, and Inter-process Communication.

UNIT-II: CPU Scheduling Basic concepts, scheduling criteria, scheduling algorithms: FCFS, SJF, Premptive and non-premptive, Round Robin,& Queue Algorithms.
Deadlocks: Deadlock characterization, Prevention and Avoidance, Deadlock Detection and Recovery Methods for handling deadlocks, Banker'sAlgorithm.

UNIT-III: Memory Management
Logical versus Physical address space, Swapping, Contiguous allocation, Paging, Segmentation.
Virtual Memory: Demand paging, Performance of demand paging, Page replacement, Page replacement algorithms, Thrashing.

UNIT-IV: Disk Scheduling and File Management
Disk structure, Disk Scheduling Algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

Type of File systems, File Structure, File allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Free space management: Bit vector, Linked list, Grouping, Counting.

Course Outcomes:

After completion of the course student will be able to :

1. Learn various types of OS and will also understand the various functions of OS.
2. Understand CPU scheduling along with its various algorithms. Also, the students will be familiar with different deadlock handling algorithms.
3. Apply various memory management schemes like demand paging and segmentation and also able to understand virtual memory and page replacement algorithms.
4. Understand disk scheduling and different file handling schemes in OS.

TextBooks/Reference Books:

1. Abraham Silberschatz,PeterB.Galvin,“OperatingSystemConcepts”,AddisonWesleypublishing. Co.,7th. Ed., 2004.
2. Nutt Gary, "Operating Systems", Addison WesleyPublication,2000.
3. Andrew S.Tannenbaum, "Modern Operating Systems", Pearson Education Asia, Second Edition, 2001.
4. William Stallings, "Operating Systems, "Internals and Design Principles", 4th Edition, PH, 2001.

BCA-23-104
Computer Networks
BCA(Data Science)-II Semester

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand basic computer network technology, Data Communications System and its components, different types of network topologies and protocols.
2. To know basic protocols of data link layer, how they can be used to assist in network design and implementation
3. To analyse the features , protocols and operations of network layer
4. To understand transport and application layer protocols, along with basics of cryptography.

UNIT-I: Data Communication Components
Representation of data, analog and digital signals, asynchronous and synchronous transmission.Various Connection Topology, Protocols and Standards, OSI model, TCP/ IP reference model, Transmission Media, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT-II: Data Link Layer and Medium Access Sub Layer
Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Medium access controls, Pure ALOHA, Slotted ALOHA, Introduction to CSMA/CD, CDMA/CA.

UNIT-III: Network Layer
Switching, IP packet format, Logical addressing – IPV4, IPV6, Physical to IP address mapping protocols – ARP, RARP, BOOTP and DHCP–Delivery, Introduction to forwarding and unicast Routing protocols.

UNIT-IV: Transport Layer and Application Layer
Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service,Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

1. Acquire knowledge about basic computer network technology, Data Communications System and its components, different types of network topologies and protocols.
2. Understand the basic protocols of data link layer, how they can be used to assist in network design and implementation
3. Apply protocols of data link layer in network design and implementation.
4. Analyse the features and operations of various transport and application layer protocols, along with basics of cryptography.

TextBooks/References:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
5. Network and Internet, Douglas Comer, Prentice Hall of India.
6. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America
7. Computer Networks, UYLess Black, Pearsons Education.

BCA-23-106
Digital Electronics-II
BCA(Data Science)-II Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To introduce the fundamentals of digital electronics.
2. To familiar the students about the design and analyze various combinational
3. circuits.
4. To give exposure to the students about design and analyze various sequential circuits.
   To introduce various converters.

Syllabus:

Unit-I: Digital codes and Logic Families

Codes, error detecting and correcting codes, FET, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

Unit II: Combinational Digital Circuits

Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

Unit III: Sequential Circuits and Systems:

Ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Unit IV: Analog to Digital Converters:

Quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

Course Outcomes:

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

1. Design and analyse combinational logic circuits.
2. Acquire basic knowledge of digital logic families & semiconductor memories.
3. Design & analyse synchronous sequential logic circuits.
4. Design various converters

Text/ Reference Books:

1. Millman and Halkias, Integrated Electronics, Pearsons Education
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
3. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

BBA/GN/104
Microeconomics
BCA(Data Science)-II Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Syllabus:

UNIT-I:

Introduction to Economics, definition and scope of Economics, nature and scope of microeconomics, Demand: law of demand and its determinants, price, cross and income elasticity of demand, law of supply and its determinants, elasticity of supply, Law of diminishing Marginal Utility Analysis, competitive equilibrium; consumer's equilibrium, utility and indifference curve approaches.

UNIT-II:

Basic Cost Concepts, Total Cost, Fixed Cost, Variable Cost Average Cost & Marginal Cost, Explicit Cost and Implicit Cost, Short run and long run production functions, laws of returns; optimal input combination; classification of costs; short run and long run lost curves and their interrelationship; internal and external economies of scale

UNIT-III:

Characteristics of various factors of production. Determination of rent; quasi rent, optimum size of the firm; factors affecting the optimum size, location of firms.

UNIT-IV:

Equilibrium of the firm and industry, perfect competition, monopoly, monopolistic competition, discriminating monopoly, aspects of non-price competition and oligopolistic behaviour.determination.Indian Economy, nature and characteristics.Basic concepts; fiscal and monetary policy, LPG, Inflation, Sensex, GATT, WTO and IMF.Difference between Central bank and Commercial banks.

Course Outcomes:

After completion of this course, student will be able to:

1. Understand the basic concept and theories of microeconomics.
2. Develop a critical understanding of the implications of the production and cost.
3. Understand various market structures and factor pricing.

4. Acquire necessary skills to analyze certain economic aspects to understand basic business activities.

TextBooks/References:

1. D. Salvatore. Microeconomic Theory. Tata McGraw Hill, New Delhi.
2. N. Dwivedi. Managerial Economics. Vikas Publishing House.
3. Mark Hirschey. Managerial Economics. Thomson, South Western, New Delhi.
4. R H Dholkia and A.N. Oza. Microeconomics for Management Students. Oxford University Press, New Delhi.
5. N. Gregory Mankiw. Economics: Principles and Applications. India edition by South Western, a part of Cengage Learning. Cengage Learning India Private Limited.
6. P.L. Mehta. Managerial Economics. Sultan Chand, New Delhi.

AEC-102-N1
Communication, Mediation and Resolution (CMR)
BCA(Data Science)-II Semester

No. of Credits: 2

L	T	P	Total
2	0	0	2

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
CO I: To familiarize the students with the process and barriers of communication.
CO II: To enable the students develop critical thinking and identify logical fallacies.
CO III: To help students in recognising factors and applying strategies in conflict resolution.
CO IV: To inspire students in appreciating the role of mediation and find creative solutions.

Unit-I: Communication and Barriers to Communication: 7C's of Communication, Win-Win Communication, Strategies for Effective Communication, Zero-Sum; Reasons for Conflict; Communication Barriers.

Unit-II: Critical Thinking and Cognitive Skills: reason; analysis, synthesis, divide and rule; root-cause analysis; logic and logical fallacies.
Reasoning; Logic; Inductive and Deductive Reasoning; Logical fallacies: *Ad hominem,* straw man fallacy; bandwagon fallacy; hasty generalization; false dilemma; false dichotomy; *Tu Quoque* ; circular reasoning and hasty generalization; Recognizing fallacies.

Unit-III: Mediation and Conflict-Resolution: Cognitive Skills and Critical thinking; Listening for key words, phrases and hints, Creative Communicating, Managing and celebrating Diversity, Adaptability and Negotiation; Dispute-resolution; arbitration; mediator's role; caucuses, third party, objectivity, impartiality, neutrality, offers, counter offers, questions, demands, and proposals, impasse, settlement. Brainstorming, Problem solving strategies, Stress management, Significance of Collaboration, Confronting challenges.

Unit-IV: Mediation in Practice: Exercises in role-playing and mediation and one case study assignment as directed by the teacher

Course Outcomes:
CO I: The students will be familiarized with the process and barriers of communication.
CO II: The students will be enabled to develop critical thinking and identify logical fallacies.
CO III: The students will be able to recognise factors and apply strategies in conflict resolution.
CO IV: The students will be able to appreciate the role of mediation and find creative solutions.

TextBooks/References:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004

2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)

3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.

4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.

5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)

6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.

7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN

VAC-101-N1
Environmental Science-I
BCA(Data Science)-II Semester

No. of Credits: 2

L	T	P	Total
2	0	0	2

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:
At the completion of this course, the learner will be able to:

1. Understand human interaction with the environment and efforts taken for emergence of environmentalism at international level.
2. Understand concept of natural resources, their distribution, conservation, management and sustainable utilization.
3. Develop critical thinking towards local, regional and global environmental issue.
4. Describe the concept of ecosystem, biodiversity and their conservation at national and international levels.

UNIT-I: Humans and the Environment
The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment, Indic Knowledge and Culture of sustainability; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. Environmental Ethics and emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972; World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts.

UNIT-II: Natural Resources and Sustainable Development
Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable.
Biotic resources: Major type of biotic resources- forests, grasslands, wetlands, wildlife and aquatic (fresh water and marine); Microbes as a resource; Status and challenges.
Water resources: Types of water resources- fresh water and marine resources; Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges; Water scarcity and stress; Conflicts over water.

Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation.
Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy; Conventional energy sources- coal, oil, natural gas, nuclear energy; non-conventional energy sources- solar, wind, tidal, hydro, wave, ocean thermal, geothermal, biomass, hydrogen and fuel cells; Implications of energy use on the environment. *Introduction to sustainable development: Sustainable Development Goals (SDGs)*- targets and indicators, challenges and strategies for SDGs.

UNIT-III: Environmental Issues: Local, Regional and Global
Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products.
Pollution: Impact of sectoral processes on Environment; Types of Pollution- air, noise, water, soil, thermal, radioactive; municipal solid waste, hazardous waste; transboundary air pollution; acid rain; smog.
Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact.
Global change: Ozone layer depletion; Climate change. Disasters – Natural and Man-made (Anthropogenic)

Unit IV: Conservation of Biodiversity and Ecosystems
Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types; Biodiversity in India and the world; Biodiversity hotspots.
Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristicsforests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and significance.
Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change.
Major conservation policies: in-situ and ex-situ conservation; Major protected areas; Biosphere reserves; Ecologically Sensitive Areas; Coastal Regulation Zone; the role of traditional knowledge for biodiversity conservation, community-based conservation; Gender and conservation.
Overview of the following conventions and protocols- Convention on Biological Diversity (CBD); Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; Ramsar sites; United Nations Convention to Combat Desertification (UNCCD).

Unit V: Case studies/ Field Work
The students are expected to be engaged in some of the following or similar identified activities:
a) Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.
b) Discussion on one national and one international case study related to the environment and sustainable development.
c) Participation in plantation drive and nature camps.
d) Documentation of campus flora and fauna

TextBooks/References:

1. Baskar, R & Baskar, S. (2010). Natural Disasters: Earth's Processes & Geological
2. Bhagwat, Shonil (Editor) (2018) Conservation and Development in India: Reimagining Wilderness, Earthscan Conservation and Development, Routledge.
3. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.
4. De Anil, K. (2003). Environmental chemistry. New Age International.
5. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
6. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Ela Publisher (Pearson)
7. Harper, Charles L. (2017) Environment and Society, Human Perspectives on Environmental Issues 6th Edition. Routledge.
8. Harris, Frances (2012) Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
9. Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press.
10. Hughes, J. Donald (2009) An Environmental History of the World- Humankind's Changing Role in the Community of Life, 2nd Edition. Routledge.
11. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, Weir Publisher (ELBS)
12. Kaushik, A., & Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.
13. Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK
14. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238
15. Perman, R., Ma, Y., McGilvray, J., and Common, M. (2003) Natural Resource and Environmental Economics. Pearson Education.
16. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press.
17. Sharma, P. D., & Sharma, P. D. (2012). Ecology and environment. Rastogi Publications.
18. Simmons, I. G. (2008). Global Environmental History: 10,000 BC to AD 2000. Edinburgh University Press
19. Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and Resource Conservation. Anamaya Publications https://sdgs.un.org/goals
20. Sinha, N. (2020) Wild and Wilful. Harper Collins, India.
21. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022) Conservation through Sustainable Use: Lessons from India. Routledge.
22. William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A global concern, Publisher (Mc-Graw Hill, USA)

BCA-23-108
OS Lab
BCA (Data Science)-II Semester

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1. Write C programs to demonstrate various process related concepts.
2. Write C programs to demonstrate various thread related concepts.
3. Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, and Round Robin.
4. Write C programs to simulate Intra & Inter – Process Communication (IPC) techniques: Pipes, Messages Queues, and Shared Memory.
5. Write C programs to simulate solutions to Classical Process Synchronization Problems: Dining Philosophers, Producer – Consumer, Readers – Writers.
6. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
7. Write C programs to simulate Page Replacement Algorithms: FIFO, LRU.
8.Write C programs to simulate implementation of Disk Scheduling Algorithms: FCFS, SSTF.
9. Write a C programs to implement UNIX system calls and file management
10. Simulate Banker's algorithm for deadlock avoidance.

BCA-23-110
Digital Electronics-II Lab
BCA (Data Science)-II Semester

No. of Credits: 2

L	T	P	Total
0	0	2	2

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1.Study of TTL gates
2. To study CMOS NAND NOR
3.To design 4 bit parallel adder/ subtract or/ for unsigned/ signed numbers
4. To verify the operation of gray to binary code convertor.
5.To verify the operation of gray to binary code convertor
6. To verify the function of 4- bit ALU.
7.To design and implement 1 bit comparator.
8.Verify the operation of ring counter and Johnson Counter
9. To design and verify operation of synchronous UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD
10. To design and verify operation of asynchronous UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD
11. To design and verify operation of synchronous UP-DOWN decade counter using JK/T Flip-Flop & derive o/p into SSD
12. To study the operation of 8-bit A/D converter.

BCA-23-112
Workshop 2(Networking Lab)
BCA (Data Science)-II Semester

No. of Credits: 6

L	T	P	Total
0	0	6	6

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments
1.Study of different types of Network cables and connectors and making the cross-wired cable and straight through cable using clamping tool.
2 Study of Network Devices such as Switch, Router, Gateway, Servers etc.
3 To study and design network/subnet using subnet masking and IP addressing.
4 To study of basic network command and network configuration commands.
5 Performing an Initial Switch Configuration
6 Performing an Initial Router Configuration
7 Configuring and Troubleshooting a Switched Network
8 Connecting and configuring Switch
9 Configuring Ethernet and Serial Interfaces
10 To design Local Area Network for a laboratory
11 Configuring WEP on a Wireless Router
12 Using the Cisco IOS Show Commands
13 Examining WAN Connections Output using commands such as ping, Traceroute, ipconfig
14 Implementing various LAN configurations using LAN kit (Benchmark).
15 Study and configure Firewall such as Cyberoam