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

Faridabad, Haryana

Department of Computer Applications

(Faculty of Informatics and Computing)

Scheme and Syllabus

BCA

(Semester I – IV)

W.e.f. 2023

Scheme

(Semester I, II, III & IV)

BCA Scheme of Studies
Semester-I

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	BCG-101-V	Fundamentals of Computers	4	-	4	25	75	100	4
2	Discipline Specific-Major	BCG-103-V	Programming in C	3		3	25	75	100	3
3	Discipline e Specific-Minor	BCG-105-V	Digital Electronics -I	3	-	3	25	75	100	3
4	Multidisciplinary	MTU-117-V	Mathematics	3	-	3	25	75	100	3
5	Ability Enhancement courses	AEC-101-V	Writing Skills and the Art of Rhetoric (WSAAR)	2	-	2	25	75	100	2
6	Value Added Course	AEC-108-V	Quantitative Reasoning	2	-	2	25	75	100	2
7	Discipline Specific Lab	BCG-107-V	C Programming Lab	-	2	2	15	35	50	1
8	Discipline Specific Lab	BCG-109-V	Digital Electronics Lab	-	2	2	15	35	50	1
9	Skill Enhancement Courses	BCG-111-V	Workshop I (Hardware)	-	6	6	15	35	50	3
Total						**27**	**195**	**555**	**750**	**22**

BCA Scheme of Studies

Semester-II

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	BCG-102-V	Introduction to Operating System	3	-	3	25	75	100	3
2	Discipline Specific-Major	BCG-112-V	Computer Networks	4		4	25	75	100	4
3	Discipline Specific-Minor	BCG-104-V	Digital Electronics-II	3	-	3	25	75	100	3
4	Multidisciplinary	BCG-114-V	Microeconomics	3	-	3	25	75	100	3
5	Ability Enhancement courses	AEC-102-V	Communication, Mediation and Resolution (CMR)	2	-	2	25	75	100	2
6	Value Added Course	VAC-101-V	Environment Science-I	2	-	2	25	75	100	2
7	Discipline Specific Lab	BCG-106-V	OS Lab	-	2	2	15	35	50	1
8	Discipline Specific Lab	BCG-108-V	Digital Electronics-II Lab	-	2	2	15	35	50	1
9	Skill Enhancement Courses	BCG-110-V	Workshop II (Networking)	-	6	6	15	35	50	3
Total						**27**	**195**	**555**	**750**	**22**

BCA Scheme of Studies

Semester– III

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	BCG-201-V	Data Structures	4	-	4	25	75	100	4
2	Discipline Specific-Major	BCG-203-V	Object-oriented Programming Using C++	4		4	25	75	100	4
3	Discipline Specific-Minor	BCG-205-V	Internet and Web Technology	4	-	4	25	75	100	4
4	Multidisciplinary	MTU-209-V	Algebra & Calculus	3	-	3	25	75	100	3
5	Ability Enhancement courses	AEC-103-V	Effective Corporate Communication	3	-	3	25	75	100	3
6	Value Aided Course	VAC-201-V	Environment Science-II	3	-	3	25	75	100	4
8	Skill Enhancement Courses	BCG-207-V	Data Structures Lab	-	4	4	15	35	50	2
9	Skill Enhancement Courses	BCG-209-V	Object-oriented Programming Using C++ Lab	-	4	4	15	35	50	2
10	Skill Enhancement Courses	BCG-211-V	Internet and Web Technology Lab	-	2	2	15	35	50	1
			Total			**32**	**195**	**555**	**750**	**27**

BCA Scheme of Studies

Semester– IV

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	BCG-202-V	Database Management System	3	-	3	25	75	100	3
2	Discipline Specific-Major	BCG-204-V	Design of Unix OS	3		3	25	75	100	3
3	Discipline Specific-Major	BCG-206-V	Python Programing	3	-	3	25	75	100	3
4.	Discipline Specific-Major	BCG-208-V	Logical Organization of Computer	4		4	25	75	100	4
5	Discipline Specific-Minor	BCG-216-V	Wireless Communications	4	-	4	25	75	100	4
6	Ability Enhancement Courses	AEC-109-V	Critical Thinking and Rhetorical Communication	2	-	2	25	75	100	2
7	Value Added Course	VAC-104-V	Indian Knowledge System	2	-	2	25	75	100	2
8	Discipline Specific Lab	BCG-210-V	Database Management System Lab	-	4	4	15	35	50	2
9	Discipline Specific Lab	BCG-212-V	Design of Unix OS Lab		4	4	15	35	50	2
10	Discipline Specific Lab	BCG-214-V	Python Programming Lab	-	4	4	15	35	50	2
			Total			**33**	**220**	**630**	**850**	**27**

SEMESTER-I

BCG-101-V
Fundamentals of Computer
BCA-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

BCG-103-V

Programming in C

BCA-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.

BCG-105-V

Digital Electronics-I

BCA-I 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: 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.

MTU-117-V

Mathematics

BCA-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-V
Writing Skills and the Art of Rhetoric (WSAAR)
BCA-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**.**

AEC-108-V
Quantitative Reasoning
BCA-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:

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/

BCG-107-V
C Programming Lab
BCA-I Semester

Discipline Specific Course

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 programsto 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

BCG-109-V
Digital Electronics-I Lab
BCA-I Semester

Discipline Specific Course

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

BCG-111-V
Workshop 1
BCA-I Semester

Discipline Specific Course

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

BCG-102-V
Introduction to Operating systems
BCA-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 schemes
4. 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.

BCG-112-V
Computer Networks
BCA-II Semester

No. of Credits:			4	
L	T	P	Total	Sessional: 25 Marks
4	0	0	4	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.

BCG-104-V
Digital Electronics-II
BCA-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.

BCG-114-V
Microeconomics
BCA-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-V
Communication, Mediation and Resolution (CMR)
BCA-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:
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-V
Environment Science-I
BCA-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)

BCG-106-V
OS Lab
BCA-II Semester

Discipline Specific Course

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.

BCG-108-V
Digital Electronics-II Lab
BCA-II Semester

Discipline Specific Course

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.

BCG-110-V
Workshop-II (Networking Lab)
BCA-II Semester

Discipline Specific Course

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

SEMESTER-III

BCG-201-V
Data Structures
BCA-III 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 basic concepts of data structures and algorithms along with an introduction to strings and some basic search algorithms (Linear Search and Binary Search).
2. To understand Arrays and linked lists in detail.
3. To become familier with the concept of stacks and queues along with their representations in memory.
4. To understand the representation and traversal of trees and graphs along with some algorithms in detail.

Syllabus:

Unit I: Introduction to Data Structure and Strings
Elementary data organization, Data Structure definition, Data type vs. data structure, Categories of data structures, Data structure operations, Applications of data structures, Algorithms complexity and time-space tradeoff, Big-O notataion.
Strings: Introduction, Storing strings, String operations, Pattern matching algorithms, Linear search, binary search.

Unit II: Arrays and Linked List
Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Parallel arrays, Sparse arrays. Searching and Sorting algorithms.
Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searchingin a linked list, Header linked list, Circular linked list, Two-way linked list, Threaded lists, Garbage collection, Applications of linked lists.

Unit III: Stack and Queues
Introduction to stack, Array and linked representation of stacks, Operations on stacks, Applications of stacks: Polish notation, Reverse Polish notation, Recursion, Evaluation of arithmetic operations.
Introduction to queue, Array and linked representation of queues, Operations on queues, Dequeues, Priority Queues, Applications of Queues.

Unit IV: Tree and Graph

Introduction to Tree, Representing Binary tree in memory, traversing binary trees using recursion and using stacks.
Introduction to graph, Matrix, List and linked representation of graphs, Traversal of the graph, Warshall's algorithm for the shortest path, Dijkstra algorithm for the shortest path, Minimum spanning tree: Prim's and Kruskal's algorithm.

Course Outcomes:

A student will be able to:

CO1: Understand the various types of data structures along with their advantages and disadvantages.
CO2: Analyze them to determine the time and computation complexity.
CO3: Implement search problem (Linear search and Binary search).
CO4: Access the performance of Arrays, Stacks, Queues, linked lists and trees, and also their time and computation complexity.
CO5: Implement tree and graph search, and traversal algorithms and determine their time and computation complexity

Text/ Reference Books:

1 Seymour Lipschutz, "Data Structure", Tata-McGraw-Hill
2 Aaron M. Tanenbaum, Data Structures using C/C++, PHI
Horowitz, Sahni & Anderson-Freed, "Fundamentals of Data Structures in C", Orient Longman.
3 Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw- Hill International Student Edition, New York.
4 Mark Allen Weiss Data Structures and Algorithm Analysis In C, Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.

BCG-203-V
Object Oriented Programming Using C++
BCA-III 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 difference between object-oriented programming and procedural programming.
2 To learn basic concepts and syntax of C++.
3 To implement C++ classes using encapsulation and design principles.
4 To critically understand a program using more advanced C++ features such as the composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, templates etc.

Syllabus:

Unit I: Object Oriented Programming Concepts
Procedural Language and Object-Oriented approach, Characteristics of OOP, user-defined types, polymorphism, and encapsulation. Getting started with C++: syntax, data types, variables, string, function, namespace and exception, operators, flow control, recursion, array and pointer, and structure.

Unit II: Abstracting Mechanism and Memory Management
Classes, private and public, Constructor and Destructor, member function, static members, references;
Memory Management: new, delete, object copying, copy constructor, assignment operator, this input/output.

Unit III: Inheritance and Polymorphism

Derived Class and Base Class, Different types of Inheritance, Overriding member function, Abstract Class, Public and Private Inheritance, Ambiguity in Multiple inheritances, Virtual function, Friend function, Static function, Operator Overloading.
Template and Standard Template Library: Template classes, declaration, template functions, namespace, string, iterators, hashes, streams, and other types.

Unit IV Exception and File Handling

Exception and derived class, function exception declaration, unexpected exception, and exception when handling an exception, resource capture, and release.
Streams and File handling: I/O streams, fos.open, fos.close, I/O stream libraries.

Course Outcomes:

A student will be able to:

CO1: Understand the difference between object-oriented programming and procedural programming.
CO2: Learn basic concepts and syntax of C++.
CO3: Implement C++ classes using encapsulation and design principles.
CO4: Implement a program using more advanced C++ features such as the composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, templates, etc.

Text/ Reference Books:

1 Bjarne Stroustrup, The C++ programming language, Pearsons education
2 Robert Lafore, Object oriented programming using C++,PHI
3 Paul Deitel & Harvey Deitel, C++ How to program , Pearsons education
4. Yashawant Kanetkar, Let Us C++, BFB

BCG-205-V
Internet and Web Technology
BCA-III Semester

No. of Credits: 4				**Total Sessional: 25 Mark**
L	**T**	**P**	**Total**	**Theory: 75 Marks**
4	**0**	**0**	**4**	**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 learn the basic concepts of the internet, its history and various fundamental features of the world wide web like HTTP, TCPIP protocols etc.
2. To understand the utility of search engines, its components and working.
3. To undersatand the concepts of Web site design and Publishing and acquaint them with advanced graphics features for designing effective web sites.
4. To analyze and implement the student the concepts of cascading style sheets and the basics of client-side scripting using JavaScript

Syllabus:

Unit I: Introduction to Internet and World Wide Web

Evolution and History of World Wide Web; Basic features; Web Browsers; Web Servers; Hypertext Transfer Protocol, Overview of TCP/IP and its services; URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools.

Unit II: HTML

Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML command Tags; Creating Links; Headers; Textstyles; Text Structuring; Text colors and Background; Formatting text; Page layouts,

Unit III: Dynamic HTML

Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes, Text Boxes, Dynamic HTML, Features of DHTML,CSS, CSSP (cascading style sheet positioning) and JSSS (JavaScript assisted style sheet), Architecture of Web Browser, The ID attributes, DHTML events.

Unit IV: Web Publishing

Hosting your Site; Internet Service Provider; Web terminologies, Phases of Planning and designing your Web Site; Steps for developing your Site; Choosing the contents; Home Page; Domain Names, Front page views, Hosting website on server and on cloud, Security issues related to website.

Course Outcomes:

A student will be able to:

CO1: Understand the basics of the internet, its applications and ways to connect to it and learned the basics and types of search engines.

CO2: Implement programs based opn HTML and learned the need and basics of CSS and the concepts of client-side JavaScript

CO3:Evaluate the difference between client-side and server-side scripting

CO4: Implement how to import multimedia pages over the web.

Text/ Reference Books:

1 Douglas E. Comer : Computer Networks and Internets.

2 Raj Kamal, “Internet and Web Technologies”, Tata McGraw-Hill.

3 Thomas A. Powell, “Web Design: The Complete Reference” , 4/e, Tata McGraw-Hill.

4 Wendy Willard, “HTML Beginners Guide”, Tata McGraw-Hill.

5 Deitel and Goldberg, “Internet and World Wide Web, How to Program”, PHI.

MTU-209-V
Algebra and Calculus
BCA-III 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 relations, equivalence relations and partitions with linear algebra.
2 To learn the ideas of the importance of multivariable calculus differentiation
3 To formulate the mathematical model of multivariable calculus-Integration and sequences and series.
4 To Access the performance of the Series representation of functions

Syllabus:

Unit I: Matrices
Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, solving system of linear equation Cramer's Rule. Symmetric, Skew-Symmetric, Orthogonal and Unitary matrices, Rank of a Matrix, Consistency, Characteristic equation – Eigen values and Eigen vectors.

Unit II: Differential Calculus

Derivative of a function, Derivatives of Sum, Differences, Product & Quotient of functions, Derivatives of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, Logarithmic Differentiation, Chain Rule and differentiation by substitution.

Unit III: Integral Calculus

Indefinite Integrals, Methods of Integration by Substitution, By Parts, Partial Fractions, Integration of Algebraic and Transcendental Functions, Reduction Formulae for simple and Trigonometric Functions, Definite Integral as Limit of Sum, Fundamental Theorem of Integral Calculus, Evaluation of definite integrals by substitution, using properties of definite integral.

Unit IV: Sequences and Series

Convergence of sequences and series, the convergence of geometric series and p-series(without proof), test of convergence (comparison, ratio and root tests without proof); Alternating series and Leibnitz test, absolute and conditional convergence.
Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence);

Course Outcomes:

A student will be able to:

CO1: Understand the systems of linear equations, diagonalize matrices and characterize quadratic forms

CO2: Compute the partial and total derivatives and maxima and minima of multivariable functions.

CO3: Utilize the multiple integrals and apply them to find areas and volumes of geometrical shapes,mass and centre of gravity of plane laminas.

CO4: Implement various tests to determine whether a given series is convergent, convergent or conditionally convergent

Text/ Reference Books:

1 H. Anton, I. Biven,S.Davis, “Calculus”, Wiley, 10th edition, 2015.

2 Erwin Kreyszig, Advanced Engineering Mathematics, 10thEdition, John Wiley & Sons, 2016.

3 J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017

4 G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.

5 Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 7th Edition, 2012

6 Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

7 B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition, 2010.

AEC-103-V

Effective Corporate Communication (ECC)

BCA III 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

Course

Objectives:

CO I: To understand the appropriate grammatical structures in written forms.
CO II: To understand the significance of technical writing and formal communication
CO III: To develop and demonstrate effective writing skills in varied forms.
CO IV: To understand how to deliver persuasive presentations.

Unit-I: Writing Skills and Basics of Grammar

Subject-verb agreement; sentence correction; tense-verb usage; Composition of a Paragraph; Characteristics of a Good Paragraph; Use of Idioms and Proverbs, Literary Tropes and Use of Figures of Speech.

Unit-II: Technical Writing and Reports

SPSE structure; IMRD structure; Report Writing: Types of Reports and Structure of a Long Report.Hedging, Nominalization; Memos; Agenda and MoM; Case Study Method; Presentations; Business Letters-quotation and placing order.

Unit-III: Drafting proposals

From essays to proposals; Types of Essay Writing:Structure of an essay; Argumentative essays; Expository essays; Narrative essays; and Descriptive essays;Structure of an EssayReading, Writing and Comprehension. Drafting proposals;Synopsis Writing;Definitions; Comparisons and Contrasts; Hedging; Nominalization, proposal presentations

Unit-IV: Exercises in Proposal Presentations

Drafting and Presenting Proposals.

Course Outcomes:

The students will be able to:
CO I: Use appropriate grammatical structures in written forms.
CO II: Understand the significance of technical writing and formal communication.
CO III: Develop and demonstrate effective writing skills in varied forms.
CO IV: Deliver persuasive presentations

VAC-201-V
Environment Science-II
BCA-IV 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 OUTCOMES:
At the completion of this course, the learner will be able to:
CO1: Understand about different types of pollution, their sources and their adverse impacts.
CO2: Develop understanding on the climate change concept, climate change adaptation and mitigation.
CO3: Understand broad aspects of environmental management systems and various methods followed for assessment of environmental quality and associated risks.
CO4: Learn about the major environmental conventions/protocols adopted at national and international level to protect and conserve environment.

Unit I: Environment Pollution and Health (6 hrs)
Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution.
A) Air pollution: Sources of air pollution; Primary and secondary pollutants; Criteria pollutants- carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter, and sulphur dioxide; Other important air pollutants- Volatile Organic compounds (VOCs), Peroxyacetyl Nitrate (PAN), Polycyclic aromatic hydrocarbons (PAHs) and Persistent organic pollutants (POPs); Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards.
B) Water pollution: Sources of water pollution; River, lake, and marine pollution, groundwater pollution; water quality. Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life.
C) Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health.
D) Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health.
E) Thermal and Radioactive pollution: Sources and impact on human health and ecosystems.

Unit II: Climate Change: Impacts, Adaptation and Mitigation (6 hrs)
Understanding climate change: Natural variations in climate; Structure of atmosphere; Anthropogenic climate change from greenhouse gas emissions– past, present and future; Projections of global climate change with special reference to temperature, rainfall, climate variability and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Climate change projections for the Indian sub-continent.
Impacts, vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change. Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept

of carbon intensity, energy intensity, and carbon neutrality; Energy efficiency measures; Renewable energy sources; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice. **Unit III: Environmental Management (6 hrs)**

Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights.

Environmental legislations in India: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules.

Environmental management system: ISO 14001, Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis, Environmental audit and impact assessment; Environmental risk assessment, Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Eco mark scheme.

Unit IV: Environmental Treaties and Legislation (6 hrs)

An overview of the following national and international cooperation, agreements, conventions, protocols - adoption, signature, ratification and entry into force; binding and nonbinding measures; Conference of the Parties (COP):

A) Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Status phase-out of production and consumption of Ozone Depleting Substances by India.

B) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; Stockholm Convention on Persistent Organic Pollutants; Minamata Convention on Mercury.

C) United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions.

D) National Green Tribunal; Some landmark Supreme Court judgements.

E) Major International organisations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), World Commission on Environment and Development (WCED), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.

Unit V: Case studies/ Field Work (6 hrs)

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) Campus environmental management activities such as solid waste disposal, water management and sanitation and sewage treatment plant

Suggested Readings:

1. Adenle A., Azadi H., Arbiol J. (2015). Global assessment of technological innovation for climate change adaptation and mitigation in developing world, Journal of Environmental Management, 161 (15): 261-275.

2. Ahluwalia, V. K. (2015). *Environmental Pollution, and Health*. The Energy and Resources Institute (TERI).

3. Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213.

4. Barrow, C. J. (1999). Environmental management: Principles and practice. Routledge.

5. Berrang-Ford, L., J.D. Ford & J. Paterson (2011). Are we adapting to climate change? Global Environmental Change—Human and Policy Dimensions 21: 25-33.

6. Bohra, Saroj, Judicial Intervention and Evolution of Environmental Principles and Doctrines (January 7, 2019). Available at SSRN: https://ssrn.com/abstract=3311406 or http://dx.doi.org/10.2139/ssrn.3311406

7. Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/standards/
8. India Code – Digital repository of all Central and State Acts: https://www.indiacode.nic.in/
9. Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education.
10. Jørgensen, Sven Marques, Erik João Carlos and Nielsen, Søren Nors (2016) Integrated Environmental Management, A transdisciplinary Approach. CRC Press.
11. Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press.
12. Kaushik, A., & Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.
13. Masters, G. M., & Ela, W. P. (2008). *Introduction to environmental engineering and science* (No. 60457). Englewood Cliffs, NJ: Prentice Hall.
14. Miller, G. T., & Spoolman, S. (2015) Environmental Science. Cengage Learning.
15. Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf
16. Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition.Routledge.
17. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.
18. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.
19. Tiefenbacher, J (ed.) (2022), Environmental Management - Pollution, Habitat, Ecology, and Sustainability, Intech Open, London. 10.5772/
20. UNEP (2007) Multilateral Environmental Agreement Negotiator's Handbook, University of Joensuu, ISBN 978-952-458-992-5
21. www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle

Lab Syllabus

BCG-207-V					
Data Structures Lab					
BCA-III Semester					
Discipline Specific Course					
No. of Credits:			2		
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours
List of Experiments					
1. Write a program to find an element in list using linear search					
2.Write a program to find an element in list using binary search.					
3.Write a program to concatenate two strings of different lengths					
4. Write a program to transpose a given matrix					
5. Write a program to implement various Sorting Algorithms.					
6. Write a program for Implementation of stacks using array.					
7. Write a program to perform all operations of queues.					
8. Write a program to perform infix to postfix using stack					
9. Write a program to implement Link List.					
10. Write a program to implement (preorder, in order,postorder) traversal in a tree..					

BCG-209-V					
Object-oriented Programming Using C++ Lab					
BCA-III Semester					
Discipline Specific Course					
No. of Credits:			2		
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours

List of Experiments

1. WAP to check a Number is prime or not

2.Write a program to find an element in list using binary search.

3. WAP to implement Student grade using Classes

4. . WAP to compute total salary of employees using containership

5. write a program to calculate grade of students using array of objects
write a program to calculate area of different shapes using function overloading
a) circle
b) square
c) cylinder
d) triangle
e) cone

6. Write a program to find compound interest using default argument

7. write a program to do swapping of two numbers using
a) call by value
b) call by reference
c) call by address

8. Write a program to have 2 times addition using argument passing

9. write a program to addition of two Matrix using argument passing

10. Write a program to add two complex number using constructor function

11.WAP to implement friend function to add two complex numbers

12. write a program to add two complex number by using overloading binary + operator.

13. write a program to implement overloading unary - operator using point class

14. write a program to compare two length object by using == operator

15. Write a program to implement incremental operator on time class object using overloading function

12write a program to exchange the values of two variables using function templates

12write a program to implement an inheritance hierarchy of class quadrilateral, parallelogram, triangle and square use quadrilateral as super class for the hierarchy specify the instance variable and member function for each class,the private instance variable of quadrilateral should be xy coordinate pair for each of four numeric
Write a program that creates a object of class and output of each as area (except quadrilateral)
Write a program to implement stack using class template that offers the following services for generic data type:-
a) push an element on a stack
b) pop an element from a stack

BCG-211-V					
Internet & Web Technology Lab					
BCA-III Semester					
Discipline Specific Course					
No. of Credits:			1		
L	T	P	Total	Sessional:	15 Marks
0	0	2	2	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours
List of Experiments					
1. Write a program using basic tags:- a)Bold b) Italic c) underline d) paragraph					
2. create a table for railway time table					
3. create a student table with attributes (name,age,roll no,class, semester)using cell spacing(4) and cell padding (3,4,5)					
4.Write a program to insert an image in the web page,use atleast 2 attributes of image ising H1 H2 tags.also write description of image					
5. Wap to use frames in a web page implementing different elements					
6. WAP to create a University Website					
7. WAP to add two numbers using JavaScript					
8. Wap to find a factorial of number using recursion in JS.					
9.Wap to add two numbers make use of the functions called sum and pass tha parameter					
10. WAP to create a University Website					

SEMESTER IV

BCG-202-V
Database Management System
BCA-IV 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 basic terminology used in database systems, basic concepts, the applications of database systems and understand role of Database administrator in DBMS.
2 The critically evaluate the various data model like Hierarchical model, Network Model, Relational model, E-R model and will be able to make E-R diagram from data given by user and table from E-R diagram.
3 The students will become familiar with relational database theory and be able to write relational algebra expressions for query and will be able to understand the logical design guidelines for databases, normalization approach, primary key, super key, foreign key concepts.
4 To design the basic issues of transaction processing, query optimization and Concurrency, security, and control.

Syllabus:

Unit I: Basic Concepts of DBMS and Database System Architecture

Introduction to Database, Purpose of Database Systems,Characteristics of Database Approach, advantages, and disadvantages of database system. Data, Information, Records, and files. Database Administrator, Database Designers, DBMS users, DBMS Functions and Components, Databases versus information retrieval. Data models, scheme, instances, Categories of Data Models, Three-Schema Architecture, Data Independence, Component modules of a DBMS and their interactions. Centralized DBMSs Architecture, Two-Tier Client/Server Architectures for DBMS, Three-Tier and n-Tier Architectures for Web Applications, DBMS Languages, Classification of DBMS.

Unit II:**Entity-Relationship Model**

Relational Data Model - Brief History, Relational Model Terminology, Relational Data Structure, Database Relations, Properties of Relations, Keys, Domains, Integrity Constraints over Relations Relational Model Constraints, Relational Database Schemes, Entity Types, Entity Sets, Attributes Relationship Types, Relationship Instances and ER Diagrams, abstraction and integration.
Basic Concepts of Hierarchical and Network Data Model

Unit III: Relational Algebra and Relational Calculus

Unary Relational Operations: Select and Project, Sequence of Operations, rename Operation, Relational algebra from set theory, Cartesian product, Binary relational operations, additional relational operations such as Generalized Projection, Aggregate Functions and Grouping etc. Tuple relation calculus, Domain relation calculus.

Unit Iv: Relational Database Design:

Functional dependencies, Modification anomalies, Ist to 3rd NFs, BCNF, 4th and 5th NFs, computing closures of set FDs, SQL: Data types, Basic Queries in SQL, Insert, Delete and Update Statements, Views, Query processing: General strategies of query processing, query optimization, query processor, concept of security, concurrency and recovery, introduction to distributed DBMS.

Course Outcomes:

A student will be able to:

CO1: Understand basic terminology used in database systems, basic concepts, and the applications of database systems and understand the role of Database administrator in DBMS. The students will also be able to understand various data models like the Hierarchical model, Network Model, Relational model, E- R model and will be able to make E-R diagrams from data given by the user and table from the E-R diagram

CO2: Work with relational database theory and be able to write relational algebra expressions for queries.

CO3: Demonstrate the logical design guidelines for databases, normalization approach, primary key, super key, and foreign key concepts.

CO4: Understand the issues of transaction processing, query optimization and Concurrency, security and control.

Text/ Reference Books:

1 Elmasri & Navathe, “Fundamentals of Database Systems”, 5th edition, Pearson Education.

2 Thomas Connolly Carolyn Begg, “Database Systems”, 3/e, Pearson Education

3 C. J. Date, “An Introduction to Database Systems”, 8th edition, Addison Wesley N. Delhi.

BCG-204-V
Design of UNIX Operating System
BCA-IV 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 services provided by and the design of an operating system.
2 To Evaluate the structure and organization of the file system.
3 To Familier with what a process is and how processes are synchronized and scheduled.
4 To compare and evaluate different approaches to memory management.

Syllabus:

Unit I: Theoretical Concepts of Unix Operating System

Evolution of UNIX, Basic features of UNIX, Architecture of UNIX kernel: File subsystem and process control subsystem, UNIX vs LINUX, introduction to shell programming. System administrator privileges.

Unit II: File system of the UNIX OS

Parent-child relationship of files, Types of files, File system layout, data structures of the file subsystem; internal representation of files: inodes, accessing and releasing inodes, the structure of regular files and directories, superblocks, inode and disk block assignment to a new file.

Unit III: Process Control System

Concept of a process, state transitions, data structures, Context of a process, Layout of the system memory, process scheduler, scheduling parameters, round robin multiple feedback scheduling, Fair share scheduler.

Unit IV: Memory Management Policies

Swapping: Data structures, implementation of swapping processes in and swapping out; Demand Paging: Data structures, page stealer process, fault handler.

Course Outcomes:

A student will be able to:
CO1: Develop an understanding of how an operating functions as a middle layer between the hardware of a computer

CO2: Appreciate the design issues and concepts of the Unix Operating Systems.
CO3: Aware with the structure and organization of the file system.

CO4: Familiar with the process management and memory management.

Text/ Reference Books:

1 The Design of the UNIX Operating System: Maurice J Bach, PHI
2 UNIX: Concepts and Applications: Sumitabha Das, Tata McGraw Hill.
3 UNIX Shell Programming: Yashwant Kanetkar, BPB publications.

BCG-206-V
Python Programming
BCA-IV 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 Learn the syntax and semantics of Python Programming Language.
2 Write Python functions to facilitate code reuse and manipulate strings.
3 Illustrate the process of structuring the data using lists, tuples and dictionaries.
4 Demonstrate the use of built-in functions to navigate the file system.

Syllabus:

Unit I: Basics of Python and Structure Types and Mutability

Python Installation and Working of it, get familiar with Python variables and data types, Operator understanding and its usage, detail study of Python blocks, conditional blocks using if, else and elif,looping with range, list and dictionaries. Hands-onorganizing python code with function, modular approach in Python.

Unit II: Exception, Testing and Debugging
Handling if exceptions to handle the code cracks, handling and helping file operations, coding with the exceptional handling, and testing Anonymous method, Properties, Indexers, Exception Handling.

Unit Iii: Classes and OOP Concepts

Procedural and Object-Oriented Programming, Classes and working with instances, Method overloading, Polymorphism, importing internal module as well as external modules in the code Packages understanding and their usage, hands on with Lambda function in python coding with the use of functions, modules and external packages

Unit Iv: Algorithm and Data Structure

Stack, Queue, Tree, ordered list, Introduction to Recursion, Divide and Conquer Strategy, Greedy Strategy, Graph Algorithms.
Advance Topics: Regular Expression, Multi thread Programming, Security

Course Outcomes:

A student will be able to:

CO1: Apply various fundamentals for problem solving using python.
CO2: Implement modular programming and differentiate the mutability of various datatypes
CO3: Create object-oriented solutions by applying various concepts like polymorphism, inheritance, and package with python programming.
CO4: Implement multithreading and manage security in Linux operating system.

Text/ Reference Books:

1 Starting Out with Python (2009) Pearson , Tonny Gaddis
2 Beginning Pyhton Wrox Publication Peter Norton, Alex Samuel
3 Python Algorithms Apress, Magnus Liet Hetland,
4 Python Object Oriented Programming PACKT Press, Dusty Phillips
5 Python for Unix and Linux System Administration O'Relly, Noad Gift

BCG-208-V

Logical Organisation of Computer

BCA-IV 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 develop an understanding of components of computer, how Computer Systems work and the basic principles

2. To make students understand the concept of microprocessor architecture and peripherals and I/O interfacing.

3. To learn the concepts of parallel processors and pipelining techniques.

4. To study the concept of memory organization and its techniques.

UNIT-I Functional blocks of a computer:

CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT-II Introduction to x86 architecture:

CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT-III Pipelining:

Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

UNIT-IV Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size Vs block size, mapping functions, replacement algorithms, write policies.

Course Outcomes:

After completion of this course, the students will be able to perform the following:

1. Draw the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Write assembly language program for specified microprocessors using different data representations and design the ALU, Control Unit and CPU of a computer system.
3. Analyse concepts of parallel processors and pipelining techniques
4. Given a CPU organization, apply design techniques for memory interfacing and interleaving.

Text Books/References:

1. **"**Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
3. "Computer Architecture and Organization", 3rd Edition by John P. Hayes WCB/McGraw-Hill
4. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
5. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

BCG-216-V
Wireless Communication
BCA-IV 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 provide an overview of the Wireless Communication Networks area and its applications and examples of wireless communication devices.
2 To understand the various terminology, principles, devices, schemes, concepts, algorithms, and different methodologies used in Wireless Communication Networks.
3 To Introduce various wireless systems and standards such as GSM and their basic operation cases. It also deals with second-generation and third-generation wireless networks.
4 To understand the characteristics of different multiple access techniques and it provides an overview of the need for Cell splitting and Cell sectoring in cellular networks.

Syllabus:

Unit I: Introduction to Wireless Communication System
Evolution of wireless communications, examples of wireless communication systems, comparison of various wireless systems.
Modern Wireless Communication System: Second generation cellular networks: GSM, third generation wireless networks: CDMA, Introduction to 4G wireless networks, wireless in local loop, wireless local area networks, Bluetooth and Personal Area Networks.

Unit II: Introduction to Cellular Mobile Systems and Design Fundamental
Spectrum Allocation, Basic cellular Systems, performance criteria, Operation of Cellular systems, Analog cellular systems, Digital cellular Systems.

Cellular System Design Fundamentals**:** Frequency Reuse, channel assignmentstrategies, hand off strategies (MAHO, MCHO, NCHO), Interference and system capacity, tracking and grade off service, improving coverage and capacity: Cell splitting, Cell sectoring, Zone concepts.
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Unit III: Multiple Access Techniques for Wireless Communication

Introduction to Multiple Access, FDMA, TDMA, spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Unit IV: Wireless Networking

Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in the wireless network, wireless data services, common channel signaling, ISDN (Integrated Service Digital Networks), Advanced Intelligent Networks.

Course Outcomes:

A student will be able to:

CO1: Aware of the overall GSM cellular concept along with Cellular systems from 1G to 3G, Wireless 4G systems.

CO2: The students will be aware of the Fundamentals of cellular communications such as hexagonal cell geometry, Co-channel interference, Cellular system design, and Sectoring using directional antennas

CO3: Have Knowledge of different spread spectrum techniques and an understanding of design considerations for how to effectively share spectrum through multiple access

CO4: Understand the basic principles channel allocation and handoffs and awareness of the technologies used in Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA)

Text/ Reference Books:

1 J. Goldsmith, Wireless Communications, Cambridge University Press, 2005.

2 D. Tse and P. Viswanath, Fundamentals of Wireless Communications, Cambridge University Press, 2005.

3 A. Molisch, Wireless Communications, John Wiley & Sons, 2005.

4 S. Haykin and M. Moher, Modern Wireless Communications, Pearson Education, 2005.

5 T. S. Rappaport, Wireless Communications, Prentice Hall, 1996.

6 G. L. Stuber, Principles of Mobile Communications, Kluwer, 1996.

7 T. Cover and J. Thomas, Elements of Information Theory, John Wiley & Sons, 1991.

AEC-109-V
Critical Thinking and Rhetorical Communication
BCA-IV 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 be familiarized with the concept and significance of critical thinking.
2. To practice critical thinking including comprehension, analysis and interpretation of information in communication process.
3. To help students articulate content for clear and persuasive communication.
4. To understand and apply conflict-resolution and problem-solving approaches towards building and managing teams and for better organizational communication.

Syllabus:

Unit 1: Introduction to Critical Thinking and Rhetoric
Definition and types: Analysis, Communication, inference, Observation; Problem-Solving; Inductive and Deductive Reasoning; Edward de Bono's Thinking Hats; The Rhetorical Situation: Purpose; Audience; Topic and Context; Rhetorical strategies: compare; contrast; classify; describe; Rhetorical devices: alliteration and amplification.

Unit II: Content Analysis and Articulation
Comprehension of core ideas of an article; Identify credible sources; Evaluate and respond to arguments; Assess alternative viewpoints; Test hypotheses against relevant criteria; analyze information and form judgments; **CRAAP test**, these queslions focus on thc currency, relevance, authority, accuracy and purpose of a source of information; bias and eliminating bias, evidence-based arguments, considering alternatives views, popular media and information literacy.

Unit III: interview Skills
STAR method: Situation, Task, Action and Result; mock-interview exercises.

Unit IV: Conflict Resolution and Group Discussion
conflict; 3 P's of conflict resolution: Problem, People and Process; strategies to resolve conflict: avoid; compromise; accommodate; compete, collaborate; GD exercises with topical issues and chronic problems of regional, national and international importance; including leadership and team-building skills.

Course Outcome:
1. Students will be familiarized with the concept and significance of critical thinking.
2. Students demonstrate critical thinking skills including comprehension analysis and interpretation of

information in communication process.
3. Students are able to articulate content for clear and persuasive communication
4. Students can apply conflict-resolution and problem-solving approaches towards building and managing teams for better organizational communication.

VAC-104-V
Subject Name: Indian Knowledge System
BCA-IV Semester

NO. OF CREDITS: 2

L	T	P	Total	
				Sessional : 25 Marks
				Final Exam : 75 Marks
2	**0**	**0**	**2**	**Total : 100 Marks**
				Duration of Exam : 3 hours

NOTE: Question paper will have two parts. Part-1 will be compulsory and have 10 questions of equalmarks covering the entire syllabus. Any four questions have to be attempted out of six from Part-2.

Course Objectives:

1. To provide an overview of different knowledge systems originated in India.
2. To introduce in the students a comprehensive understanding of Indian ethics and values.

UNIT-I: Introduction and foundational concepts of IKS (4 Hrs)

Overview of various streams of knowledge in India and classification of ancient Indian texts;Variousphilosophical systems of India and fundamental principles inlaid in them

UNIT-II: Psychology from Indian perspective, Yoga and Indian Linguistics (4 Hrs)
Introduction to Ashtanga Yoga; Rasa Siddhanta of Natyasastra(theory of emotions), Panini's contribution to linguistics; Contributions of the Vakyasastra and Pramanasastra to linguistics

UNIT-III: Indian Mathematics and Astronomy (8 Hrs)
An overview of Indian mathematics, Development of arithmetic geometry and Trigonometry; Introduction to spherical geometry and calculus in India.
Vedic system of arithmetic computation, Vedic sutra for arithmetic computation.
An introduction to Indian Astronomy, Pre and Post Siddhantic period

UNIT-IV: Medicinal traditions in India (3 Hrs)
An Introduction to Ayurveda; Distinct features of Ayurveda, as compared to Alopathy; Excerpts from Sutrasthana

UNIT-V: Indian Architecture and Planning (3 Hrs)
Traditional measurement system used in Vastusastra, Prescriptions for residential Vastu, City planning as per Vastusastra

UNIT-VI: Economics, Management and Governance (4 Hrs)
An overview of Indian economic thought- Arthasastra and Nitisastra, Leadership and Motivation, Planning and Organizing, Financial Management etc.

SUGGESTED BOOKS:

1. Introduction to Indian Knowledge System, B. Mahadevan, V. R. Bhat, Nagendra Pavana R. N., PHI. 2022

2. Yoga System of Patanjali, J. H. Woods, Bharatiya Kala Prakashan 2009
3. Indian Philosophy Vol I and II, S. Radhakrishnan, Oxford University Press. 2009
4. Mayamatam Indian Treatise on Housing, Architecture and Iconography (2 volumes), Bruno Daegens, Indira Gandhi National centre for Arts. 2007
5. Vedanta and Management: Relevance of Vedantic Concepts in Modern Management Practices, N. V. Dave, Deep & Deep. 2002
6. Tantrasa graha with detailed Mathematical Explanatory Notes, K. Ramasubramanian, M. S. Sriram, Hindustan Book Agency. 2011
7. Karanapadhati of Putumana Somayaji, Venkateswara Pai, Ramasubramanian, M. S. Sriram and M.D. Srinivas, Hindustan Book Agency 2018
8. New Delhi 2002
9. The Nigha Motilal Banarsidass Publishers 2015
10. ga Literature, Archak K.B. Kaveri Books, New Delhi, 2012
11. Textbook of Ayurveda: Volume 1 - Fundamental Principles of Ayurveda, Vasant Lad, Ayurvedic Press; UK ed. Edition 2002
12. Sanskrit Academy, Hyderabad. 2010
13. Vedic Mathematics, Jagadguru Swami Sri Bharati Krsna Tirathji Maharaj, Motilal Banarsidass Publishers, Delhi 1965
14. Lilavati Bhaskaracarya: A Treatise of Mathematics of Vedic Tradition, K S Patwardhan, S A Naimpally and Shyam Lal Singh, Motilal Banarsidass Publishers Pvt Ltd, Delhi 2006

BCG-210-V					
Data Base Management System Lab					
BCA-IV Semester					
Discipline Specific Course					
No. of Credits:			2		
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours
List of Experiments					
1. Create a table and display data from table to understand the concept of create, insert and select command. Use of update, Delete, Truncate command to understand the concept of DML.Apply Alter command and Drop command to understand the concept of DDL.					
2. Apply constraints to understand the concept of Primary Key, Foreign key, Unique key, integrity constraints					
3. Apply Operators, Range Searching, and Pattern Matching on data to understand the concept of And, Or, Not, Arithmetic Operator, Like operator, In, Not in operator					
4. Write a program to execute DDL(Create, Alter, Drop and Truncate) commands with examples.					
5. For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause					
6. Write a program to execute DML(Insert, Update, Delete and Select) commands with examples.					
7. Write a program to perform join operations on two tables.					
8. Write a program to execute Transaction control language(Commit, Rollback and Save) commands with examples.					
9. Develop GUI using front end tool					
10. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.					

BCG-212-V					
Design of Unix OS Lab					
BCA-IV Semester					
Discipline Specific Course					
No. of Credits:			2		
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours

List of Experiments

1. Write a shell that takes a valid directory name as an argument and recursively descend all the subdirectories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output.

2. Write a shell script that accepts a path name creates all the components in that path name as directories. For example, if the script is named mpc, then command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.

3. Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permission are identical, output common permission and otherwise output each file name followed by its permissions.

4. Write a shell script which accepts valid log in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message.

5. Write a shell script that accept one or more filenames as argument and convert all of them to uppercase, provided they exist in current directory.

6. Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message.

7. Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir

8. Write a shell script that determine the period for which a specified user is working on system and display appropriate message.

9. Write a shell script that folds long lines into 40 columns. Thus any line that exceeds 40 characters must be broken after 40th, a "\" is to be appended as the indication of folding and the processing is to be continued with the residue. The input is to be supplied through a text file created by the user.

10. Write an script that accepts date argument in the form of dd-mm-yy and displays it in the form if month, day and year. The script should check the validity of the argument and in the case of error, display a suitable message.

BCG-214-V					
Python Programming Lab					
BCA-IV Semester					
Discipline Specific Course					
No. of Credits:			2		
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours
List of Experiments					
1. Write a Python program which accepts the radius of a circle from the user and compute the area.					
2. Write a Python program to get the largest number from a list.					
3. Write a Python program to display the first and last colors from the following list. color_list = ["Red","Green","White" ,"Black"].					
4. Write a Python program to calculate the sum of three given numbers, if the values are equal then return thrice of their sum.					
5. Write a Python program to find whether a given number (accept from the user) is even or odd, print out an appropriate message to the user.					
6. Write a Python script to add a key to a dictionary.					
7. Write a Python script to check if a given key already exists in a dictionary.					
8. Write a Python function to sum all the numbers in a list.					
9. Write a Python script to make calculator using Tkinter.					
10. Write a program to implement file handling in python.					
11. Write a Python script to perform various functions on Images.					