



# KHARAGPUR COLLEGE

## KHARAGPUR

ESTD. : 1949

P.O.– Inda, Kharagpur, Municipality– Kharagpur, Sub-Division– Kharagpur,  
P.S.– Kharagpur (T), Dist.– Paschim Medinipur, West Bengal, PIN– 721305.

### This is in answer to your DVV Query against metric 1.2.1 of Criterion 1 of the SSR:

The HEI hereby provides the syllabus of the core courses as approved by the affiliating University, that is Vidyasagar University, along with the syllabus and course modules of the certificate courses conducted by the respective departments to facilitate a comparative analysis. The comparison clearly indicates that the Certificate Courses have been designed keeping in view the approved syllabus and do not adhere to the core courses offered in the curriculum. Rather, the certificate courses have been designed to enhance and build upon the knowledge provided by the Core Courses and thus prepare the participants for future endeavors and potential job market. Some of the courses have been designed completely out of the core course structures and hence adds to the knowledge base of the students. The course modules of the following certificate courses are provided along with the respective University prescribed syllabus of the Department offering the course:

<b>Name of the certificate course:</b>	<b>Offered by:</b>
Modern Academia: Looking through Interdisciplinary Lens: Develop skills in Sanskrit	Department of English Department of Sanskrit
Advancement of Mathematics for UG level	Department of Mathematics
Recent Trends in Political Science	Department of Political Science
Fundamental Analysis of Financial Securities Market of India	Department of Commerce
Chemistry: A subject with multifarious opportunities	Department of Chemistry
Computer Programming using MATLAB and Python Language (2023)	Department of Physics
Significance of Sources for Historical Studies	Department of History
Ethics and Practice	Department of Philosophy
Skill development on different languages	Morning Shift
Values in education	Morning Shift
Modern trends in research methodology in interdisciplinary Studies	Department of Geography
Rural Development	Morning Shift
19th century Bengali Literature	Department of Bengali
Mushroom Cultivation	Department of Botany
Hindi mein rozgar ke absar evong sambhannaye	Department of Hindi
Research Methodology in Social Science	Department of Political Science
Human Resource Management & Personnel Management	Morning Shift
Introductory Human Physiology	Department of Physiology
Chemistry in Forensic Science	Department of Chemistry
Advanced Computer Programing using MATLAB & Python Language	Department of Physics
<b>Python Programming</b>	<b>Department of BCA</b>



ATTESTED  
Principal  
Kharagpur College

**VIDYASAGAR UNIVERSITY**  
**MIDNAPORE-721102**  
**B.C.A. (3 year Degree Course)**  
**(W.e.f.2010-2011)**  
**SYLLABUS**  
**FOR**  
**BACHELOR IN COMPUTER APPLICATION**

**Title of the Course:** The proposed course called as BCA – Bachelor in Computer Application

**B.C.A (3 year Degree Course)**  
**(W.e.f 2010-2011)**

**PROPOSED CURRICULA**

**FIRST SEMESTER:**

Course Code No.	Title	Lect. Hrs.	Tutorial. Hrs.	Prac. Hrs.	Marks		
					IA	UE	Total
BCA 1101	Computer Fundamentals and application software	3	1	0	30	70	100
BCA 1102	Programming in “C”	3	1	0	30	70	100
BCA 1103	Discrete Mathematics with application to computer science	3	1	0	30	70	100
BCA 1104	Digital Electronics	3	1	0	30	70	100
BCA 1195	Communication skill and Language laboratory.	0	0	6	30	70	100
BCA 1196	C programming Lab	0	0	6	30	70	100
BCA 1197	Digital electronics lab	0	0	6	30	70	100
		12	4	18	210	490	700

**SECOND SEMESTER**

Course Code No.	Title	Lect. Hrs.	Tutorial. Hrs.	Prac. Hrs.	Marks		
					IA	UE	Total
BCA 1201	Computer Organization and Architecture	3	1	0	30	70	100
BCA 1202	Data Structure	3	1	0	30	70	100
BCA 1203	Mathematical foundation for computer science	3	1	0	30	70	100
BCA 1204	Financial and Management Accounting	3	1	0	30	70	100
BCA 1205	System analysis and design	3	1	0	30	70	100
BCA 1296	Data structure Lab	0	0	6	30	70	100
BCA 1297	Financial accounting lab	0	0	6	30	70	100
		15	5	12	210	490	700

### THIRD SEMESTER

Course Code No.	Title	Lect. Hrs.	Tutorial. Hrs.	Prac. Hrs.	Marks		
					IA	UE	Total
BCA 2101	Design and analysis of Algorithm	3	1	0	30	70	100
BCA 2102	System Programming	3	1	0	30	70	100
BCA 2103	Computer Oriented Numerical method and Statistical method	3	1	0	30	70	100
BCA 2104	Database Management System	3	1	0	30	70	100
BCA 2105	Microprocessor	3	1	0	30	70	100
BCA 2196	DBMS Lab	0	0	6	30	70	100
BCA 2197	Gr.A: Microprocessor Lab (8085) and System Programming lab(8086) Gr.B: Numerical Laboratory	0	0	3	15	35	50
				3	15	35	50

#### FOURTH SEMESTER

Course Code No.	Title	Lect. Hrs.	Tutorial. Hrs.	Prac. Hrs.	Marks		
					IA	UE	Total
BCA 2201	Object Oriented programming using C++	3	1	0	30	70	100
BCA 2202	Operating System	3	1	0	30	70	100
BCA 2203	Operation Research	3	1	0	30	70	100
BCA 2204	Software Engineering	3	1	0	30	70	100
BCA 2205	Computer Network	3	1	0	30	70	100
BCA 2296	C++ Lab	0	0	6	30	70	100
BCA 2297	Gr.A: Operating System Lab	0	0	3	15	35	50
	Gr. B: Computer Network Lab			3	15	35	50
		15	5	12	210	490	700

## FIFTH SEMESTER

Course Code No.	Title	Lect. Hrs.	Tutorial. Hrs.	Prac. Hrs.	Marks		
					IA	UE	Total
BCA 3101	OOPS using JAVA	3	1	0	30	70	100
BCA 3102	Profession Values and Ethics	3	1	0	30	70	100
BCA 3103	.(dot)NET Technology	3	1	0	30	70	100
BCA 3104	Elective-I	3	1	0	30	70	100
BCA 3195	Seminar (Individual)	0	0	6 (Practice session)	30	70	100
BCA 3196	JAVA Lab	0	0	6	30	70	100
BCA 3197	.(dot) NET Lab	0	0	6	30	70	100
		12	4	18	210	490	700

### ELECTIVE – 1:

- (a) Applied graph theory.
- (b) Web design and application.
- (c) Fuzzy logic and neural network.
- (d) Advanced UNIX and Shell programming.
- (e) Mobile Computing
- (f) Automata Theory
- (g) Compiler Design

## SIXTH SEMESTER

Course Code No.	Title	Lect. Hrs.	Tutorial. Hrs.	Prac. Hrs.	Marks		
					IA	UE	Total
BCA 3201	OOAD using UML	3	1	0	30	70	100
BCA 3202	Elective-II	3	1	0	30	70	100
BCA 3203	Computer Graphics and Multimedia	3	1	0	30	70	100
BCA 3294	Computer Graphics and Multimedia Laboratory	0	0	6	30	70	100
BCA 3295	Project (Industrial)	0	0	12	50	150	200
BCA 3296	Grand VIVA	0	0	0	0	100	100
		9	3	18	170	530	700

### ELECTIVE - 2

- (a) Image Processing and pattern recognition.
- (b) PHP/My SQL.
- (c) Advanced OS.
- (d) Advance Networking
- (e) Data ware housing & Mining.
- (f) Advanced DBMS.
- (g) E – Commerce & ERP

## FIRST SEMESTER

### COMPUTER FUNDAMENTALS

(BCA-1101)

#### GROUP-A :

- UNIT-I: Overview: A brief introduction of computer generation. Types of computer (Micro, Mini, Mainframe, Super), Machine language & Assembly language, High level language, Type of Software.
- UNIT-II: Computer Basic: Need and application of computers, hardware and software, organization of computer, concept of algorithm and flow charts.
- UNIT-III: Data representation: representation of characters, integers, fraction and numbers in computers. Character representation codes and their inter conversion: decimal to binary, decimal to octal, binary to decimal, octal etc.1,s complement 2,s complement. Binary arithmetic: Binary addition, subtraction, multiplication and division.Floating and normalized floating point representation of signed number, one's and two's complement representation of numbers.
- UNIT-IV: Logical circuits (truth table and gates), multiprogramming, processor, virtual memory.
- UNIT-V: Input/output units: floppy disk, printers, VDU, etc.

#### GROUP-B :

- UNIT-I: Computers memory: memory organization and comparison of different type of memories including primary and secondary memory.
- UNIT-II: Operating system: different type of operating system like DOS, UNIX, WINDOWS, etc.
- UNIT-III:Internet: WWW, E\_mail, FTP, rlogin, HTML, computer networks(overview of ISO OSI model), multiplexing, LAN,WAN, and other Network topologies. Net Banking, E-Commerce, Current trends on Internet.

#### Reference Books:

1. Raja Raman. V: Fundamentals of computers, PHI
2. Introduction to Computer Science, ITL Education Solutions Limited, pearson education.
3. Computer Fundamentals, Anita Goel
4. Foundations of Computer Science By Ashok Arora

### PROGRAMMING IN C

(BCA-1102)

- UNIT-I: Introduction: -Scope of C Language Distinction and similarities with other HLLs Special features and Application areas .Elements of C :-Character Set, Key Words, Data Types ,Constants and Variables Operators unary, binary, ternary , Operator precedence ,Console Input/Output :-Types of IO , Console IO ,Unformatted console IO: getchar (), Gets(), Puts(),Formatted IO : Scanf(), Printf(),String Handling
- UNIT-II: Control Flow: - Statements and blocks, If , Switch, Loops: For, While, Do While, Go to and labels
- UNIT-III: Arrays: -Basic Concepts, Memory Representation, One Dimensional Arrays, Two Dimensional Arrays, Three Dimensional Arrays
- UNIT-IV: Functions:- Basic concept, Declaration and prototype , Calling Arguments , Call by value and call by reference, Scope rules Recursion, Storage classes types, Library of functions math, string, system
- UNIT-V: Pointers:- Basic Concepts ,&, \* Operator ,Pointer expression: assignment, arithmetic, comparison ,Dynamic Memory Allocation , Pointer V/S Array , Array of Pointer , Pointer V/S Function



UNIT-VI: Structure, Union and Enumerated Data Types:-Basic Concepts, Declarations and Memory Map, Elements of Structures, Structure V/S Function, Structure V/S Array, Union, Enumerated data Types: Type Def, Enum Self-referential structures  
UNIT-VI: File Handling: Types of Files File Organization Opening, Reading, Writing, Closing Text and binary file

**Reference Books:**

1. C Programming, Stephen Kochan
2. Programming with C, Schaum' s Series
3. C Programming , V. Balaguru Swami
4. Let Us C, Yashwant Kanetkar
5. Programming in C: A Practical Approach, Ajay Mittal

**DISCRETE MATHEMETICAL STRUCTURE WITH APPLICATION OF COMPUTER SCIENCE**  
**(BCA-1103)**

UNIT-I: Set theory. Relations and functions: Set notations and description, subsets, basic set operations. Venn diagrams, laws of set theory, partition of sets, basic definitions of relations and functions, properties of relations; injective, surjective and bijective functions, composition.  
UNIT-II: Combinations: Rule of products, permutations, combinations. Algebra of Logic: Propositions and logic operations, truth tables and propositions generated by set, equivalence and implication laws of logic, mathematical system, and propositions over a universe, mathematical induction. Recursion and recurrence: The many faces of recursion, recurrence, relations, and some common recurrence relations, generating functions.  
UNIT-III: Algebraic Structures: Table of operation, properties of binary operations, semigroup, subsemigroup, free semigroup, product of semigroup, congruence relation, monoid, submonoid, group, subgroup, cyclic group, coset, order of group, order of element, normal subgroup, homomorphisms, Isomorphism, Automorphism, Rings, Types of rings, subrings, Integral domain, Field.  
UNIT-IV: Posets, Lattices and Boolean Algebra: Poset, Hasse Diagram, Lattices, sublattics, Boolean Algebra, Boolean Expression, Principal of Duality, K-Map, Simplification using K-Map.  
UNIT-V: Graph theory: Various types of graphics, simple and multigraphs, directed and undirected graphs, Eulerian and Hamiltonian graph, graph connectivity, traversals, trees, spanning trees, rooted trees, binary trees.

**Reference Books:**

1. Discrete Mathematics and Graph Theory, Satyanarayana & Prasad
2. Discrete Mathematics with Graph Theory, 3rd ed., Goodaire & Parmenter
3. Discrete Mathematics and Graph Theory, 2nd ed., Biswal
4. Discrete Mathematics, Rajendra Akerkar and Rupali Akerkar
5. Discrete Mathematics, Babu Ram

**DIGITAL ELECTRONIC**  
**(BCA-1104)**

UNIT -I: Data and number representation- binary-complement representation BCD-ASCII, Gray Code, conversion of numbers form one system to the other, 2's Complement representation, binary arithmetic, Code Conversion.

UNIT-II: Logic gates, basic logic operations, truth tables, Boolean expression, simplification using KMAP, Prime Implicate. Combination circuits, adders, Subtractor, Decoder, encoder, Multiplexer, Sequential circuits, flip-flops, Registers, counter (Async & Sync).

UNIT-III: Memory circuits, ROM, PROM, EPROM and dynamic RAM, Digital Components. Seven segment display.

UNIT-IV: Different types of A/D and D/A conversion techniques, Different Logic families- TTL, ECL, MOS and CMOS, their operation, design and specifications

### **Reference Books:**

1. Fundamentals of Digital Circuits, Anand Kumar, PHI
2. Digital Electronics, Tokheim, TMH
3. Digital Electronics, S. Rangnekar, ISTE/EXCEL
4. Digital Logic & Computer Design, M. Morris Mano
5. Introduction to Digital Computer Design, An, 5th ed., Rajaraman & Radhakrishnan

## **COMMUNICATION SKILL AND LANGUAGE LABORATORY**

**(BCA-1195)**

### **UNIT-I: Acquisition – (16 Marks)**

- (i) Vocabulary Expansion through knowledge of
  - a) Spelling of words (Orthographical)
  - b) Semantic and phonetic aspects of words. Synonym/Antonym/ Homonym.
- (ii) Basic grammar and Grammar of words
  - a) Sentence form (SVO, SVA), Question form, and Negative form.
  - b) Tense and time. Number concepts-Singular, Plural, Collective, and Distributive.
  - c) Verb manipulation-Passive Voice, Question tag, indirect narration, Causative Conditionals.
  - d) Agreement-Noun, Pronoun, Subject, Verb. Completion of Prediction-Object, Complement, Adverbs. Word-Order: - Adverb Order, Object Clause, and Antecedent, Participial Opening and Subject Concord.
  - e) Articles and Prepositions. Focusing (It was then that/there that/he who/etc.
  - f) Evaluation Statements (It is + Adjective + Infinitive Structure.
- (iii) Principles of sentence structure (Construction) and devices for effective writing.
- (iv) Synthesis of Sentences.

### **UNIT-II: Expression:- (8+8 =16 Marks)**

a) Reading Skill

(i) Comprehension Test [200 words] (ii) Precise Writing [150 words]

### **UNIT-III: Writing Skill-**

- (i) Essay on current topic (10 Marks)  
(Scientific/Industrial/Technological)[250-300 words] (10 Marks)
- (ii) Report Writing (Survey, Organization of written materials, Report to Newspaper) [150 words]. (8 Marks)
- (iii) Letter Writing (Personal, Official, Commercial, Social, Letter to Press etc.). [150-175 words] (8 Marks)
- (iv) Dialogue writing (imaginary conversation between persons on various topics especially on recent happenings). [150-175 words] (8 Marks)
- (v) Amplification on Expansion of thoughts.
- (vi) Telegram writing/Notice writing (4 Marks)

### **Reference Books:**

1. Business Correspondence & Report Writing, Sharma, TMH
2. English for Technical communication, Laxminarayanan, SciTech
3. Business Communication, Kaul, PHI
4. Effective Technical English, Laxminarayanan, scitech
5. Communication Skill, Ghanekar, EPH,
6. Communication Skill, L.M. Shakh, EPH

### **C PROGRAMMING LABORATORY**

**(BCA-1196)**

1. Numerical problem.
2. Statistical problem.
3. Search and sorting problem.
4. String manipulation.
5. Misc. Problems.

### **Reference Books:**

1. C Programming, Stephen Kochan
2. Programming with C, Schaum's Series
3. C Programming , V. Balaguru Swami
4. Let Us C, Yashwant Kanetkar
  
5. Programming in C: A Practical Approach, Ajay Mittal

### **DIGITAL ELECTRONIC AND LOGIC LABORATORY**

**(BCA-1197)**

Combinational and sequential circuit design using I-C, & NOR, NAND gates, their usage to realize NOT, AND,OR Gates'-OR gates as controlled inverters, ax & Decoders,2-level circuit (NAND-NAND only).

Problems: 1. Verification of Gates, 2. Half/Full Adder/Subtractor , 3. Parallel Adder/Subtractor , 4. Excess-3 to BCD & Vice Versa, 5. Binary-Grey & Grey-Binary Converter, 6. MUX/DEMUX, 7. MUX/DEMUX using only NAND Gates, 8. Comparators , 9. Encoder/Decoder, 10. Flip-Flops, 11. Counters, 12. Shift Registers , 13. Johnson/Ring Counters, 14. Sequence Generator 15. Multivibrators , 16. Static RAM etc.

### **Reference Books:**

1. Fundamentals of Digital Circuits, Anand Kumar, PHI
2. Digital Electronics, Tokheim, TMH
3. Digital Electronics, S. Rangnekar, ISTE/EXCEL
4. Digital Logic & Computer Design, M. Morris Mano
5. Introduction to Digital Computer Design, An, 5th ed., Rajaraman & Radhakrishnan

## SECOND SEMESTER

### COMPUTER ORGANIZATION AND ARCHITECTURE

**(BCA-1201)**

Unit I - Combinational and Sequential Circuits. Introduction to Boolean algebra, Different type of Gates, Law of Boolean Algebra, Algebraic expressions, Karnaugh –Maps, Flip-Flops, Sequential Circuits,

Unit II - Introduction to Hardware. Cycle time of CPU, Register, Accumulator, Arithmetic Logical Unit, System Bus- Introduction, Memory (Hierarchy of memory, features of memory, semiconductor memories).

Unit III - Instruction Format and Addressing Methods.Processor Organization, Register Organization Different Instruction Format, Instruction length, Introduction of Addressing Mode, Different Addressing Modes, Processor Organization, Register Organization.

Unit IV - Organization of data and I/O System Interrupt.Organization of Data in Memory, Stack, Input Output Organization, Different I/O techniques, Input /Output Processor, RISC, CISC.

Unit V - Memory Organization and Peripherals.Memory, Memory Hierarchy, Various Memory Devices, Cache Memory, Virtual Memory, Secondary Memory, Different Input / Output Devices and their function, Associative Memory, DMA.

Unit- VI- Control Unit- Control unit and its functions, Microprogram control unit structure, Micro instruction format, horizontal and vertical micro instruction, hardware control unit.

#### Reference Books:

1. Computer Organization – V. Carl Hamacher & Zvonko G. Vransic – McGraw Hill
2. Computer Architecture & Logic Design – Thomas C. Barty - McGraw Hill
3. Computer Organization – J.P. Heys
4. Digital Computer – Morris Mano – Pearson.

### DATA STRUCTURE

**(BCA-1202)**

Unit I : Development of Algorithms: Notations & Analysis, storage structures for arrays, Arrays Pointer ,Sparse matrices- Structures & Arrays of structures.

Unit II : Linked list (Single linked list, double linked list, circular linked list), Application of linked list (Polynomial manipulation), Stack & Queue (Implementation of stack as an array and linked list, Application of Stack, Implementation of Queue as an array and linked list,). Infix , prefix and postfix expression and their conversion. Various types of queue. Deque.

Unit III : Tree, Binary Trees, Binary search trees, General trees, Tree Traversing, Operations on Binary trees, Expressions manipulations, Height Balanced Trees. B Tree, B+Tree

Unit IV: Graphs, Graphs Representation, Path matrix-BFS, DFS- Bi-connected graphs, shortest path problems.

Unit V: Sorting (Selection, Bubble, Insertion, Merge, Quick), Linear Searching, Binary Searching.

Unit- VI: Hasing, Different problem in Hading and their solutions.

#### Reference Books:

1. Data Structure using C – Rajni Jindal – Umesh Publication
2. Data Structure using C – B. Baluja Dhanpatrai Publication
3. Classic Data Structures, 2nd ed., Samanta
4. Data Structures Using C and C++, 2nd ed., Langsam, Augenstein & Tenenbaum

## **MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE**

**(BCA-1203)**

UNIT-I: Classical Algebra-Fundamental theorem of classical Algebra, Desarts rule of sign and their application. Relation between roots and co-efficient up to 4<sup>th</sup> degree polynomial Eqn. Linear Algebra-Vector space (Def.), Linear independence and dependence of vectors. Eigen vector and Eigen value, characteristic polynomial and characteristic equation, Cayley- Hamilton theorem. Determinant, Matrix-addition, multiplication of matrices, matrix inverse. Solution of system of equation of three variables by matrix method, Cramer's rule. Higher Algebra-different type of mapping and their simple example.

UNIT-II: Differential Calculus-Successive differentiation. Leibnitz's theorem, mean value theorem. Rolle's theorem (Statement only), Cauchy mean value theorem (statement only), Lagrange mean value theorem (statement only), Taylor's and Maclaurin's theorem with Lagrange form of remainder (statement only), Taylor's Series example, Partial derivatives (concept) and simple example, Homogeneous function, Euler's theorem on homogeneous function (for two variables) and its verification with example. Integral Calculus: Definite Integral (Limit of a sum) and their elementary properties,

UNIT-III: Definition of Probabilities (Classical,) and laws of probability. Conditional probability, Independence of events, Bayes rule, Random variable (Discrete and continuous type). Cumulative distribution function. Mathematical expectation, Mean, Mode, Median, Standard Deviation, Skewness, Kurtosis (Definition and simple example) Probabilities Models:-Normal, Poisson, Binomial. Correlation and Regression (Definition and concept), simple example. Methods Least square and curve fitting (simple example).

### **Reference Books:**

1. Engineering Mathematics, Vol:1 & Vol:2, Sastry, PHI
2. University Algebra through 600 Solved Problems, N. S. Gopalakrishnan, New Age International
3. Engineering Mathematics, Arumugam, SCITECH

## **FINANCIAL AND MANAGEMENT ACCOUNTING**

**(BCA-1204)**

UNIT-I: Conceptual Framework of Accounting: Nature and scope of accounting information, Identifying and recording accounting transaction using traditional and accounting equations approach. Generally accepted accounting principles, Accounting Standards in India Bases of accounting – Cash and accrual, capital and Revenue items.[6L]

UNIT-II: Fundamentals of Computerized Accounting System: Concept of grouping the accounting head, schemes of assigning the codes to accounting heads, maintaining the hierarchy of ledger accounts for preparing control accounts.[6L]

UNIT-III: Application of computers in Accounts: Accounting procedure used in practice, For recording Cash, Bank, and Journal Transactions using appropriate vouchers.[4L]

UNIT-IV: Preparation of ledger Accounts, Cash book, Journal Book, and Bank Book.[6L]

UNIT-V: Preparation of trial balance, profit & loss Account and Balance Book.(Trading and Non Trading)[6L]

UNIT-VI: Ratio Analysis[4L]

UNIT-VII: Budget and Budgetary control.[4L]

UNIT-VIII: Accounting System for orders booking, processing (forwarding and acceptance) and invoicing for a trading organization. [4L]

### **Reference Books:**

1. R.N Anthony and J.B Reece "Accounting Principle".
2. P.K Ghosh and G.S Gupta "Fundamental of management accounting".
3. L.E Heitger and Serge Mutulich "Financial accounting"
4. N.L Hingorani and A.R. Ramanathan "Management accounting"

5. Essentials of Financial Accounting, Bhattacharyya
6. Financial Accounting: Concepts, Analysis, Methods and Uses, Banerjee
4. Financial Accounting: A Managerial Perspective, 3rd ed. Narayanaswamy

## **SYSTEM ANALYSIS AND DESIGN**

**(BCA-1205)**

**Unit I** - Overview of System Analysis and Design. Introduction to System, Difference between Manual System and Automated System, Types of Systems, System Analyst, System Development Life Cycle and its Phases, Elements of Structured Analysis and Characteristics.

**Unit II** - Designing of a System. Data Flow Diagrams (DFD), Data Dictionary, Pseudo code, The Process of System Design, Difference between Logical Design and Physical Design, Top-Down Design and Functional Decomposition, Forms-Driven Methodology.

**Unit III** - File Organization and Data Base Design. The Major Development Activities in Structured Design, Elements of Design, Introduction to File Organization, Data Base Design, Objectives of Data Base Design, The Role of DBA.

**Unit IV** - System Testing and Implementation. System Testing, Need for System Testing, Testing Strategies, Quality Assurance, Implementation, Evaluation.

### **Reference Books :**

1. Award Elias M. – Systems Analysis & Design.
2. Sen James A. – Analysis & Design of Information Systems
3. Lee-Introductory Systems Analysis and Design
4. Wetherbe James C. Systems Analysis & Design

## **DATA STRUCTURE LABORATORY**

**(BCA-1296)**

1. Implementation of Lists, Stacks, Queues, and trees with static and dynamic structure.(Using arrays and pointers).
2. Sorting internal and external – heap, merge, quick and bubble sorts of arrays, files and lists.
3. Tree traversal of binary trees.
4. Implementation of Hash table of fixed sizes.

### **Reference Books:**

1. Data Structure using C – Rajni Jindal – Umesh Publication
2. Data Structure using C – B. Baluja Dhanpatrai Publication
3. Classic Data Structures, 2nd ed., Samanta
4. Data Structures Using C and C++, 2nd ed., Langsam, Augenstein & Tenenbaum

## **FINANCIAL ACCOUNTING LABORATORY**

**(BCA-1297)**

Accounting using

1. Tally
2. Fact

### **Reference Books:**

1. Tally 9.0 By Dinesh Maidasani
2. Computer Accounting with Tally 7.2 By Firewall

## THIRD SEMESTER

### DESIGN AND ANALYSIS OF ALGORITHM

**(BCA-2101)**

- UNIT-I: Time and space complexity[2L],Asymptotic Notation [3L] Big-O, omega, theta etc.; finding time complexity of well known algorithms, like- heapsort, search algorithm etc.
- UNIT-II: Algorithm Design techniques [2L]Recursion- Definition, Use, Limitations, Examples: Hanoi problem. Tail Recursion.
- UNIT-III: Divide and Conquer [3L]. Basic method, use, Examples: Merge sort, Quick Sort, Binary Search.
- UNIT-IV: Dynamic Programming [4L]. Basic method, use, Examples: matrix-chain multiplication, All pair shortest paths, single-source shortest path,Travelling Salesman problem.
- UNIT-V: Branch and Bound [2L] : Basic method, use, Examples: The 15-puzzle problem.
- UNIT-VI: Backtracking [3L], Basic method, use, Examples: Eight queens problem, Graph coloring problem, Hamiltonian problem
- UNIT-VII: Greedy Method [4L]. Basic method, use, Examples: Knapsack problem, Job sequencing with deadlines, minimum spanning tree(Prim's and Kruskal's algorithms).
- UNIT-VIII: Lower Bound Theory [2L].Bounds on sorting and sorting techniques using partial and total orders.
- UNIT-IX: Disjoint Set Manipulation [2L], Set manipulation algorithm like UNION-FIND, union by rank, Path compression.
- UNIT-X: Properties of graphs and graph traversal algorithms [3L]: BFS and DFS. Matrix manipulation algorithms [5L]
- UNIT-XI: Different types of algorithms and solution of simultaneous equations, DFT & FFT algorithm; integer multiplication schemes Notion of NP-completeness [5L]. P class, NP-hard class, NP-complete class, Circuit Satisfiability problem, Clique Decision Problem. Approximation algorithms [3L]

#### Reference Books:

1. A.Aho, J.Hopcroft and J.Ullman “The Design and Analysis of algorithms”
2. D.E.Knuth “The Art of Computer Programming”, Vol. I & Vol.2
3. Horowitz Ellis, Sahani Sartaz, R. Sanguthevar " Fundamentals of Computer Algorithms".
4. Goodman: Introduction to Design and Analysis Of Algorithms TMH

### SYSTEM PROGRAMMING

**(BCA-2102)**

- UNIT-I: Introduction to Systems Programming, Introduction to Assembly Language Programming - Introduction to Instruction Formats, Data formats - Role of Base Register, Index Register.
- UNIT-II: Introduction to Assembler, databases used in assembler design, Design of Assembler - Single Pass & Double Pass. Introduction to Macros, various types of Macros, Design of Macro Processor - Single Pass & Double Pass.
- UNIT-III: Introduction to Loaders, functions of a loader, types of Loaders, databases used in Loaders, Design of Loaders - Absolute & DLL.
- UNIT-IV: Introduction to compilers: a brief discussion on various phases of compilers. Applications of FSM and grammars in compiler design.
- UNIT-V: Introduction to Software Tools, Text editors, Interpreters, Program Generators, Debug Monitors.

#### Reference Books:

1. Systems Programming, Donovan, Tata Mc Graw Hill
2. System Programming, Dhamdhare (IInd Revised Edition), Tata Mc Graw Hill
3. System software, Author: Chattopadhyay Santanu
4. System software : an introduction to systems programming, Author :Beck Leland L

## **COMPUTER ORIENTED NUMERICAL METHOD AND STATISTICAL METHOD**

**(BCA-2103)**

UNIT-I: Approximation in numerical computation, Truncation and rounding errors.

UNIT-II: Interpolation : Lagrange's interpolation, forward differences, backward differences . Newton forward and backward formulae for interpolation, errors in polynomial interpolation.

UNIT-III: Numerical Integration: derivation of general formulae for numerical integration using newton's forward difference formula. Trapezoidal rule, Simpson 1/3 rule.

UNIT-IV: Numerical solution of a system of linear equation, Gauss elimination method, Matrix inversion, Gauss-Jacobi method, Gauss Seidel method.

UNIT-V: Algebraic Equation : Bisection method, Regula-Falsi method, Newton Raphson method,

UNIT-VI: Numerical solution of ordinary differential equation : Euler's method, Runga – kutta method,

UNIT-VII: Concept of random variable and probability distributions, discrete random variable and its distributions – Binomial, Poisson, Hyper geometric.

UNIT-VIII: Continuous random variable and its distributions - Uniform, Normal, Exponential, Concept of Sampling distribution and various types of it, Statistical inferences – point estimate, interval estimate, Sample size determination.

UNIT-IX: Principles of Statistical inferences – Testing hypotheses and Inferences concerning means, variances and proportions.

### **Reference Books:**

1. V. Rajaraman, Computer Oriented Numerical Methods - Prentice Hall Publication.
2. S. S. Sastry, Introductory methods of Numerical Analysis - Prentice Hall Publication.
3. Dr. B. S. Grewal : Numerical Methods in Engineering and Science.
4. Statistics For engineers –Richardson, TATA Mchraw Hill.
5. Numerical Mathematical Analysis (By J.B.Scarborough)
6. Numerical Analysis & Algorithms, Pradeep Niyogi, TMH
7. Numerical Mathematical Analysis ,Mathews,PHI
8. C language and Numerical Methods ( By C.Xacier)
9. Numerical Analysis ( By S. Ali Mollah)
10. Introductory Numerical Analysis(By Dutta & Jana)
11. Numerical Methods (Problems and Solution) (By Jain , Iyengar & Jain),New Age International
12. Computer Oriented Numerical Methods, N. Dutta, VIKAS
13. Numerical Methods,Arumugam,Scitech
14. Numerical Methods in Computer Applications, P.U.Wayse.EPH.



## **DATABASE MANAGEMENT SYSTEM**

**(BCA-2104)**

UNIT-I - Overview of DBMS. Introduction to DBMS, Data, Information and knowledge, Increasing Use of Data as a Corporate Resources, Data Independence, Database, Administrative Roles, DBMS Architecture, Different kind of DBMS Users, Importance of Data Dictionary, Contents of Data Dictionary, Types of Database Languages, Data Models.

UNIT-II - Traditional Database Model Over Relational Database Model. Traditional Model, Hierarchical, Network, Relational Model, Data Definition and Data Manipulation, Constructs in each of the three models, A Comparison of Three Models, Relational Model, Definition of relation and properties of relation model, Concept of Keys (Candidate Keys, Primary Key, Alternate Key, Foreign Key), Relational Algebra, Different Types of Join (Theta Join, Equi Join, Natural Join, Outer Join), Simple and Complex Queries using Relational Algebra,

UNIT- III - Structured Query Languages. Create Simple Queries Using (Where, Like, Group By, Having, Order By), View table Structure, Temporary Tables.

UNIT-IV - Database Design. ANSI/SPARC 3-Level Architecture, Conceptual Model, Logical Model, Physical Model, Entity, Relational Model, ER Diagram, Strong and Weak Entities, Generalization, Specialization and Aggregation, Converting and ER Model to Relation Schema,

UNIT-V: Normalization, Functional Dependencies, Multi-Value Dependencies, Join Dependencies, Normal Forms, Issue of Physical Design, Concepts of Indexed, File Organization for Relational Tables, De-Normalization, Clustering of Tables, Clustering Indexes.

### **Reference Books:**

1. The complete reference-By Coach and loney
2. A Beginners guide- By Abbey and corney
3. Database System-Elmasri and Navathe
4. Database system concepts- Silberschatz Abraham Korth Henry F. Jt. auth. Sudarshan S. Jt. Auth.
5. Database management system oracle SQL and PL/SQL- Das Gupta Pranab Kumar

## **MICROPROCESSOR**

**(BCA-2105)**

UNIT-I: Introduction to microprocessors: Features, Programmers model, external & internal organization.

UNIT-II: 8085 Architecture: 8085 Architecture & organization, Instruction cycles, machine cycles and T-states, address decoding Techniques, minimum system design, Memory interfacing with timing considerations, clock, reset & buffering circuits, 8085 Instruction set: Instruction format, addressing modes, classification of instruction set., 8085 Programming: Assembly language programming:- basic structure, data transfer, arithmetical, logical, transfer of control & Miscellaneous instruction types.

UNIT-III: Stack & subroutines: Stack operations, limitations, subroutine concepts, parameter passing techniques, subroutine design, delay subroutine design & applications, Re-entrant & recursive subroutines, concept of counters and timers.

UNIT-IV: I/O data transfer techniques: I/O interface concepts, speed considerations, program controlled I/O, asynchronous & synchronous I/O techniques interrupt driven program controlled I/O, direct memory

access data control techniques, handshake signals, concepts of serial communication, matrix keyboard & multiplexed display interface.

UNIT-V: Interrupts: Requirements, single level interrupt, multilevel interrupt & vector interrupt system, 8085 interrupt structure and its operation, 8259A interrupt controller.

UNIT-VI: I/O controllers: Features, organization & operating modes of 8155 multifunction device, 8255 programmable peripheral interface, 8254 programmable timer, 8237 programmable DMA controller..

UNIT-VII: 16 bit processors: 8086 and architecture, segmented memory has cycles, read/write cycle in min/max mode. Reset operation, wait state, Halt state, Hold state, Lock operation, interrupt processing. Addressing modes and their features. Software instruction set (including specific instructions like string instructions, repeat, segment override, lock prefixes . and their use) and Assembly Language programming with the same.

UNIT-VIII: Brief overview of some other microprocessors (eg. 6800 Microprocessor).

### **Reference Books:**

1. Microprocessor system Lbu & Gibson Computer Interfacing & applications Venugopal, BPB
2. 8085 microprocessor : programming and interfacing-Srinath N K.
3. Microprocessor 8085 : architecture, programming and interfacing-Wadhwa Ajay
4. Microprocessor 8085 and its interfacing-Mathur Sunil
5. Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.
6. Intel Corp: The 8085 / 8085A. Microprocessor Book – Intel marketing communication, Wiley inter science publications, 1980.
7. An introduction to micro computers Vol. 2 – some real Microprocessor – Galgotia Book Source, New Delhi by Adam Osborne and J. Kane
8. Advanced Microprocessors by Ray and Bhurchandi – TMH
9. Intel Corp. Micro Controller Handbook – Intel Publications, 1994.
10. Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992
11. Assembly Language Programming the IBM PC by Alan R. Miller, Subex Inc, 1987
12. The Intel Microprocessors: 8086/8088, 80186, 80286, 80386 & 80486, Bary B. Brey, Prentice Hall, India 1996.

### **DBMS LABORATORY**

**(BCA-2196)**

Structured Query Language : 1. Creating Database, : Creating a Database, , Creating a Table, ,Specifying Relational Data Types, Specifying Constraints, ,Creating Indexes.

2. Table and Record Handling: INSERT statement ,Using SELECT and INSERT together ,DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements.

3. Retrieving Data from a Database: The SELECT statement, Using the WHERE clause, Using Logical Operators in the WHERE clause Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause Using Aggregate Functions, Combining Tables Using JOINS, Subqueries.

4. Database Management: Creating Views, Creating Column Aliases ,Creating Database Users ,Using GRANT and REVOKE, Cursors in Oracle PL / SQL ,Writing Oracle PL / SQL Stored Procedures

### **Reference Books:**

1. The complete reference-By Coach and loney
2. A Beginners guide- By Abbey and corney
3. Database System-Elmasri and Navathe

4. Database system concepts- Silberschatz Abraham Korth Henry F. Jt. auth. Sudarshan S. Jt. Auth.
5. Database management system oracle SQL and PL/SQL- Das Gupta Pranab Kumar

**MICROPROCESSOR LABORATORY (8085) and SYSTEM PROGRAMMING LABORATORY(8086)**  
**(GR.-A) (BCA-2197)**

1. Familiarization with 8085 register level architecture and trainer kit and TASM components, including the memory map. Familiarization with the process of storing and viewing the contents of memory as well as registers.
2. Study of prewritten programs on trainer kit using the basic instruction set ( data transfer, Load/Store, Arithmetic, Logical) Assignments based on above.
3. Familiarization with 8085 simulator on PC. Study of prewritten programs using basic instruction set ( data transfer, Load/Store, Arithmetic, Logical) on the simulator. Assignments based on above.
4. Programming using kit/simulator for i) table look up ii) Copying a block of memory iii) Shifting a block of memory. iv) Packing and unpacking of BCD numbers , v) Addition of BCD numbers , vi) Binary to ASCII conversion , vii)String Matching , viii)Multiplication using Booth's Algorithm ,
5. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit eg, subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc .
6. Interfacing any 8-bit Latch (eg, 74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding
7. Interfacing with I/O modules: a) ADC number of pulses within specified time period. b) Speed control of mini DC motor using DAC c) Keyboard d) Multi-digit Display with multiplexing e) Stepper motor
8. Writing programs for 'Wait Loop (busy waiting)' and ISR for vectored interrupts (eg, counting number of pulses within specified time period
9. Study of 8051 Micro controller kit and writing programs for the following tasks using the kit. a) Table look up b) Basic arithmetic and logical operations c) Interfacing of Keyboard and stepper motor
10. Familiarization with EPROM programming and Erasing

**NUMERICAL LABORATORY (GR.-B)**

1. Solving various problems related programme with C
2. Implement Numerical problems Using C.
3. Assignments on Interpolation: Newton forward &backward, Lagrange .
4. Assignments on Numerical Integration: Trapezoidal Rule, Simson's 1 /3 Rule, .
5. Assignments on Numerical solution of a system of linear equation: Gauss elimination,Gauss Jacobi, Matrix Inversion, Gauss Seidel.
6. Assignments on Algebraic Equation: Bisection, Secant, Regula-falsi, Newton Raphson
7. Assignments on Ordinary Differential Equation: Taylor Series, Euler's method, RungeKutta.

**Reference -Book:**

1. Numerical Methods (Problems and Solution) (By Jain , Iyengar & Jain),New Age International
2. C language and Numerical Methods ( By C.Xacier)

## FOURTH SEMESTER

### OBJECT ORIENTED PROGRAMMING USING C++

**(BCA-2201)**

Unit I - Introduction to OOPs and C++ Element. Introduction to OOPs, Features & Advantages of OOPs, Different element of C++ (Tokens, Keywords, Identifiers, Variable, Constant, Operators, Expression, String).

Unit II - Program Control Statements. Sequential Constructs, Decision Making Construct, Iteration / Loop Construct, Arrays, Functions (User defined Function, Inline Function, Function Overloading), User Defined Data Types (Structure, Union and Enumeration).

Unit III - Class, Object, Constructor & Destructor. Class, Modifiers (Private, Public & Protected), Data Member, Member Function, Static Data Member, Static Member Function, Friend Function, Object, Constructor (Default Constructor, Parameterized Constructor and Copy Constructor), Destructor.

Unit IV - Pointer, Polymorphism & Inheritance. Pointer (Pointer to Object, this Pointer, Pointer to Derive Class), Introduction to Polymorphism (Runtime Polymorphism, Compile time Polymorphism), Operator Overloading, Virtual Function, Inheritance (Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance), Virtual Base Class, Abstract Class.

Unit V - File Handling, Exception Handling. Files I/O, Exception Handling (Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism, Re-throwing an Exception).

### Reference Books:

1. E. Balaguruswami – Object Oriented programming with C++
2. Kris James – Success with C++
3. David Parsons – Object Oriented programming with C++
4. D. Ravichandran – Programming in C++
5. Dewhurst and Stark – Programming in C++
6. Venugopal, Ravishankar, Rajkumar – Mastering C++

### OPERATING SYSTEM

**(BCA-2202)**

UNIT-I: Introduction [4L] : Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

UNIT-II: System Structure[3L] : Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

UNIT-III: Process Management : Processes [3L]: Concept of processes, process scheduling, operations on processes, co-operating processes, inter- process communication. Threads [2L]: overview, benefits of threads, user and kernel threads. CPU scheduling [3L]: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling. Process Synchronization [5L]: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

UNIT-IV: Deadlocks [4L]: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

UNIT-V: Storage Management : Memory Management [5L]: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging. Virtual Memory [3L]: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing. File Systems [4L]: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

UNIT-VI: I/O Management [4L]: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

UNIT-VII: Disk Management [3L]: disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.

UNIT-VIII: Protection & Security [4L] : Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Case study: UNIX.

### **References Books:**

1. Milenkovic M., "Operating System : Concept & Design", McGraw Hill.
2. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
3. Silberschatz A. and Peterson J. L., "Operating System Concepts", Wiley.
4. Dhamdhare: Operating System TMH
5. Stallings, William, "Operating Systems", Maxwell McMillan International Editions, 1992.
6. Dietel H. N., "An Introduction to Operating Systems", Addison Wesley.

## **OPERATION RESEARCH**

**(BCA-2203)**

UNIT-I: Basics of operation research (OR) : Characteristics of OR – Necessity of OR in industry – OR and decision making – role of computers in OR. Linear Programming: Formulations and graphical solution of (2 variables) canonical and standard forms of linear programming problem.

UNIT-II: Algebraic solution: simplex methods – charnes method of penalties – two phase simplex method., Duality.

UNIT-III: Transportation Model: Definition – formulation and solution of transportation models – The row – minima, column-minima, matrix-minima and vogel's approximation methods. Assignment model: Definition of assignment model – comparison with transportation model – formulation and solution of assignment model. Integer programming problem.

UNIT-IV:sequencing problem: Processing of n jobs through 2 machines – processing n jobs through 3 machines – processing 2 jobs through m machines.

UNIT–V:Networks – Fulkerson’s rule – measure of activity – PERT computation – CPM computation – resource scheduling. Game Theory.

### **Reference Books:**

1. Hamdy A.Taha : Operation Research – An introduction 5th edition, PHI., New Delhi–1996.
2. Ackoff, R.L. and Sasieni, M.W: Fundamentals of operation research, John wiley and sons, New York
3. Charnes A. Cooper W. and Hendersen A : introduction to linear programming, john wiley andsons, newyork 1953.
4. Srinath I.s.: PERT and CPM Principles and applications, affiliated east press pvt. Ltd., newyork1973.
5. Kanti swarup, p.k. gupta & manmohan – operation research 1996.
6. S.Kalavathy: Operations Research – Second Edition – Vikas Publishing House Pvt. Ltd., 2002.

## **SOFTWARE ENGINEERING**

**(BCA-2204)**

**Unit I :** Overview of System Analysis & Design , Business System Concept, System Development Life Cycle, Waterfall Model , Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. [10L] .

**Unit II :** System Requirement Specification – DFD, Data Dictionary, ER diagram, Process Organization & Interactions. [5L] System Design – Problem Partitioning, Top-Down And Bottop-Up design ;Decision tree, decision table and structured English; Functional vs. Object- Oriented approach. [5L] Coding & Documentation - Documentation. [4L]

**Unit III :** Structured Programming, OO Programming, Information Hiding, Reuse, System Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment . , Validation & Verification Metrics, Monitoring & Control. [8L]

**Unit IV :** Software Project Management – Project Scheduling , Staffing, Software Configuration Management, Quality Assurance, Project Monitoring. [7L]

CASE TOOLS : Concepts, use and application. [5L]

### **Reference Books:**

1. Sommerville I: Software Engineering, Addison Wesley
2. Object Oriented & Classical Software Engineering(Fifth Edition),
3. Vans Vlet, Software Engineering, SPD
4. Uma, Essentials of Software Engineering, Jaico
5. Sommerville, Ian – Software Engineering, Pearson Education
6. Benmenachen, Software Quality, Vikas
7. IEEE Standards on Software Engineering.
8. Ghezzi C. Jazayeri M and Mandrioli: Fundamentals of software Engg. , PHI
9. Behforooz, Software Engineering Fundamentals,OUP
10. Pankaj Jalote – An Integrated Approach to Software Engineering, NAROSA.
11. Kane, Software Defect Prevention, SPD

**Unit I :** Physical Layer: Introduction to Computer Communication and Network : Network Topologies, Types of Network, OSI Model, Protocol Stack, Network Protocols. Analog Signals & Digital Signals. Data Transmission: Sampling, Transmission Mode. Analog Transmission: Modulation (Analog & Digital Signals). Multiplexing: FDM, WDM & TDM. Transmission Media: Guided Media, Unguided Media (Wireless). Circuit Switching.

**Unit II :** Data Link Layer: Error detection and correction: - Type of Errors, Detection, Error Correction, Framing. Data Link Control and Protocols: - Flow and Error control, CRC, REC, FEC, Hamming Code, Stop-and Wait ARQ, Go-Back, N ARQ, Selective Repeat ARQ, HDLC. ALOHA, CSMA, CSMA/CD. Multiple Access: Random Access, Controlled Access, Area Network: Ethernet, Wireless LANS: IEEE 802-11, Frame Relay, ATM

**Unit-III:** Network Layer: Host to Host Delivery: IP Addressing and Routing, Gateway, N/W Layer Protocols: ARP, IPV4, ICMP, IPV6, Transport Layer: Process-to-Process Delivery: UDP, TCP Congestion Control & Quality of Service.

**Unit-IV:** Application Layer: Client Server Model, Domain Name System (DNS), E-mail (SMTP), File Transfer (FTP) HTTP, WWW.

**Reference Books:**

1. Data Communication & Networking – Behouuz A. Forouzan, TMH
2. Computer Network – A.S Tanenbaum, Pearson Education
3. Computer Networks- kundu – PHI
4. Computer Network – Rajesh – Vikash

**C++ LAB****(BCA-2296)**

Based on Paper BCA-2201

**Reference Books:**

1. E. Balaguruswami – Object Oriented programming with C++
2. Kris James – Success with C++
3. David Parsons – Object Oriented programming with C++
4. D. Ravichandran – Programming in C++
5. Dewhurst and Stark – Programming in C++
6. Venugopal, Ravishankar, Rajkumar – Mastering C++

**OPERATING SYSTEM LAB ( Gr. – A)****(BCA-2297)**

Shell programming : creating a script, making a script executable, shell syntax.

Process: starting new process, replacing a process image, duplicating a process image , waiting for a process.

Signal: signal handling, sending signals, signal interface, signal sets.

Semaphore: programming with semaphores (use functions semctl, semget, semop, set\_semvalue, del\_semvalue, semaphore\_p, semaphore\_v).

POSIX Threads : programming with pthread functions(viz. pthread\_create, pthread\_join, pthread\_exit, pthread\_attr\_init, pthread\_cancel)

Inter-process communication: pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO).

**Reference Books:**

1. Operating systems : a practical approach, Author Chopra Rajiv
2. Teach yourself unix shell programming in 14 days, Author, husain Kamran
3. Shell programming by kanetkar

**NETWORKING LAB ( Gr. – B)**

Socket Programming: Simple Application using elementary socket system calls in client/server model in unix/linux using c language. TCP/UDP example using only the elementary socket system calls.

**Reference Books:**

1. UNIX network programming : the sockets networking API , Author Stevens W Richards Fenner Bill Rudoff Andrew M Fenner Bill Rudoff Andrew M
2. Linux socket programming by example, Warren W. Gay, Warren Gay
3. Linux socket programming, Sean Walton



## FIFTH SEMESTER

### OBJECT ORIENTED PROGRAMMING USING JAVA

(BCA-3101)

UNIT I - Introduction to JAVA. Introduction to Java, Java Virtual Machine, Object Oriented Principle, Object and Classes, Java Keywords, Variable, Data types and Literals in Java, String, Operators and Casting, Control of Flow, (Selection Statements, Iteration Statements), Command Line Argument.

UNIT II - Classes and Inheritances. Introduction to Class and Object, Method, Overloading Method, Constructor, Constructor Overloading, this Keyword, Introduction to Inheritance, Using Super, Multilevel Hierarchy, Abstract class, Using Final.

UNIT III - Package and Interface. Package (Defining Package, Finding Package), Introduction to Interface, Defining, and Implementing of Interface, Predefined Package.

UNIT IV - Exception Handling and Threads. Exception Handling, Type of Exception, Try, Catch, and Finally. Multiple Catch blocks, Nested Try Statements, throw, throws, Thread Model, Multithreading.

UNIT V - Applet, AWT, Input Output Stream. Introduction to Applet, Applet Methods, Introduction to AWT (Working with Windows, Graphic, Text), GUI Components, Using AWT Controls, Layout Managers, and Menus, Event Classes, Event Listener Interface.

#### Reference Books:

1. Complete Reference (Java 2) – Herbert Schildt - Tata McGraw Hill
2. Java in a nut shell – Flanagan – Orielly Publication
3. Ali Bahrami, “Object–Oriented System Development” Mc Graw Hill.
4. Bruce, Foundations of Object Oriented Languages, PHI
5. Patrick Naughton, Herbert Schildt–“The complete reference+Java2” TMH

### PROFESSION VALUES AND ETHICS

(BCA-3102)

UNIT-I: EFFECTS OF TECHNOLOGICAL GROWTH: Rapid Technological growth and depletion of resources. Reports of the Club of Rome. Limits to growth; sustainable development. Energy Crisis; Renewable Energy Resources. Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics. Appropriate Technology Movement of Schumacher: later developments. Technology and developing nations. Problems of Technology transfer. Technology assessment/ impact analysis; Industrial hazards and safety, safety regulations safety engineering. Politics and technology, authorization versus democratic control of technology; Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centred Technology

UNIT-II: PROFESSION AND HUMAN VALUES : Value Crisis in contemporary society. Nature of values: Value Spectrum of a ‘good’ life Psychological values: Integrated personality; mental health. Societal values: The modern search for a ‘good’ society, justice, democracy, secularism, rule of law; values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity Moral and ethical values: Nature of moral judgments; canons of ethics; Ethics of virtue; ethics of duty; ethics of responsibility. Work ethics, professional ethics.

UNIT-III: MODERN MARKETING : Meaning of market, Definition of market, Selling & Marketing , Objectives of marketing, Modern approach & marketing. Marketing mix- meaning & definition, Marketing Functions, Classification, Functions of exchange & Functions of Physical supply, Marketing Planning , Importance & benefit of marketing planning, Marketing Audit. Consumer Behavior,

Definition and importance of buying behavior, Buying motives, Determinants of Buying behavior, Market segmentation, Concept and Important Bases. Advertising- Concept , Selecting Advertising Media. Sales Promotion & Different tools for sales promotion.

**UNIT-IV: HUMAN RESOURCE MANAGEMENT** :Concept and perspective of Human Resource Management, Concept of Human Resource Planning – importance, Human Resource planning process, Barriers to Human Resource planning, Measures to make Human Resource Planning effective, Role of training & Development of Human Resources , Conducting Training & Development Programmes, Cost – benefit analysis for Training & Development. Concept of incentives, Financial incentives- types, Rationale of incentives , fringe Benefits , Types of benefits, Making benefit Programmes effective. Human Resources Communication, Communication channels, Human Resources Communication Media, making Human Resources Communication Effective.

### **Reference Books:**

1. Human Resource Management : L. M. PRASAD.
2. Principal Management : L. M. PRASAD.
3. Modern Marketing : R.S.N.PILLAI, BAGAVATHI.
4. Blending the best of the East & West, Dr. Subir Chowdhury, EXCEL
5. Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
6. Business Ethics,Pherwani,EPH
7. Ethics,Indian Ethos & Mgmt., Balachandran,Raja,Nair, Shroff Publishers
8. Business Ethics: concept and cases, Velasquez, Pearso

### **.(dot) NET TECHNOLOGY**

**(BCA-3103)**

**UNIT-I:** An Overview of NET, Defining NET, Web Services, The NET Framework, The Common Language Runtime, CLRBased Languages, The NET Framework Class Library, The NET Compact Framework, NET My Services, The NET Enterprise Servers, A NET Scenario,

**UNIT-II:** Web Services, Describing Web Services, Access to Internet Applications, B2B Integration, A Web Services Scenario, XML, WSDL, SOAP, UDDI, Future Directions for Web Services,

**UNIT-III:** The Common Language Runtime, The Common Type System, Introducing the Common Type System, The Common Language Specification, Compiling Managed Code, Microsoft Intermediate Language, Metadata, Manifests, Categorizing Assemblies, Loading Assemblies, Compiling MSIL, Securing Assemblies, Garbage Collection, Application Domains,

**UNIT-IV:** NET Languages, NET Languages, Overview of the NET Framework, The System Namespace, A Survey of Systems Subordinate, System , System Runtime Serialization, SystemXml, The XML Technology Family, What SystemXml Provides, SystemReflection, SystemRuntimeRemoting, An Overview of the Remoting Process, Choosing a Channel, Creating and Destroying Remote Object, System Enterprise Services, Accessing COM Objects, Accessing NonCOM DLLs, Building GUIs Using Windows Forms, Windows Forms Controls.

UNIT-V: ADONET: NET Data Providers, Direct Access to Data, Accessing Data with DataSets, Creating and Using DataSets, Accessing and Modifying a DataSet, Using DataSets with XMLDefined Data,

UNIT-VI: ASPNET: SystemWebUI, How Browser Applications Work, Web Controls, Separating the User Interface, Web Services Servers, Web Services Clients, Options for Web Services Applications, Microsoft Specific Support,

### **Reference Books:**

1. Understanding .NET: a tutorial and analysis By David Chappell
2. ASP.NET 2.0 : a developer's notebook, Author :Lee Wei-Meng
3. Beginning ASP.NET 2.0 with C#, Author:Hart Chris
4. C# and the .NET platform, Author: Troelsen Andrew
5. Core C# and .NET, Author:Perry Stephen C

## **ELECTIVE - I**

**(BCA-3104)**

### **1. APPLIED GRAPH THEORY.**

UNIT-I: FUNDAMENTAL CONCEPTS: what is a Graph-Paths-Cycles-Trails-Vertex Degrees and Counting-Directed Graphs-Trees and Distance-Spanning Trees-Enumeration-Optimization and trees.

UNIT-II: MATCHINGS AND CONNECTIVITY : Matchings and Covers-Algorithms and applications of matching-Matchings in General graphs-Cuts and Connectivity-k-connected graphs-Network flow problems.

UNIT-III: COLORING AND PLANAR GRAPHS: Vertex coloring and upper bounds-Structure of kchromatic Graphs-Enumerative Aspects-Embeddings and Euler's formula-Characterization of Planar graphs-Parameters of Planarity-Edges and Cycles-Line Graphs and edge-coloring-Hamiltonian Cycles-Planarity-coloring and cycles.

### **Reference Books:**

1. Michel Townsend, "Discrete Mathematics: Applied Combinatorics and graph theory", The Benjamin/Cummings Publishing Company", California.
2. Kenneth H Rosen. "Discrete Mathematics and Its Applications, Tata McGrahHill Publishing Company, New Delhi.
3. Robin J. Wilson, "Introduction to Graph Theory" Pearson Education Asia, New Delhi.

### **2. WEB DESIGN AND APPLICATION.**

UNIT I - Introduction to Internet Basic - The Basic of the Internet, Concepts of Domain, IP Addressing, Resolving Domain Names, Overview of TCP/IP and its Services, WWW.

UNIT II - Designing Pages with HTML - Introduction to HTML, Essential Tags, Deprecated Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Lists and their Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Different Section of a Page and Graphics, Footnote and e-Mailing, Creating Table, Frame, Form and Style Sheet.

UNIT III - DHTML - Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

UNIT IV - Java Script -Objects, Methods, Events and Functions, Tags, Operators, Data Types, Literals and Type Casting in JavaScript, Programming Construct, Array and Dialog Boxes, Relating JavaScript to DHTML, Dynamically Changing Text, Style, Content.

UNIT V - Front Page -Front Page Basics , Web Terminologies, Phases of Planning and Building Web Sites, The FTP, HTTP and WPP, Features, Front Page Views, Adding Pictures, Backgrounds, Links, Relating Front Page to DHTML.

**Reference Books:**

1. HTML Black Book – Steven Holzner – Dreamtech Press
2. HTML, Java Script, DHTML, PERL, CGI – Evan Bayross - BPB

**3. FUZZY LOGIC AND NEURAL NETWORK.**

UNIT – I: Introduction to Neural Networks, Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT- II: Essentials of Artificial Neural Networks, Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

UNIT–III: Single Layer Feed Forward Neural Networks, Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

UNIT- IV: Multilayer Feed forward Neural Networks Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

UNIT V: Associative Memories, Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis.

UNIT – VI: Classical & Fuzzy Sets, Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT VII: Fuzzy Logic System Components Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT VIII: Applications Neural network applications: Process identification, control, fault diagnosis. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

**Reference Books:**

1. Simon Haykin, “Neural Networks- A comprehensive foundation”, Pearson Education, 2001.
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa “Introduction to Neural Networks using MATLAB 6.0”, TMH,

3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.
4. Timothy J. Ross, “Fuzzy Logic With Engineering Applications”, McGraw-Hill Inc. 1997

#### **4. ADVANCED UNIX AND SHELL PROGRAMMING.**

UNIT-I: Organization of UNIX. User interface, Programmer interface. The environment of UNIX process System calls. Process control, File related system calls. Process related system calls. Signals programming using system calls. Advanced I/O multiplexing. Memory mapped I/O.

UNIT-II: Interprocess communication: Pipes, shared memory, semaphores, messages. Advanced inter-process communications. Streams, Pipes, Open server.

#### **Reference Books:**

1. Your UNIX, the Ultimate Guide, Sumitava Das, TMH
2. Design of UNIX Operating System, Bach, PHI
3. UNIX Programming Environment, Kernigham & Pike, PHI
4. Learning UNIX Operating System, Peek, SPD/O'REILLY
5. Learning the Vi Editor, Lamb, SPD/O'REILLY
6. Essentials Systems Administration, Frisch, SPD/O'REILLY

#### **5. MOBILE COMPUTING**

UNIT I: WIRELESS COMMUNICATION FUNDAMENTALS : Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

UNIT II: TELECOMMUNICATION NETWORKS :Telecommunication systems – GSM – GPRS – DECT – UMTS – IMT-2000 – Satellite Networks - Basics – Parameters and Configurations – Capacity Allocation – FAMA and DAMA – Broadcast Systems – DAB – DVB.

UNIT III: WIRELESS LAN : Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - 802.11b standards – HIPERLAN – Blue Tooth.

UNIT IV: MOBILE NETWORK LAYER :Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics.

UNIT V: TRANSPORT AND APPLICATION LAYERS : Traditional TCP – Classical TCP improvements – WAP, WAP 2.0.

#### **References Books:**

1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002.
3. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York, 2003.
5. Hazysztof Wesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2002.

#### **6. AUTOMATA THEORY**

- UNIT-I: BASIC LANGUAGE & AUTOMATA THEORY: Review of finite automata, regular sets, Context-free grammars & languages, Moore & Mealy state machines, their capabilities & limitations. Deterministic & Non-Deterministic FSM's, Push-down stack & memory machine. (PDM)
- UNIT-II: TUNING MACHINES: Recursive languages, Turing acceptors, techniques for Turing machine construction, Church's hypothesis, Turing machines as generators, variations & equivalence of Turing machines.
- UNIT-III: UNDECIDABILITY: Universal Turing machines, undecidability of the halting problem, and undecidable problems about context free languages.
- UNIT-IV: THE CHOMSKY HIERARCHY: Grammars and their relations to automata, relations between classes of languages, LR (0) and LR (1) grammars, parser construction.
- UNIT-V: CLOSURE PROPERTIES OF FAMILIES OF LANGUAGES: Abstract families of languages, language operations.

### Reference Books:

1. Hopcroft JE. and Ullman JD., "Introduction to Automata Theory, Languages & Computation", Narosa.
2. K.L.P Mishra & N. Chandrasekharan – "Theory of Computer Science", PHI
3. Lewis H. R. and Papadimitrou C. H., "Elements of the theory of Computation", P.H.I.
4. Kain, "Theory of Automata & Formal Language", McGraw Hill.
5. Kohavi ZVI, "Switching & Finite Automata", 2nd Edn., Tata McGraw Hill.
6. Linz Peter, "An Introduction to Formal Languages and Automata", Narosa
7. "Introduction to Formal Languages", Tata McGraw Hill, 1983.

## 7. COMPILER DESIGN

- UNIT-I: Introduction to compilers, structure of a compiler, phases of compilation, such as Lexical analysis, code generation, code optimization, table management.
- UNIT-II: Implementation aspects of programming language constructs such as data elements, Declarations, binding attributes to names, in built data structures such as arrays, records, sets, strings, expression evaluation, statements of different types, parameter passing (call by reference, value, name), storage management, recursion.
- UNIT-III: Design of lexical analyzer. Basic parsing techniques such as shift reduce parsing, operator-precedence parsing, Top-down parsing, bottom-up parsing. Symbol tables: Contents, data structures, representation of scope. Syntax directed translation.
- UNIT-IV: Code generation, type checking, cross compiler.

### Reference Books:

1. Aho, Sethi, Ullman - "Compiler Principles, Techniques and Tools" - Pearson Education.
2. Holub - "Compiler Design in C" - PHI.

## SEMINAR

**(BCA-3103)**

Individual SEMINAR topic must be given to Each student by the Department of concern College . EVERY Students have to present the seminar topic before the External Examiner.

Note: Every seminar topic should be guided by the concern teacher of college. Student must have to present their seminar before the college teacher and must be evaluated by the teacher and which will be treated as Internal marks.

**JAVA LAB**

**(BCA-3196)**

1. Simple JAVA program and program for inheritance, overloading, polymorphism, constructors, destructors, loop, private, protected, friend, public etc.
2. Assignments on class, constructor, overloading, inheritance, overriding
3. Assignments on wrapper class, vectors, arrays
4. Assignments on developing interfaces- multiple inheritance, extending interfaces
5. Assignments on creating and accessing packages
6. Assignments on multithreaded programming, handling errors and exceptions, applet programming and graphics programming
7. Use of CASE tools

**.NET LAB**

**(BCA-3197)**

programming based on BCA-3103,

## **SIXTH SEMESTER**

### **OBJECT ORIENTED ANALYSIS AND DESIGN (Using UML)**

**(BCA-3201)**

UNIT-I: Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Lifecycle.

UNIT-II: Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT-III: Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT-IV: Basic Behavioral Modeling-I: Interactions, Interaction diagrams.

UNIT-V: Basic Behavioral Modeling-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT-VI: Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-VII: Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT-VIII: Case Study: The Unified Library application

### **Reference Books:**

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TATA McGraw Hill
5. Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

### **ELECTIVE – 2**

**(BCA-3202)**

#### **1. IMAGE PROCESSING AND PATTERN RECOGNITION.**

UNI-I: Digital image processing systems: Image acquisition, storage, processing, communication, display.

UNIT-II: Visual perception: Structure of human eye, image formation in the human eye, brightness, adaptation and discrimination.

UNIT -III: Image model: Uniform and non-uniform sampling, quantization.



UNIT-IV: Image transforms: Introduction to Fourier transform, DFT and two-dimensional DFT, some properties of DFT, separability, translation, periodicity, conjugate symmetry, rotation, scaling, average value, convolution theorem, correlation, FFT algorithms, inverse FFT, and filter implementation through FFT.

UNIT-V: Other transforms: Other separable image transforms and their algorithms

UNIT-VI: Pattern Recognition: Classification, Clustering, recognition etc.

### **Reference Books:**

1. Digital Image Processing & Analysis, Chanda, PHI
2. Fundamentals of Digital Image Processing, Jain, PHI
3. Image Processing, Analysis & Machine Vision, Sonka, VIKAS

### **2. PHP/MY SQL.**

1. Introduction to Web Programming
2. Installation of PHP/MySQL and web server
3. Introduction to PHP programming
4. Writing PHP Programs
5. Loops, Control Structure and Arrays
6. PHP functions String functions, Array functions, Mathematical function, Graphics functions, File system function, Date and time function, Miscellaneous Functions,
7. Error handling
8. Object Oriented Features of PHP
9. File and Directory handling
10. MySQL database Configuration of MySQL server, Starting MySQL server, MySQL tables, Displaying MySQL data, Adding and removing user access.
11. Web Servers IIS web Server, Apache web server

### **Reference Books:**

1. Beginning PHP 4 Databases – Christopher Scollo, Harish Rawat, Dipak Thomas, Sanjay Abraham, Andrew Hill & Jim Hubbard; Wrox Press
2. PHP MySQL Website Programming – Chris Bea, Mike Duzzard, Jessy White, Cinis & Dilip Thomas; Wrox Press
3. PHP Black Book – Peter Moulding, Coriolis Group
4. MySQL – PHP Database Applications – Jay Greenspan & Brad Bulger; John Wiley & Sons
5. PHP MySQL Website Programming: Problem-Design-Solutions – Chris Bea, Mike Duzzard, Jessy White, Cinis & Dilip Thomas; Apress
6. Essential PHP for Web Professionals – Christopher Cosentino; Prentice Hall
7. Sam's Teach Yourself PHP 4 in 24 Hours – Matt Zandstra; SAMS
8. PHP 5.1 For Beginners – Ivan Bayross, O'Reilly, Shroff Publishers & Distributors Pvt. Ltd.

### **3. ADVANCED OS.**

UNIT-I: Introduction to Distributed Systems: Goals – Advantages of distributed systems overcentralized systems – disadvantages of distributed systems, Hardware & Software Concepts, loosely coupled

systems, network operating systems, Network file systems, design Issues –transparency – Flexibility – performance – scalability.

UNIT-II: Remote Procedure Calling: Introduction, Features of RPC, User package, Design issues, Classes of RPC system, Interface definition language, exception handling, delivery guarantees, implementation, interface processing, binding, Locating the binder, RPC in Unix system

UNIT-III: Synchronization in Distributed systems: Clock synchronization, Logical Clocks, Physical Clocks, Clock synchronization algorithms, Mutual exclusion, A centralized algorithms, Distributed algorithms, A token ring algorithms, comparison of the three algorithms, Election algorithms, The Bully algorithms, Ring algorithms, Dead Locks in distributed systems, Distributed deadlock detection.

UNIT-IV: Process and Processors in distributed systems: Threads, Introduction, Usage, Design issues for thread packages, An example for thread packages, System models, The workstation model, The processor pool model, The hybrid model , Processor allocation, Allocation models, Design issues, Implementation issues.

UNIT-V: Distributed File and Directory Services: Distributed file service requirements, File service components, Flat file service , Directory Service, Client module, Design issues, implementation techniques.

UNIT-VI: Distributed shared memory Introduction: Shared memory, Consistency models, Page based Distributed shared memory, Shared – variable Distributed shared memory, Object based Distributed Shared Memory.

### **Reference Book:**

1. Distributed Operating systems, Andrew s.Tanenbanm
2. Advanced Concepts in Operating Systems, Singhal and Niranjana G.Shivaratna

## **4. ADVANCE NETWORKING**

UNIT I: Introduction: Protocols and standards, OSI model. TCP / IP protocol suite, addressing,versions,underlyingtechnologies.

UNIT II: IP Addresses, Routing, ARP And RARP: Classful addressing, other issues, subnetting, supernetting, classless addressing, routing methods, delivery, table and modules,CIDR,ARPpackage,RARP.

UNIT III: IP, ICMP, TGMP AND UDP: Datagram, fragmentation, options, checksum, IP package, ICMP, messages, formats, error reporting, query, checksum, ICMP package, IGMP, messages, operation, encapsulation, IGMP package, UDP, datagram,checksum,operation,uses,UDPpackage.

UNIT IV: TCP, Unicast And Multicast Routing Protocols: Services, flow, congestion and error control, TCP package and operation, state transition diagram, unicast routing protocols, RIP, OSPF, BGP, multicast routing, trees, protocols, MOSPF, CBT,PIM

UNIT V: Application Layer, Sockets: Client server model, concurrency, processes, sockets, byte ordering, socket system calls, TCP and UDP client-server programs, BOOTP -DHCP, DNS, name space, resolution, types of records, concept, mode of operation,Rlogin.

### **Reference Book:**

- 1.Behrouz Forouzan, “TCP/IP protocol suite “, 4th edition, Tata McGrawhill..
- 2.Douglas Comer, “Internetworking with TCP / IP” ,Vol – 1, PHI, 2000.

## 5. DATA WARE HOUSING & MINING.

- UNIT-I: Introduction to Data Mining: Motivation and importance, What is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.
- UNIT-II: Data Warehouse and OLAP Technology for Data Mining  
What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining.
- UNIT-III: Data Preprocessing Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation.
- UNIT-IV: Data Mining Primitives, Languages and system Architectures, Data Mining Primitives: What defines a Data Mining Task?, A Data Mining query language, Designing Graphical User Interfaces Based on a Data Mining Query language, Architectures of Data Mining Systems.
- UNIT-V: Concept Description: Characterization and comparison, What is Concept Description? Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases.
- UNIT-VI: Mining Association rule in large Databases, Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transactional Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.
- UNIT-VII: Classification and prediction, Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbor Classifiers, Case-Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy.
- UNIT-VIII: Cluster Analysis What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods.

### **Reference Books:**

1. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman Publications
2. Introduction to Data Mining, Adriaan, Addison Wesley Publication
3. Data Mining Techniques, A.K. Pujari, University

## 6. ADVANCED DATABASE MANAGEMENT SYSTEM

- UNIT-I: Database Design: Multivalued dependencies, theory of normalisation-4NF, 5NF, 6NF DKNF
- UNIT-II: ANSI SQL2: DDL, DML, constraints and assertions, views, database security.
- UNIT-III: Transaction processing, concurrency control, Recovery management. Transaction model properties, lock base protocols, Two-phase locking, Live – Lock, Time- Stamp Protocol.

UNIT-IV: Brief introduction to distributed database, temporal database and object-oriented database.  
UNIT-V: Embedded SQL & Applications.

### **Reference Books:**

1. Data Base System Concepts, Korth, MH
2. Data Base Management System, RamaKrishnan, MH
3. Data Base Management System, A.K. Pujari, ISTE/EXCEL
4. Data Base Management System, Leon, VIKAS
5. Data Base Management System, V.K. Jain, Wiley Dreamtech

## **7. E – Commerce & ERP**

UNIT-I: Electronic Commerce : Overview, Definitions, Advantages & Disadvantages of E – Commerce, Threats of E – Commerce, Managerial Prospective, Rules & Regulations For Controlling E – Commerce, Cyber Laws.

UNIT-II: Technologies : Relationship Between E – Commerce & Networking, Different Types of Networking For E – Commerce, Internet, Intranet & Extranet, EDI Systems Wireless Application Protocol : Definition, Hand Held Devices, Mobility & Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement For E – Commerce .

UNIT-III: Business Models of e – commerce : Model Based On Transaction Type, Model Based On Transaction Party - B2B, B2C, C2B, C2C, E – Governance. E – strategy : Overview, Strategic Methods for developing E – commerce.

UNIT-IV: Four C's : ( Convergence, Collaborative Computing, Content Management & Call Center ).  
Convergence : Technological Advances in Convergence – Types, Convergence and its implications, Convergence & Electronic Commerce. Collaborative Computing : Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security.

UNIT-V: Content Management : Definition of content, Authoring Tools & Content Management, Content – partnership, repositories, convergence, providers, Web Traffic & Traffic Management ; Content Marketing. Call Center : Definition, Need, Tasks Handled, Mode of Operation, Equipment , Strength & Weaknesses of Call Center, Customer Premises Equipment (CPE).

UNIT-VI: Supply Chain Management : E – logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution (SCE), SCE - Framework, Internet's effect on Supply Chain Power.

UNIT-VII: Enterprise Resource Planning (ERP) : Features, capabilities and Overview of Commercial Software, re-engineering work processes for IT applications, Business Process Redesign, Knowledge engineering and data warehouse . Business Modules: Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, QualityManagement, Sales&Distribution ERPPackage,

ERP Market: ERP Market Place, SAP AG, PeopleSoft, BAAN, JD Edwards, Oracle Corporation

ERP-Present and Future: Enterprise Application Integration (EAI), ERP and E-Commerce, ERP and Internet, Future Directions in ERP

**Reference Books:**

1. E-Commerce, M.M. Oka, EPH
2. Kalakotia, Winston : Frontiers of Electronic Commerce , Pearson Education.
3. Bhaskar Bharat : Electronic Commerce - Technologies & Applications. TMH
4. Loshin Pete, Murphy P.A. : Electronic Commerce , Jaico Publishing Housing.
5. Murthy : E – Commerce , Himalaya Publishing.
6. E – Commerce : Strategy Technologies & Applications, Tata McGraw Hill.
7. Global E-Commerce, J. Christopher & T.H.K. Clerk, University Press
8. Beginning E-Commerce, Reynolds, SPD
9. Krishnamurthy, E-Commerce Mgmt, Vikas

**COMPUTER GRAPHICS AND MULTIMEDIA**

**(BCA-3203)**

UNIT-I: Development of Computer Graphics: Basic graphics system and standards, Raster scan and random scan, graphics; Continual refresh and storage display, display processors and character generator, Colour display techniques, Frame buffer and bit operations, concepts in raster graphics.

UNIT-II: Points, Line and Curves; Scan Conversion; Line drawing algorithms; circle and ellipse generation; Polygon filling; Conic-section generation, Ant-aliasing.

UNIT-III: Two-dimensional viewing: Basic transformations; Co-ordinate systems; Windowing and Clipping; Segments; Interactive picture-construction techniques; interactive input-output device.

UNIT-IV: Three-dimensional Concepts: 3-D representation and transformations; 3-D viewing; Algorithm for 3-D volumes, spline curves and surface; Fractals; Quad tree and oct-tree data structures; Hidden line and surface rendering, and animation.

UNIT-V: An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT-VI: Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

**Reference Books:**

1. Procedural & Mathematical Elements in Computer Graphics, Rogers, TMH
2. Computer Graphics, Hearn & Baker, PHI
3. Introduction to Computer Graphics, A. Mukherjee, VIKAS
4. Fundamentals of Computer Graphics & Multimedia, Mukherjee, PHI
5. Computer Graphics, Bhandari & Joshi, EPH

1. Point plotting, line & regular figure algorithms
2. Raster scan line & circle drawing algorithms
3. Clipping & Windowing algorithms for points, lines & polygons
4. 2-D / 3-D transformations
5. Simple fractals representation , Demonstrate the properties of the Bezier curves.
6. Filling algorithms , Clip line segments against windows
7. Web document creation using Dreamweaver.
8. Creating Animation using Flash.

**Reference Books:**

1. Procedural & Mathematical Elements in Computer Graphics, Rogers, TMH
2. Computer Graphics, Hearn & Baker, PHI
3. Introduction to Computer Graphics, A. Mukherjee, VIKAS
4. Fundamentals of Computer Graphics & Multimedia, Mukherjee, PHI
5. Computer Graphics, Bhandari & Joshi, EPH

**PROJECT:(INDUSTRIAL)****(BCA-3295)**

Project Based on latest SOFTWARE and guided by faculty member of the respective college. FOR External project guide at least one Internal guide is require for each project. One faculty member can not guide more than eight(8) projects. Individual project is preferred. In case of group project **not** more than **four student** participate.

**Grand Viva****(BCA-3296)**

Grand Viva will be conducted in presence of external examiner and will be based on all the subjects throughout the course.

**Kharagpur College**  
**Department of Computer Science & BCA**  
**Date of Commencement: 11.05.2022**  
**Class schedule for the Certificate Course on**  
**“Python Programming”**

Sl. No.	Topic	Resource Person	Theory/ Practical	Duration (Hours)	Date and time
1	Introduction	Prof. Alok Haldar	Both	3	11.05.2022
2	Introduction to Python	Prof. Anudyuti Ghorai	Both	3	12.05.2022
3	Elements of Python	Prof. Alok Haldar	Both	3	14.05.2022
4	Elements of Python	Prof. Anudyuti Ghorai	Both	3	17.05.2022
5	Conditional Statement	Prof. Anudyuti Ghorai	Both	3	19.05.2022
6	Control Statement	Prof. Alok Haldar	Both	3	21.05.2022
7	Sequential data types	Prof. Biswajit Laya	Both	3	01.06.2022
8	Functions and Modules	Prof. Biswajit Laya	Both	3	02.06.2022
9	File Handling	Prof. Subhadip Mukherjee	Both	3	06.06.2022
10	Data Visualization	Prof. Subhadip Mukherjee	Both	3	07.06.2022
11	Evaluation	Prof. Alok Haldar Prof. Anudyuti Ghorai	Practical	½	14.06.2022

*Alok Haldar 06/05/22*  
Alok Haldar  
Course Coordinator and Head,  
Department of Computer Science & BCA

*(B) 06/05/22*  
Principal  
Kharagpur College



*Principal*  
Kharagpur College

# Kharagpur College

Dept. Computer Science & BCA  
Certificate course on Python Programming

## Course Overview

This course covers Basic to Advanced topics of Python language.

**Entry Requirement** : (10 + 2) or equivalent qualified

**Course Duration** : 10 days (30 hrs.)

**Mode of Training** : Face to face Instructor led Training

## Course Content

<p><b>Module1:Introduction</b></p> <ul style="list-style-type: none"> <li>• Problem solving, Algorithm, flowchart</li> <li>• Types of language, translator</li> </ul>	<p><b>Module6:Control Statement</b></p> <ul style="list-style-type: none"> <li>• While loop</li> <li>• For loop</li> </ul>
<p><b>Module 2: Introduction to Python</b></p> <ul style="list-style-type: none"> <li>• Features of python</li> <li>• Application</li> <li>• Python installation</li> <li>• Python Shell, Python IDLE</li> <li>• Basic programming demo</li> </ul>	<p><b>Module7:Sequential data types</b></p> <ul style="list-style-type: none"> <li>• List</li> <li>• Tuples</li> <li>• Strings</li> <li>• Bytes and bytes array</li> <li>• Set</li> <li>• dictionary</li> </ul>
<p><b>Module3:Elements of Python</b></p> <ul style="list-style-type: none"> <li>• Python variables, Identifiers</li> <li>• Constants, literal, token, keyword</li> <li>• Data types</li> <li>• Operators: arithmetic, relational, logical</li> </ul>	<p><b>Module8:functions and modules</b></p> <ul style="list-style-type: none"> <li>• Function</li> <li>• Function declaration</li> <li>• Function definition</li> <li>• Function call</li> <li>• Function parameters</li> <li>• Return statement</li> <li>• Types of function parameters</li> </ul>
<p><b>Module4:Elements of Python</b></p> <ul style="list-style-type: none"> <li>• Operators: bitwise, Identity, membership</li> <li>• Operators Precedence and associativity</li> <li>• Expression in Python</li> </ul>	<p><b>Module9:File Handling</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• File path</li> <li>• Types of files</li> <li>• Opening and closing files</li> <li>• File positions</li> <li>• Renaming and deleting files</li> </ul>
<p><b>Module5: Conditional statement</b></p> <ul style="list-style-type: none"> <li>• If</li> <li>• If - else</li> <li>• If -elif -else</li> <li>• Nested if</li> </ul>	<p><b>Module10:Data visualization</b></p> <ul style="list-style-type: none"> <li>• Matplotlib</li> <li>• Scatter plot</li> <li>• Line chart</li> <li>• Bar chart</li> <li>• Histogram</li> </ul>

*Alok Halder*

Alok Haldar

Course Coordinator and Head,  
Department of Computer Science & BCA



*6/09/22*

Principal  
Kharagpur College

Principal  
Kharagpur College



29	035	SAYANDIP BOXI	Sayandip Boxi
30	036	SHREYA RANI DE	Shreya De
31	037	SHREYA UPADHYAY	Shreya Upadhyay
32	038	SHREYASI SARKAR	Shreyasi Sarkar
33	039	SK AFTAB	Sk. Aftab
34	040	SK RAKIUR RAHAMAN	S. R. Rahaman
35	041	SOMNATH BANERJEE	Somnath Banerjee
36	044	SUBHASH CHANDRA ADAK	Subhash Chandra Adak
37	046	SUDIPTA KOTAL	Sudipta Kotal
38	047	SUJIT HEMBRAM	Sujit Hembram
39	048	SUMAN MANDAL	Suman mandal
40	049	SUNIL BISUI	Sunil Bisui
41	050	SUPRIYO KUNDU	Supriyo Kundu.
42	052	ZIAN NAWAZ	Ziam Nawaz

Aftab.

Signature of the Teacher

Certificate course on *Python Programming*

Organized by

Department of Computer Science & BCA

Kharagpur College

Course Duration-11.05.2022 to 14.06.2022 (10 days, 30 hours)

Attendance Sheet

Date- 19/05/22

Name of the Teacher: ANUDYUTI GHORAI

SL. NO	ROLLNO	STUDENT NAME	SIGNATURE
1	002	ABHISHEK SHARMA	Abhishek sharma
2	003	ABIR MAITY	Abir Maity
3	004	AJIT SAREN	Ajit Saren
4	005	ANIRBAN DAS	Anirban Das
5	006	ANOMITRA KAR	Anomitra Kar
6	007	ANUVAB SAHU	Anuvab Sahu
7	009	AVIJIT SUI	Avijit Sui
8	010	AYAN BISWAS	Ayan Biswas
9	011	AYON MONDAL	Ayon Mondal
10	012	B SRUTHI	ABSENT
11	014	BHIM HANSDA	Bhim Hansda
12	017	DEEPAK SINGH	Deepak Singh
13	018	DIPAYAN CHOWDHURY	Dipayan Chowdhury
14	019	HIMANSHU RAY	Himanshu Ray
15	020	JEET GOPE	Jeet Gope
16	021	JOY DUTTA	Joy Dutta.
17	022	KARAN NATH MAHAPATRA	Karan nath mahapatra
18	023	KOUSHIK SINGHA MAHAPATRA	Koushik S.M.P
19	024	KUMARJIT MONGAL	Kumarjit Mongal
20	025	KUNAL MONDAL	Kunal Mondal
21	026	MANOJIT RAUL	Manojit Raul.
22	027	PARTHIB HALDAR	Parthib Haladar.
23	029	PUJA DAS	Puja Das
24	030	PUSKAR GHOSH	Puskar Ghosh
25	031	RAHUL KUIRY	Rahul kuiry
26	032	RAHUL SINGHA	Rahul Singha
27	033	RAJA DAS	Raja Das
28	034	SANDIP KUMAR KUNDU	Sandip Kumar Kundu

29	035	SAYANDIP BOXI	Sayandip Boxi
30	036	SHREYA RANI DE	Shreya De
31	037	SHREYA UPADHYAY	Shreya Upadhyay
32	038	SHREYASI SARKAR	Shreyasi Sarkar
33	039	SK AFTAB	Sk. Aftab
34	040	SK RAKIUR RAHAMAN	Sk Rakiur Rahman
35	041	SOMNATH BANERJEE	Somnath Banerjee
36	044	SUBHASH CHANDRA ADAK	Subhash Chandra Adak
37	046	SUDIPTA KOTAL	Sudipta Kotal
38	047	SUJIT HEMBRAM	Sujit Hembram
39	048	SUMAN MANDAL	Suman Mandal
40	049	SUNIL BISUI	Sunil Bisui
41	050	SUPRIYO KUNDU	Supriyo Kundu
42	052	ZIAN NAWAZ	Zian Nawaz

Aghorai

Signature of the Teacher

**Certificate course on Python Programming**  
**Organized by**  
**Department of Computer Science & BCA**  
**Kharagpur College**  
**Course Duration-11.05.2022 to 14.06.2022 (10 days, 30 hours)**  
**Attendance Sheet**

Date- 17/05/22

Name of the Teacher: ANUDYUTI GHORAI

SL. NO	ROLLNO	STUDENT NAME	SIGNATURE
1	002	ABHISHEK SHARMA	Abhishek sharma
2	003	ABIR MAITY	Abir Maity
3	004	AJIT SAREN	Ajit Saren
4	005	ANIRBAN DAS	Anirban Das
5	006	ANOMITRA KAR	Anomitra Kar
6	007	ANUVAB SAHU	Anuvab Sahu
7	009	AVIJIT SUI	Avisit Sui
8	010	AYAN BISWAS	Ayan Biswas
9	011	AYON MONDAL	Ayon Mondal
10	012	B SRUTHI	ABSENT
11	014	BHIM HANSDA	Bhim Hansda
12	017	DEEPAK SINGH	Deepak Singh
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14	019	HIMANSHU RAY	Himanshu Ray
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21	026	MANOJIT RAUL	Manojit Raul.
22	027	PARTHIB HALDAR	Parthib Haldar.
23	029	PUJA DAS	Puja Das
24	030	PUSKAR GHOSH	Puskar Ghosh
25	031	RAHUL KUIRY	Rahul Kuiry
26	032	RAHUL SINGHA	Rahul Singha.
27	033	RAJA DAS	Raja Das
28	034	SANDIP KUMAR KUNDU	Sandip Kumar Kundu