

**L. N. MISHRA INSTITUTE OF ECONOMIC  
DEVELOPMENT AND SOCIAL CHANGE,  
PATNA**



**SYLLABUS  
*for*  
BACHELORS OF COMPUTER APPLICATIONS  
(BCA) PROGRAMME**

*Based on*

**Choice Based Credit System (CBCS)  
(2020-2023 onwards)**

**[www.lnmipat.ac.in](http://www.lnmipat.ac.in)**

### **Introduction to Choice Based Credit System (CBCS):**

The CBCS provides an opportunity to the students for choosing the courses from the prescribed list of courses comprising the core, elective/minor or skill-based courses. The courses can be evaluated on the basis of grading system, which is considered to be better than the conventional marking or evaluation system. Grading system provides uniformity in the evaluation and computation of the **Cumulative Grade Point Average (CGPA)** based on student's performance in examinations which enables the student to move across institutions of higher learning. The uniformity in the evaluation system also enables the potential employers to assess the performance of the candidates.

### **Basic connotation of various terms commonly used in Choice Based Credit System CBCS:**

**Academic Program** - means an entire course of study comprising its program structure, course details, evaluation schemes etc. designed to be taught and evaluated in a teaching Department/Centre or jointly under more than one such Department/Centre.

**Course** - means a segment of a subject that is part of an Academic Program.

**Program Structure** - means a list of courses (Core, Elective, Practical, Project, etc.) that makes up an Academic Program, specifying the syllabus, Credits, hours of teaching, evaluation and examination schemes.

**Core Course** - means a course that a student admitted to a particular program must successfully complete to receive the degree and which cannot be substituted by any other course.

**Elective Course** - means an optional course to be chosen or selected by a student out of such courses offered in the same or any other Department/Centre.

**Credit** - means the value assigned to a course which indicates the level of instruction; One-hour lecture per week equals 1 Credit, 2 hours practical class per week equals 1 credit. Credit for a practical class could be proposed as part of a course or as a separate practical course.

**SGPA** - means **Semester Grade Points Average** calculated for the courses of a particular semester.

**CGPA** - is **Cumulative Grade Points Average** calculated for all courses completed by the students at any point of time. CGPA is calculated each year for both the semesters clubbed together.

**Grand CGPA** - is calculated in the last year of the course by clubbing together of CGPA of three years, i.e., six semesters.

### **Conversion of Marks into Grades**

In each course, numeric scores will be awarded to both the evaluation components: Internal Assessment and End-semester Examination. Internal assessment score will be based on the average of the numeric scores of the various components such as quizzes, assignments, class participation, discipline, etc. The total score in a paper is obtained by adding the internal

assessment marks and the End-semester Examination marks. The total score obtained in a paper is converted to a letter grade on the basis of the grading scale given below:

<b>Marks</b>	<b>Grade</b>	<b>Grade Points</b>
90+	A+	10
80+	A	9
70+	B	8
60+	C	7
50+	D	6
40+	P	5
	F	0

**Grade Points:** To be considered on the basis of the grading scale table given above.

**CWP (Credit Weightage Point) =** Grade Point x Credit Point

**SGP (Semester Grade Point) =**  $\sum$  CWP

**SGPA (Semester Grade Point Average) =**  $\frac{\sum \text{CWP}}{\sum \text{Credit Points}}$

**CGPA (Cumulative Grade Point Average) =**  $\frac{\sum \text{SGP}}{\sum \text{Credit Points}}$

## BCA (Three-Year Full-Time) Program Details:

### Program Structure:

The Bachelor of Computer Application is a full time Program of three years and each year consists of two semesters which are given in the table below.

Years	Semester - Odd	Semester- Even
First Year	Semester - I	Semester - II
Second Year	Semester - III	Semester - IV
Third Year	Semester - V	Semester - VI

### Semester-wise Course Credit Scheme:

Semester	No. of courses offered	Total marks (Semester-wise)	Total credits (Semester-wise)
I	6	600	26
II	6	600	26
III	6	600	27
IV	7	700	33
V	7	700	33
VI	2	300	13
<b>TOTAL</b>	<b>34</b>	<b>3500</b>	<b>158</b>

SEMESTER - I								
Course Code	Course Name	ESE (Marks)	IA (Marks)	Full (Marks)	L	T	P	Credit
<b>THEORY COURSES</b>								
BCA 101	Mathematical Foundation	70	30	100	3	1	-	4
BCA 102	Business Communication	70	30	100	3	1	-	4
BCA 103	Computer Fundamentals & IT	70	30	100	3	1	-	4
BCA 104	Programming in C	70	30	100	3	1	-	4
<b>PRACTICAL COURSES</b>								
BCA-105	Lab on Windows & MS Office	70	30	100	-	2	3	5
BCA-106	Lab on Programming in C	70	30	100	-	2	3	5
<b>Total</b>				<b>600</b>	12	8	6	<b>26</b>

\*\*\* All six courses (Theory and Practical) are compulsory.

L–Lecture

T–Tutorial

P–Practical

ESE–End Semester

Examination IA–Internal Assessment

<b>SEMESTER - II</b>								
Course Code	Course Name	ESE (Marks)	IA (Marks)	Full (Marks)	L	T	P	Credit
<b>THEORY COURSES</b>								
BCA 201	Discrete Mathematics	70	30	100	3	1	-	4
BCA 202	Data Structure Using C	70	30	100	3	1	-	4
BCA 203	Database Management System	70	30	100	3	1	-	4
BCA 204	Business Accounting	70	30	100	3	1	-	4
<b>PRACTICALS COURSES</b>								
BCA 205	Lab on Data Structure Using C	70	30	100	-	2	3	5
BCA 206	Lab on DBMS(Oracle)	70	30	100	-	2	3	5
<b>Total</b>				<b>600</b>	12	8	6	<b>26</b>

\*\*\* All six courses (Theory and Practical) are compulsory.

<b>SEMESTER - III</b>								
Course Code	Course Name	ESE (Marks)	IA (Marks)	Full (Marks)	L	T	P	Credit
<b>THEORY COURSES</b>								
BCA 301	Computer Organization & Architecture	70	30	100	4	1	-	5
BCA 302	Statistical Methods	70	30	100	4	-	-	4
BCA 303	Object Oriented Programming using C++	70	30	100	3	1	-	4
BCA 304	Fundamentals of Management	70	30	100	3	1	-	4
<b>PRACTICALS COURSES</b>								
BCA 305	Lab on Statistical Methods	70	30	100	-	2	3	5
BCA 306	Lab on C++	70	30	100	-	2	3	5
<b>Total</b>				<b>600</b>	14	7	6	<b>27</b>

\*\*\* All six courses (Theory and Practical) are compulsory.

<b>SEMESTER – IV</b>								
Course Code	Course Name	ESE (Marks)	IA (Marks)	Full (Marks)	L	T	P	Credit
<b>THEORY COURSES</b>								
BCA 401	Java Programming	70	30	100	3	1	-	4
BCA 402	Operating System	70	30	100	4	1	-	5
BCA 403	Web Designing	70	30	100	3	-	2	5
BCA 404	Computer Network	70	30	100	4	-	-	4
<b>PRACTICAL COURSES</b>								
BCA 405	Lab on Java Programming	70	30	100	-	2	3	5
BCA 406	Lab on Web Designing	70	30	100	-	2	3	5
<b>ELECTIVE COURSES</b>								
BCA 407	Machine Learning	70	30	100	4	1	-	5
BCA 408	Network Programming	70	30	100	4	1	-	5
BCA 409	Web Based Programming	70	30	100	4	1	-	5
<b>**Total</b>				<b>700</b>	<b>18</b>	<b>7</b>	<b>8</b>	<b>33</b>

<b>SEMESTER – V</b>								
Course Code	Course Name	ESE (Marks)	IA (Marks)	Full (Marks)	L	T	P	Credit
<b>THEORY COURSES</b>								
BCA 501	Software Engineering	70	30	100	4	1	-	5
BCA 502	Front End Design Tool VB.Net	70	30	100	4	1	-	5
BCA 503	Numerical Methods	70	30	100	3	1	-	4
BCA 504	Python Programming	70	30	100	3	1	-	4
<b>PRACTICAL COURSES</b>								
BCA 505	Lab on Numerical Methods	70	30	100	-	2	3	5
BCA 506	Lab on Python Programming	70	30	100	-	2	3	5
<b>ELECTIVE COURSES</b>								
BCA 507	Computer Graphics	70	30	100	3	-	2	5
BCA 508	Computer Network and Information Security	70	30	100	3	-	2	5
BCA 509	Mobile Computing	70	30	100	3	-	2	5
<b>**Total</b>				<b>700</b>	<b>17</b>	<b>8</b>	<b>8</b>	<b>33</b>

**\*\*\* All the Theory and Practical courses are compulsory and one elective course will be offered if minimum 1/3<sup>rd</sup>. of BCA-IV and BCA-V Semester students will opt for the same or it will be decided by the concerned department or authority.**

**\*\* The totaling of BCA-IV and BCA-V semesters is on the basis of six compulsory (four theory and two practical) courses and one elective course opted by the students of BCA-IV and BCA-V semesters.**

<b>SEMESTER - VI</b>								
<b>Course Code</b>	<b>Course Name</b>	<b>ESE (Marks)</b>	<b>IA (Marks)</b>	<b>Full (Marks)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>PROJECTS AND SEMINARS</b>								
BCA 601	Project Report & Viva Voce	100	100	200	-	-	-	8
BCA 602	Seminar Presentation	70	30	100	-	-	-	5
<b>Total</b>				<b>300</b>	-	-	-	<b>13</b>

**\*\*\* All two courses (Projects & Viva-Voce and Seminars) are compulsory.**

**SEMESTERWISE COURSE CONTENTS**



## **SEMESTER - I**

### **BCA 101: MATHEMATICAL FOUNDATION**

#### **Course Contents:**

##### **UNIT – I**

**DETERMINANTS:** Definition, Minors, Cofactors, Properties of Determinants, **MATRICES:** Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramer's Rule, Rank of Matrix Dependence of Vectors, Eigen - Vectors of a Matrix, Caley-Hamilton Theorem (without proof)

##### **UNIT – II**

**LIMITS & CONTINUITY:** Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities.

##### **UNIT – III**

**DIFFERENTIATION:** Derivative, Derivatives of Sum, Differences, Product & quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's), Indeterminate Forms, L' Hospitals Rule, Maxima & Minima, Asymptote, Successive Differentiation & Liebnitz Theorem.

##### **UNIT – IV**

**INTEGRATION:** Integral as Limit of Sum, Riemann Sum, Fundamental Theorem of Calculus, Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Integration of Algebraic and transcendental Functions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions.

#### **TEXT BOOKS:**

- [1] Kresyig E., "Advanced Engineering Mathematics", John Wiley & Sons.
- [2] Babu Ram, "Engineering Mathematics", Pearson Education.
- [3] Apostol Tom M, Calculus, Vol I and II John Wiley.

#### **REFERENCE BOOKS:**

- [1] B.S. Grewal, "Elementary Engineering Mathematics".
- [2] H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company.
- [3] Shanti Narayan, "Differential Calculas", S. Chand & Company.

## **BCA 102: BUSINESS COMMUNICATION**

### **Course Contents:**

#### **UNIT – I**

**Concepts and Fundamentals:** Introduction to Technical Communication, meaning of communication, Importance of communication, Communication scope, types, Process of communication, Communication models and theories, Essentials of good communication - The seven Cs of communication, Factors responsible for growing importance of communication, Channels of communication, Verbal and Non-Verbal communication, Formal and Informal communication, Barriers of, and aids to communication.

#### **UNIT – II**

**Written Communication:** Objectives of written communication, Media of written communication, Merits and demerits of written communication, Planning and preparing of effective business messages. Persuasive writing. Overview of Technical Research and Report Writing: Definition and Nature of Technical Writing, Properties/features and process of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing, The Role of Technical Writing, The Wholistic Guide of Technical Writing, End-products of Technical Writing. Writing Proposals.

#### **UNIT-III**

**Oral & Interactive Communication:** Importance in Modern Era

**Writing Letters:** Business letters, Office memorandum, Good news and bad news letters, Persuasive letters, Sales letters, Letter styles/ layout.

**Report Writing:** Meaning & Definition, Types of report (Business report & Academic report), Format of report, Drafting the report, Layout of the report, Essential requirement of good report writing.

#### **UNIT – IV**

**Project Presentations:** Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation).

**Language Skills:** Improving command in English, improving vocabulary, choice of words, Common problems with verbs, adjectives, adverbs, pronouns, tenses, conjunctions, punctuations, prefix, suffix, idiomatic use of prepositions. Sentences and paragraph construction, improve spellings, introduction to Business English.

### **TEXT BOOKS:**

- [1] Kavita Tyagi and Padma Misra , “Advanced Technical Communication”, PHI.
- [2] P. D. Chaturvedi and Mukesh Chaturvedi, “Business Communication – Concepts, Cases and Applications”, Pearson.
- [3] Rayudu, “C.S- Communication”, Himalaya Publishing House.
- [4] Asha Kaul , “Business Communication”, PHI.

### **REFERENCE BOOKS:**

- [1] Raymond Murphy, “Essential English Grammar- A self-study reference and practice book for elementary students of English”, Cambridge University Press, second edition.
- [2] Manalo, E. & Fermin. Technical and Report Writing. ECC Graphics. Quezon City.
- [3] Kavita Tyagi and Padma Misra , “Basic Technical Communication”, PHI.

- [4] Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, “Effective Business Communication”, McGraw Hill.

## **BCA 103: COMPUTER FUNDAMENTALS & IT**

### **Course Contents:**

#### **UNIT – I**

**Introduction to Computers:** The evolution of computers: Computer Generation from First Generation to Fifth Generation. Classifications of Computers: Micro, Mini, Mainframe and super computers, Distributed Computer System, Parallel Computers.

**Computer Hardware:** Major Components of a digital computer, Block Diagram of a computer Input-output devices, Description of Computer Input Units, Output Units. CPU.

**Computer Memory:** Memory Cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices Used to construct Memories, Magnetic Hard disk, floppy Disk Drives, Compact Disk Read Only Memory, Magnetic Tape Drives.

#### **UNIT – II**

**Interaction With Computers:** Computer Software: System software, assemblers, compilers, interpreters, linkers Elementary Operating System concepts, different types of operating systems, Application Software: Introduction to MS Office (MS-Word, MS Powerpoint, MS-Excel) Computer Programming and Languages: Algorithms, flow chart, decision tables, pseudo code, Low level languages and introduction to high level languages.

#### **UNIT – III**

**Computer Number System:** Decimal, Binary, Octal, Hexa-decimal.

**Conversion:** Decimal to all other number systems, Binary to octal and hexadecimal, Addition of binary numbers, Binary subtraction, use of complements to represent negative numbers, Conversion of a binary fraction to a decimal fraction and decimal to binary fraction, Binary Coded Decimal (BCD), ASCII Codes, EBCDIC codes, Gray codes, Unicode.

#### **UNIT – IV**

**Computer Network & Internet:** Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), Client and Servers, Intranet, Extranet.

**Internet:** Terminologies related to Internet: Protocol, Domain name, IP address, URL, World Wide Web. Overview of various services on Internet: E-mail, FTP, Telnet, Chat, Instant Messaging.

### **TEXT BOOKS:**

- [1] P. K. Sinha & Priti Sinha, “Computer Fundamentals”, BPB Publications.
- [2] Anita Goel “Computer Fundamentals”, Pearson.

### **REFERENCE BOOKS:**

- [1] B. Ram Computer Fundamentals Architecture and Organization, New Age Intl.
- [2] Alex Leon & Mathews Leon, “Introduction to Computers”, Vikas Publishing.
- [3] Norton Peter, “Introduction to computers”, TMH.
- [4] Vikas Gupta, “Comdex Computer Kit”, Wiley Dreamtech, Delhi.

## **BCA 104: PROGRAMMING IN C**

### **Course Contents:**

#### **UNIT – I**

**C basics:** C character set, Identifiers and keywords, Data types, constants, variables and arrays, declarations, expressions statements, symbolic constants, compound statements, arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operators, bit operators. C constructs: If statement, if... else statement, if... else if... else statement, while statement, do... while statement, for statement, switch statement, nested control statement, break operator, continue operator, comma operator, go to statement.

#### **UNIT-II**

**Arrays:** Arrays, pointers, array & pointer relationship, pointer arithmetic, dynamic memory allocation, pointer to arrays, array of pointers, pointers to functions, array of pointers to functions, Preprocessor directives: #include, #define, macro's with arguments, the operators # and ##, conditional compilations.

**String Manipulation** functions and other standard library functions from stdio.h, stdlib.h, conio.h, ctype.h, math.h, string.h, process.h. Usage of command line arguments.

#### **UNIT – III**

**C Functions:** Functions: declaration, definition & scope, recursion, call by value, call by reference.

**Storage Classes:** automatic, external (global), static & registers.

#### **UNIT – IV**

**Structures:** Structures, unions, passing structure to functions, bit fields, file handling [text (ASCII), binary].

### **TEXT BOOKS:**

- [1] Ashok N. Kamthane, "Computer Basics and C Programming", Pearson Education.
- [2] E. Bala Guruswamy, "Programming in ANSI C".
- [3] V Rajaraman, "Computer Basics and C Programming", PHI.

### **REFERENCE BOOKS:**

- [1] Herbert Schildt, "C The Complete Reference".
- [2] Yashwant Kanetkar, "Let us C".
- [3] Kernighan and d. Ritchie, "The ANSI C Programming Language".
- [4] Stephenn Prata, "C Primer Plus".
- [5] Schaum's Outline Series, "Programming with C".

**BCA 105: LAB ON WINDOWS & MS OFFICE**

Lab would be based on the Course BCA – 103: Computer Fundamentals & IT. The objective of this lab is to help the students to understand the various types of computers, programming language, memory, etc. The students should develop flowcharts and they must understand the various types of O.S. especially MS – Windows & Office.

**BCA 106: LAB ON C PROGRAMMING**

Lab would be based on the Course BCA – 104: Programming in C. The objective of this lab is to help the students to understand the basics of C- Programming. The lab should help the students to develop their capability on C-functions, Arrays, String Manipulation, etc.

## **SEMESTER – II**

### **BCA 201: DISCRETE MATHEMATICS**

#### **Course Contents:**

##### **UNIT – I**

**SETS:** Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.

**RELATIONS AND FUNCTIONS:** Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

##### **UNIT – II**

**PARTIAL ORDER RELATIONS AND LATTICES:** Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, glb, lub, Principle of Duality, Basic Properties, Sublattices, Distributed & Complemented Lattices.

##### **UNIT – III**

**Graphs:** types and operations (bipartite graph. Subgraph, distance of a graph, cut-edges & cut vertices, isomorphic and homomorphic graphs), degree of graphs, adjacent and incidence matrices, path circuit (Floyd's and Warshall algorithms), hamiltonian graph, graph colouring.

##### **UNIT – IV**

**Propositional Logic:** Proposition, First order logic, Basic logical operation, truth tables, tautologies, contradictions, Algebra of Proposition, logical implications, logical equivalence.

#### **TEXT BOOKS:**

- [1] Rosen, K.H., Discrete Mathematics and its Applications, McGraw Hill,
- [2] Kolman, Busby and Ross, "Discrete Mathematical Structure", PHI.
- [3] Babu Ram, "Discrete Mathematics", Pearson Education.

#### **REFERENCE BOOKS:**

- [1] S.K. Sarkar, "Discrete Maths"; S. Chand & Co.
- [2] Tremblay, J.P. and Manohar, R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.



## **BCA 202: DATA STRUCTURE USING C**

### **Course Contents:**

#### **UNIT – I**

**Introduction to Data Structures:** Basic Terminology, Elementary Data Organizations, Classification of data structures and its operations.

**Arrays:** Representation of single and multidimensional arrays (up to three dimensions); sparse arrays - lower and upper triangular matrices and Tri-diagonal matrices; addition and subtraction of two sparse arrays. (Multidimensional, and, sparse arrays, to be given elementary treatment.)

**Stacks and Queues:** Introduction and primitive operations on stack; Stack application: Polish Notations; Evaluation of postfix expression; Conversion from infix to postfix; Introduction and primitive operations on queues; D-queues, priority queues and Circular Queue.

#### **UNIT – II**

**Lists:** Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion, searching, two-way lists and Use of headers

**Trees:** Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion and deletion;

#### **UNIT – III**

Introduction to and creation of AVL trees and m-way search trees - (elementary treatment to be given); Multilevel indexing and B-Trees: Introduction; Indexing with binary search trees; Multilevel indexing, a better approach to tree indexes; Example for creating a B-tree.

#### **UNIT – IV**

**Sorting Techniques:** Insertion sort, selection sort bubble sort and merge sort.

**Searching Techniques:** linear search, binary search and hashing. (Complexities NOT to be discussed for sorting and searching)

### **TEXT BOOKS:**

- [1] Ashok N. Kamthane, "Introduction to Data Structures in C", Pearson Edu.
- [2] Y. Langsam, Tananbaum, et. al., "Data Structures using C and C++", PHI.
- [3] Schaum's outline series, "Data Structure", TMH.

### **REFERENCE BOOKS:**

- [1] Yashwant Kanetkar, "Data Structures Through C", BPB Publications.
- [2] A.K. Sharma, "Data Structure Using C", Pearson
- [3] P. S. Deshpande and O.G. Kakde, "C & Data Structure", Wiley Dreamtech.
- [4] Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", COURSE TECHNOLOGY, CENGAGE Learning
- [5] E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Booksource Pvt. Ltd.

## **BCA 203: DATABASE MANAGEMENT SYSTEM**

### **Course Contents:**

#### **UNIT – I**

**Introduction:** An overview of database management system, database system Vs file system, Characteristics of database approach, DBMS architecture, data models, schema and instances, data independence.

**Data Modeling using Entity Relationship Model:** Entity, Entity types, entity set, notation for ER diagram, attributes and keys, Concepts of composite, derived and multivalued attributes, Super Key, candidate key, primary key, relationships, relation types, weak entities, enhanced E-R and object modeling, Sub Classes: Super classes, inheritance, specialization and generalization.

#### **UNIT – II**

**Relational Data Model:** Relational model terminology domains, Attributes, Tuples, Relations, characteristics of relations, relational constraints domain constraints, key constraints and constraints on null, relational DB schema. Codd's Rules.

**Relational algebra:** Basic operations selection and projection, Set Theoretic operations Union, Intersection, set difference and division.

**Join operations:** Inner, Outer, Left outer, Right outer and full outer join.

**ER to relational Mapping:** Data base design using ER to relational language.

**Data Normalization:** Functional dependencies, Armstrong's inference rule, Normal form up to 3<sup>rd</sup> normal form.

#### **UNIT – III**

**Introduction to SQL:** Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals.

**Types of SQL commands:** DDL, DML, DCL. Basic SQL Queries.

**Logical operators:** BETWEEN, IN, AND, OR and NOT.

**Null Values:** Disallowing Null Values, Comparisons Using Null Values

**Integrity constraints:** Primary Key, Not NULL, Unique, Check, Referential key Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Aggregate Operators: The GROUP BY and HAVING Clauses.

**Joins:** Inner joins, Outer Joins, Left outer, Right outer, full outer joins. Overview of views and indexes.

#### **UNIT – IV**

**Transaction processing and Concurrency Control:** Definition of Transaction, Desirable ACID properties, overview of serializability, serializable and non-serializable transactions

**Concurrency Control Techniques:** Definition of concurrency, lost update, dirty read and incorrect summary problems due to concurrency. Overview of Locking, 2PL, Timestamp ordering, multi-versioning, validation

**Elementary concepts of Database security:** system failure, Backup and Recovery Techniques, authorization and authentication.

### **TEXT BOOKS:**

- [1] R. Elmarsri and SB Navathe, "Fundamentals of Database Systems", Pearson.
- [2] Singh S.K., "Database System Concepts, design and application", Pearson Education
- [3] Ramakrishnan and Gherke, "Database Management Systems", TMH.

**REFERENCE BOOKS:**

- [1] Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", McGraw Hill.
- [2] Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers.
- [3] A. K. Majumdar, P. Battacharya, "Data Base Management Systems", TMH.
- [4] Bipin Desai, "An Introduction to database Systems", Galgotia Publications.

**BCA 204: BUSINESS ACCOUNTING**

**Course Contents:**

**UNIT – I**

**Meaning and nature of accounting**, Scope of financial accounting, Interrelationship of Accounting with other disciplines, Branches of Accounting, Accounting concepts and convention, Accounting standards in India.

**UNIT – II**

**Journal**, Rules of Debit and Credit, Sub Division of Journal: Cash Journal, Petty Cash Book, Purchase Journal, Purchase Return, Sales Journal, Sales Return Journal, Ledger, Trial Balance

**UNIT – III**

**Preparation of Final Accounts**, Profit & Loss Account, Balance Sheet-Without adjustments and with adjustments. Preparation Of Receipt and Payment Account. Income and Expenditure Account and Balance Sheet.

**UNIT – IV**

**Meaning of Inventory**, Objectives of Inventory Valuation, Inventory Systems, Methods of Valuation of Inventories-FIFO, LIFO and Weighted Average Method, Concept of Depreciation, Causes of Depreciation, Meaning of Depreciation Accounting, Method of Recording Depreciation, Methods of Providing Depreciation.

**TEXT BOOKS:**

- [1] Maheshwari, S.N. and Maheshwari, S. K., An Introduction to Accountancy, Vikas Publishing House.
- [2] Tulsian, P.C., Financial Accountancy, Pearson Education.

**REFERENCE BOOKS:**

- [1] Gupta R. L., & Gupta V.K., “Principles & Practice of Accounting”, Sultan Chand & Sons.
- [2] Monga J R, “Introduction to Financial Accounting”, Mayur Paperbacks.
- [3] Raja Sekaran/Lalitha, “Financial Accounting”, Pearson Education.

**BCA 205: LAB ON DATA STRUCTURE USING C**

Lab would be based on the Course BCA – 202: Data Structure using C. The objective of this lab is to help the students to understand the sequential and linked lists. They should be able to deal with traversal, insertion, deletion and searching operation. The lab should help the students to develop their capability for AVL trees, m-way search trees, multi-level indexing and B-trees.

**BCA 206: LAB ON DBMS IN ORACLE**

Lab would be based on the Course BCA – 203: Database Management System. The objective of this lab is to help the students to understand the data modeling using entity relationship model and Relational data model. They should be equipped to apply SQL commands – DDL, DML and DCL

## **SEMESTER – III**

### **BCA 301: COMPUTER ORGANIZATION & ARCHITECTURE**

#### **Course Contents:**

#### **UNIT – I**

**Register Transfer and Micro-operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Microoperations, Arithmetic logic shift unit.

**Basic Computer Organizations and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Register reference instructions, Input - Output Instructions, Design of Accumulator Logic.

#### **UNIT – II**

#### **Design of Microprogrammed Control Unit**

**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes. Difference between RISC and CISC.

**Pipeline and Vector Processing:** Arithmetic and Instruction pipeline, Vector operations, Matrix Multiplication, memory interleaving.

#### **UNIT – III**

**Computer Arithmetic:** Introduction, Multiplication Algorithms, Division Algorithms, for fixed point-members.

**Input-Output Organization:** Peripheral Devices, Input-Output Interfaces, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

#### **UNIT – IV**

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

#### **TEXT BOOKS:**

- [1] Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India Private Limited.

#### **REFERENCE BOOKS:**

- [1] William Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited.
- [2] Subrata Ghosal, "Computer Architecture and Organization", Pearson.
- [3] Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill,

## **BCA 302: STATISTICAL METHODS**

### **Course Contents:**

#### **UNIT - I**

Statistics and its role in decision making, Internal and external source of data. Methods of collecting primary data. Sampling and its different techniques. Uses of secondary data.

Formation of a frequency distribution. Types of frequency distributions. Graphical and diagrammatical representation of business data. Histogram, frequency polygon and frequency curves.

#### **UNIT - II**

Uses of average in analyzing business data. Simple and weighted mean, mode, median, geometric and harmonic mean, properties and limitations of average. Measuring variability of business data by quartile deviation, mean deviation and standard deviation. Application of the concept of skewness and kurtosis for measuring the symmetry of business data.

#### **UNIT - III**

Significance of the study of correlation. Types of correlation, Coefficient of correlation by Karl Pearson and rank order method. Use of regression analysis. Regression equations as a predicting tool.

#### **UNIT - IV**

Analysis of time series, different components of a time series. Measurement of secular trend of business data by moving average method.

### **TEXT BOOKS:**

1. S.P. Gupta : Statistical Methods
2. Shukla & Gulsan : Statistics
3. S.P. Gupta & M.P. Gupta : Business Statistics

### **REFERENCE BOOKS:**

1. S.C. Gupta : Fundamentals of Statistics
2. R.P. Hooda : Statistics for Business
3. G. V. Shenoy & Madan Pant : Statistical Methods



## **BCA 303: OBJECT ORIENTED PROGRAMMING IN C++**

### **Course Contents:**

#### **UNIT – I**

**Introduction:** Introducing Object-Oriented Approach, Relating to other paradigms (functional, data decomposition). Features of Procedure oriented programming, Basic Concepts of Object Oriented Programming, Benefits of OOP, Applications of OOP, Difference between C and C++, cin, cout, new, delete operators.

**C++ Environment:** Program development environment, the language and the C++ language standards. C++ standard libraries. Introduction to various C++ compilers, C++ standard libraries, Testing the C++ program in Turbo C++/Borland C++/Microsoft VC++/GNU C++ compiler.

#### **UNIT – II**

**Classes and Objects:** Encapsulation, information hiding, abstract data types, Object & classes, attributes, methods, C++ class declaration, references, this pointer, Function Overloading, Constructors and destructors, instantiation of objects, Default parameter value, C++ garbage collection, dynamic memory allocation, Meta class/abstract classes.

#### **UNIT – III**

**Inheritance and Polymorphism:** Inheritance, Class hierarchy, derivation – public, private & protected, Agrégation, composition v/s classification hiérarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric polymorphism, Virtual Function, Early v/s Late Binding.

#### **UNIT – IV**

**Generic Programming** – Introduction, templates, template functions, Overloading of template functions, Overriding inheritance methods.

**Files and Exception Handling:** Persistent objects, Streams and files, Namespaces, The basic stream classes: C++ predefined streams, Error handling during file operations, Command Line Arguments. Types of Exception, Catching and Handling Exceptions.

### **TEXT BOOKS:**

- [1] Ashok N. Kamthane, “Object-Oriented Programming With Ansi And Turbo C++”, Pearson Education.
- [2] A.R.Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH.
- [3] E. Balguruswamy, “C++ ”, TMH Publication.

### **REFERENCE BOOKS:**

- [1] Mahesh Bhave, “Object Oriented Programming with C++”, Pearson Education.
- [2] D. Parsons, “Object Oriented Programming with C++”, BPB Publication.
- [3] Steven C. Lawlor, “The Art of Programming Computer Science with C++”, Vikas Publication.
- [4] Schildt Herbert, “C++: The Complete Reference”, Tata McGraw Hill.
- [5] R. Lafore, “Object Oriented Programming using C++”, Galgotia Publications.

## **BCA 304: FUNDAMENTALS OF MANAGEMENT**

### **Course Contents:**

#### **UNIT – I**

**Management:** Meaning & concept, Management principles (Fayol & Taylor), Management process (in brief), Managerial levels, Roles & skills of a manager.

#### **UNIT – II**

**Planning:** Meaning, Purpose & process, Decision making: Concept & process,

**Organizing:** Process, Departmentation, Authority & Responsibility relationships, Decentralization. Staffing: Nature & Importance,

#### **UNIT – III**

**Staffing:** Concept, nature & importance of staffing.

**Directing:** Motivation: concept & theories (Maslow's, Herzberg Two factor, McGregor's theory X & Y), Leadership: Concepts & styles.

**Controlling:** Nature, Importance, significance & Process of control.

#### **UNIT – IV**

**Managing People:** Meaning, Need of understanding human behavior in organization, Models of OB, **Major concepts in OB (elementary)**- Personality, Learning, Perception & Attitude Building.

### **TEXT BOOKS:**

[1] Dr. C.B Gupta "Management concepts & practices" S.Chand & Sons.

### **REFERENCE BOOKS:**

[1] Stoner, Freeman & Gilbert, "Management" 6<sup>th</sup> Edition, Pearson International.

[2] Ankur Chhabra, "Organisational Behaviour", Sun India Publications.

[3] Robbins, Stephen P, "Organisational Behaviour". PHI.

**BCA 305: LAB ON STATISTICAL METHODS**

The lab would be based on the course 302 – Statistical Methods. The objective of this lab is to help the students to do the graphical diagrammatical representation of business data. They should be equipped to apply Histogram, Frequency Polygon and frequency curves. They should know the application of the concept of skewness and kurtosis for measuring the symmetry of business data.

**BCA 306: LAB ON C++**

The lab would be based on the course 303 – Object Oriented Programming using C++. The objective of this lab is to help the students to understand the basic Concepts of Object-Oriented Programming, numerous benefits of applications of OOP and difference between C and C++, cin, cout, new, delete operators. They should be capable to apply polymorphism techniques. Students should know the application of Overriding inheritance methods.

## **SEMESTER - IV**

### **BCA 401: JAVA PROGRAMMING**

#### **Course Contents:**

#### **UNIT – I**

**Java Programming:** Introduction, Data types, access specifiers, operators, control statements, arrays.

**Classes:** Fundamentals, objects, methods, constructors.

**Inheritance:** Super class, sub class, this and super operator, method overriding, use of final, packages, abstract class, interface.

**Polymorphism:** Method overloading, constructor overloading.

#### **UNIT – II**

**Exception Handling:** Exception Class, built in checked and unchecked exceptions, user defined exceptions, use of try, catch, throw, throws, finally.

**Multi-threaded programming:** Overview, comparison with multiprocessing, Thread class and runnable interface, life cycle, creation of single and multiple threads, thread priorities, overview of Synchronization.

**Java Library:** String handling (only main functions), String Buffer class.

Elementary concepts of Input/Output: byte and character streams, System-in and System-out, print and println, reading from a file and writing in a file.

#### **UNIT – III**

#### **Software Development using Java:**

**Applets:** Introduction, Life cycle, creation and implementation,

**AWT controls:** Button, Label, TextField, TextArea, Choice lists, list, scrollbars, check boxes, Layout managers,

**Elementary concepts of Event Handling:** Delegation Event Model, Event classes and listeners, Adapter classes, Inner classes.

**Swings:** Introduction and comparison with AWT controls.

#### **UNIT – IV**

**Networking Basics:** Socket (datagram and TCP/IP based client and server socket), factory methods, InetAddress

**JDBC:** JDBC Architecture, JDBC Drivers, Connecting to the Database

**Introduction to Java Servlets:** Life cycle, Interfaces and classes in javax. servlet package (only description) Creating a simple servlet.

#### **TEXT BOOKS:**

- [1] Patrick Naughton and Herbert Schildt, “Java-2 The Complete Reference”, TMH.
- [2] Y. Daniel Liang, “Introduction to Java Programming, Comprehensive Version, Pearson.

#### **REFERENCE BOOKS:**

- [1] Krishnamoorthy R., Prabhu S., “Internet and Java Programming”, New Age Intl.
- [2] David Flanagan, Jim Farley, William Crawford and Kris Magnusson, “Java Enterprise in a Nutshell”, O’Reilly.

**BCA 402: OPERATING SYSTEM**

**Course Contents:**

**UNIT – I**

**Introduction:** Introduction, Simple Batch Systems, Multi-programmed Batches systems, Time-Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems

**Processes:** Process Concept, Process Scheduling, Operation on Processes

**CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling,

**UNIT-II**

**Memory Management:** Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation

**Virtual Memory:** Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations

**UNIT – III**

**Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

**Process Synchronization:** Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization

**UNIT – IV**

**Device Management:** Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary-Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability

**TEXT BOOKS:**

- [1] Silberschatz and Galvin, “Operating System Concepts”, John Wiley & Sons.
- [2] Haldar/Aravind, “Operating System”, Pearson Edu.

**REFERENCE BOOKS:**

- [1] Madnick E., Donovan J., “Operating Systems”, Tata McGraw Hill.
- [2] Tannenbaum, “Operating Systems”, PHI.
- [3] An Introduction to Operating Systems: Concepts & Practice, Bhatt, PHI

## **BCA 403: WEB DESIGNING**

### **Course Contents:**

#### **UNIT – I**

**History of the Internet and World Wide Web**, Search Engines, News-group, E-mail and its Protocols, Web Portal, Browsers and their versions, Its functions, URLs, web sites, Domain names, Portals.

**Static Web Development: HTML** - Introduction to HTML, HTML Document structure tags, HTML comments, Text formatting, inserting special characters, anchor tag, adding images and Sound, lists types of lists, tables, frames and floating frames, Developing Forms, Image maps.

#### **UNIT – II**

**Introduction to Java Script:** Data Types, Control Statements, operators, Built in and User Defined Functions, Objects in Java Script, Handling Events.

**Cascading Style Sheet:** Types of Style Sheets – Internal, inline and External style sheets, creating styles, link tag.

#### **UNIT – III**

**DHTML:** Introduction to DHTML, JavaScript & DHTML, Document Object Model, Filters and Transitions, DHTML Events, dynamically change style to HTML Documents.

#### **UNIT – IV**

**Introduction to WYSIWYG** Design tools, Introduction to Dreamweaver, Website Creation and maintenance, Web Hosting and Publishing Concepts, XML: Introduction to XML-Mark up languages, Features of Markup languages, XML Naming rules, Building block of XML Document, Difference between HTML & XML

Components of XML, XML Parser, DTD's Using XML with HTML and CSS

### **TEXT BOOKS:**

- [1] The complete reference HTML, by Thomas A powell, TMH publication.
- [2] Mastering HTML by Deborah S. Ray and Erich J. Ray. BPB Publication.
- [3] Internet and World Wide Web Deitel HM, Deitel, Goldberg.

### **REFERNCE BOOKS:**

- [1] HTML Black Book, Stephen Holzner, Wiley Dreamtech.
- [2] Rajkamal, "Web Technology", Tata McGraw-Hill.
- [3] Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson.
- [4] XML How to Program by Deitel Deitel Nieto.

## **BCA 404: COMPUTER NETWORKS**

### **Course Contents:**

#### **UNIT - I**

**Basic Concepts:** Components of data communication, distributed processing, Line configuration, topology, transmission mode, and categories of networks. OSI and TCP/IP Models: Layers and their functions, comparison of models. Digital Transmission: Interfaces and Modems: DTE-DCE Interface, modems, cable modems. Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity.

#### **UNIT – II**

**Telephony:** Multiplexing, error detection and correction: Many to one, one to many, WDM, TDM, FDM, circuit switching, packet switching and message switching. Data Link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols overview.

**ISDN:** Services, historical outline, subscriber's access, ISDN, Layers, and broadband ISDN.

#### **UNIT – III**

**Devices:** Repeaters, bridges, gateways, routers, The Network Layer, Design Issues, Network Layer Addressing and Routing concepts (Forwarding Function, Filtering Function); Routing Methods (Static and dynamic routing, Distributed routing, Hierarchical Routing); Distance Vector Protocol, Link State protocol.

#### **UNIT – IV**

**Transport and upper layers in OSI Model:** Transport layer functions, connection management, Functions of session layers, Presentation layer, and Application layer.

### **TEXT BOOKS:**

- [1] A. S. Tanenbaum, "Computer Networks"; Pearson Education Asia.
- [2] Behrouz A. Forouzan, "Data Communication and Networking", Tata McGraw Hill.

### **Reference Books**

- [1] D. E. Comer, "Internetworking with TCP/IP", Pearson Education Asia.
- [2] William Stallings, "Data and computer communications", Pearson education Asia.



**BCA 405: LAB ON JAVA PROGRAMMING**

The lab would be based on the course 401 – Java Programming. The objective of this lab is to help the students to understand the basic Concepts of Java Programming. They should know the main functions of string handling. Students should have elementary concepts of Java Library. Students should know the application of JDBC Architecture, JDBC Drivers.

**BCA 406: LAB ON WEB DESIGNING**

The lab would be based on the course 602 – Web Designing. The objective of this lab is to help the students to understand the HTML Document structure tags, HTML comments, Text formatting, inserting special characters, anchor tag, adding images and Sound, types of lists, tables, frames and floating frames, Developing Forms, Image maps. The students should be having clear concept of Components of XML, XML Parser, DTD's Using XML with HTML and CSS.

## **BCA 407: MACHINE LEARNING**

### **Course Contents:**

#### **UNIT-I**

**Introduction:** Learning theory, Hypothesis and target class, Inductive bias and bias-variance tradeoff, Occam's razor, Limitations of inference machines, Approximation and estimation errors, Curse of dimensionality, dimensionality reduction, feature scaling, feature selection methods.

#### **UNIT-II**

**Regression:** Linear regression with one variable, Linear regression with multiple variables, Gradient Descent, Logistic Regression, Polynomial regression, over-fitting, regularization. performance evaluation metrics, validation methods.

#### **UNIT-III**

**Classification:** Decision trees, Naive Bayes classifier, k-nearest neighbor classifier, Perceptron, multilayer perceptron, Neural network, back-propagation Algorithm, Support Vector Machine, Kernel functions.

#### **UNIT-IV**

**Evaluation:** Performance evaluation metrics, ROC Curves, Validation methods, Bias variance decomposition, Model complexity.

#### **UNIT-V**

**Unsupervised learning:** Clustering, distance metrics, Mixture models, Expectation Maximization, Cluster validation methods.

### **Readings:**

1. Alpaydin, Ethem, Introduction to machine learning, MIT press, 2014.
2. Christopher, M. Bishop, Pattern Recognition And Machine Learning, Springer-Verlag, 2016.
3. Shai Shalev-Shwartz, Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge Press, 2014.
4. Michalski, Ryszard S., Jaime G. Carbonell, and Tom M. Mitchell, eds. Machine learning: An artificial intelligence approach, Springer Science & Business Media, 2013.

## **BCA 408: NETWORK PROGRAMMING**

### **Course Contents:**

#### **UNIT-I**

##### **Introduction to Network Programming:**

OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

#### **UNIT-II**

##### **Sockets:**

Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

#### **UNIT-III**

##### **TCP client server:**

Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host. I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option.

#### **UNIT-IV**

##### **Elementary UDP sockets:**

Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP. Elementary name and Address conversions: DNS, get-host by Name function, Resolver option.

### **TEXT BOOKS:**

1. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W. Richard Stevens, Pearson Edn. Asia.
2. UNIX Network Programming, 1st Edition, - W. Richard Stevens. PHI.

### **REFERENCES:**

1. NIX Systems Programming using C++, T CHAN, PHI.
2. UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education

**BCA 409: WEB BASED PROGRAMMING**

**Course Contents:**

**Unit – I**

Introduction to web applications, HTML, Client-Side Scripting Vs Server-Side Scripting, Web Servers: Local Servers and Remote Servers, Installing Web servers, Internet Information Server (IIS) and Personal Web Server (PWS). Static website vs Dynamic website development.

**Unit – II**

Introduction to PHP, Start and End Tags of PHP, Data types in PHP, Variables, Constants, operators and Expressions, printing data on PHP page, Control statements – if, switch case, for, while, do while.

Arrays: Initialization of an array, iterating through an array, Sorting arrays, Array Functions, Functions: Defining and Calling Functions, Passing by Value and passing By references, Inbuilt Functions.

**Unit – III**

Working with Forms: Get and Post Methods, Query-strings, HTML form controls and PHP, Maintaining User State: Cookies, Sessions, Application State.

Working with Files: Opening and Closing Files, Reading and Writing to Files, Getting Information on Files.

**Unit – IV**

PHP Database Connectivity: Introduction to MYSQL, Creating database and other operations on database, connecting to a database, Use a particular database, Sending query to database, Parsing of the query results, Checking data errors.

**TEXT BOOKS:**

1. Programming PHP. Rasmus Lerdorf, Kevin Tatroe. (O'Reilly, ISBN 1565926102).
2. PHP, MySQL, and JavaScript: A Step-By-Step Guide to Creating Dynamic Websites by Robin Nixon O'Reilly Media; 1 edition.

**REFERNCE BOOKS:**

1. Core PHP Programming. Leon Atkinson (Prentice Hall, ISBN 0130463469).
2. Beginning PHP5 and MySQL: From Novice to Professional, W. Jason Gilmore, 2004, Apress, ISBN: 1-893115-51-8

## **SEMESTER - V**

### **BCA 501: SOFTWARE ENGINEERING**

#### **Course Contents:**

##### **UNIT – I**

**Introduction:** Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models

**Software Requirements analysis & specifications:** Requirement engineering, requirement elicitation techniques like FAST, QFD, Requirements analysis using DFD(with case studies), Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

##### **UNIT – II**

**Software Project Management Concepts:** The Management spectrum, The People, The Problem, The Process, The Project.

**Software Project Planning:** Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Risk Management.

##### **UNIT – III**

**Software Design:** Cohesion & Coupling, Classification of Cohesiveness & Coupling, Layered arrangement of modules, Function Oriented Design, Object Oriented Design.

**Software Metrics:** Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics.

##### **UNIT – IV**

**Software Testing:** Code Review, Testing Process, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing (Performance Testing and Error Seeding), Debugging Activities.

**Software Maintenance:** Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

#### **TEXT BOOKS:**

- [1] K. K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International.
- [2] Rajib Mall, “Fundamental of Software Engineering”, PHI Learning Private Limited
- [3] I. Sommerville, “Software Engineering”, Pearson Edu.
- [4] Pankal Jalote, “Software Engineering”, Narosa Publication

#### **REFERENCE BOOKS:**

- [1] Jibitesh Mishra and Ashok Mohanty, “Software Engineering”, Pearson
- [2] R. S. Pressman, “Software Engineering – A practitioner’s approach”, McGraw Hill Int. Ed.
- [3] James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach”, John Wiley & Sons.

## **BCA502: FRONT END DESIGN TOOL VB.NET**

### **Course Contents:**

#### **UNIT - I**

Introduction: Introduction to .Net, Two tier and Three tier client server model, .Net Architecture, Features of .Net, Advantages of .Net, .Net Framework, CLR, CTS, CLS, Assemblies, Memory management issues – Garbage Collector and collection process, Exception Handling, Code Access Security.

#### **UNIT - II**

Introduction to Visual Basic.Net IDE: Creating a project, Types of project in .Net, Exploring and coding a project, Solution explorer, toolbox, properties window, Output window, Object Browser.

**VB.Net Programming Language:** Similarities and Differences with Visual Basic, Variables, Comments, Data Types, Working with Data Structures – Arrays, Array Lists, Enumerations, Constants, Structures; Introduction to procedures, calling procedures, argument passing mechanisms, scope of variable. **Control Flow Statements** – conditional statement, Loops, Nesting of Loops, MsgBox and Input Box.

#### **UNIT – III**

**GUI Programming:** Introduction to Window Applications, Using Form – Common Controls, Properties, Methods and Events. Interacting with controls - Textbox, Label, Button, Listbox, Combobox, Checkbox, Picture Box, Radio Button, Panel, scroll bar, Timer, ListView, TreeView, toolbar, Status Bar. Dialog Controls, Creating and Using MDI applications, Toolbar, Status Bar, creating custom controls, Creating Menus.

**Object Oriented Features:** Classes and Objects, Access Specifiers: Private, Public and Protected, Building Classes, Reusability, Constructors, Inheritance, Overloading, Overriding, Creating and Using Namespaces.

#### **UNIT – IV**

**Introduction to ADO:** ADO vs ADO.Net, ADO.Net data namespaces, ADO.Net Object Model, accessing data from Server Explorer, Creating Connection, Command, Data Adapter, Data Reader and Data Set with OLEDB and SQLDB, Data Binding.

**Crystal Report:** Connection to Database, Table, Queries, Building Report, Modifying Report, Formatting Fields, Publishing and exporting reports.

### **TEXT BOOKS:**

- [1] Visual Basic 2010 programming Black Book, by Kogent Learning Solutions, Wiley India.
- [2] Visual Basic 2010 Step by Step, Michael Halvorson, PHI.

### **REFERENCE BOOKS:**

- [1] Mastering Microsoft Visual Basic 2010, Evangelos Petroustos, Wiley Publications.
- [2] Beginning Visual Basic 2010 (Wrox)

## **BCA 503: NUMERICAL METHODS**

### **Course Contents:**

#### **UNIT - I**

Representation of floating-point numbers, Computer arithmetic, Normalization, Concept of error.

Transcendental equations. Bisection method, false position method, Newton-Raphson method and Method of successive approximation. Rate of Convergence.

#### **UNIT - II**

Gauss elimination method, Gauss Jordan method, Jacobi method and Gauss Siedel method. Pivotal condensation, Matrix Inversion.

#### **UNIT - III**

Polynomial Interpolation, Lagrange's method, Difference table, Newton's forward, backward and divide difference methods.

Numerical differentiation up to second order, Trapezoidal rule and Simpson's rule.

#### **UNIT - IV**

Method of least square, fitting of straight lines, polynomials and exponential curves.

### **TEXTS BOOKS:**

1. V. Rajaraman : Computer Oriented Numerical Methods
2. R.S. Salaria : Computer Oriented Numerical Methods –  
A Programming Approach

### **REFERENCE BOOKS:**

1. E. Balaguruswamy : Numerical Methods
2. Jain & Narang : Numerical Methods Techniques



## **BCA 504: PYTHON PROGRAMMING**

### **Course Contents:**

#### **UNIT – I**

**Python Programming basics:** Introduction to Python, features, Structure of a Python Program, Elements of Python, Interpreter, Python shell, Indentation, Identifiers and keywords, Data types, Literals, Strings-operations on strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment and Decrement operator).

#### **UNIT – II**

**Creating Python Programs:** Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass, Iteration and Recursion.), Tables- Two-dimensional tables, Functions Defining Functions, default arguments, Profiling, Modules- Defining and Creating, exploring, importing of modules, Arrays, Lists–operation on lists, set and Dictionaries, pattern matching and searching using regular expression. File handling and I O methods, Errors and Exceptions handling, Threads Understanding threads, forking threads, synchronizing the threads, Programming using multithreading.

#### **UNIT – III**

**Object-Oriented Programming:** Introduction to Classes, Objects and Methods, Constructor, class attributes and destructors overlapping and overloading, Inheritance. Namespaces and Packages in Python.

#### **UNIT – IV**

**Databases:** Creating database, Database connection, DDL, DML, DTL commands.

#### **UNIT – V**

**GUI Programming and Graphics:** HTML Prerequisites-Basic GUI construction-Form Elements-Textbox, Label, Button, Checkbox, list, Option - python integration with web forms. Graphics introduction sample graphics programming-pie chart, bar chart, histograms.

### **TEXT BOOKS:**

- [1] Practical Programming- An Introduction To Computer Science Using Python Byjeniffer Campbell, Paulgries, Jasonmanioja.
- [2] T. Budd, Exploring Python, TMH.
- [3] Python Tutorial/Documentation [www.python.org](http://www.python.org)
- [4] Allen Downey, Jeffrey Elkner, Chris Meyers. How to think like a computer scientist learning with Python – Freely available online.
- [5] <http://docs.python.org/3/tutorial/index.html>

**BCA 505: LAB ON NUMERICAL METHODS**

The lab would be based on the course 503 – Numerical Methods. The objective of this lab is to help the students to understand the Computer arithmetic, Normalization and Concept of error. The students should be enabled to apply Newton's forward, backward and divide difference methods. The students must be equipped to apply Polynomial Interpolation and Numerical differentiation up to second order.

**BCA 506: LAB ON JAVA PROGRAMMING.**

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria: Grade A: Percentage  $\geq 80$   
Grade B: Percentage  $\geq 70$  and  $\leq 60$   
Grade C: Percentage  $\geq 60$  and  $\leq 40$  and  
Grade D: Percentage  $\geq 40$  and  $\leq 0$ .
3. Program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. Program to generate Pythagorean triplets.
5. Program to display the first n terms of Fibonacci series.
6. Program to check whether a given number is Armstrong number or not.
7. Program to find sum of the following series for n terms:  $1 - 2/2! + 3/3! - \dots - n/n!$
8. Program to calculate the sum of two compatible matrices.
9. Program to calculate the product of two compatible matrices.
10. Program to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula  $m = 60 / (t + 2)$ , where t is the time in hours. Sketch a graph for t vs. m, where  $t \geq 0$ .
11. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:  $P(t) = (15000(1+t)) / (15 + e)$  where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.
12. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:
  - I. velocity wrt time ( $v = u + at$ )
  - II. distance wrt time ( $s = u*t + 0.5*a*t*t$ )
  - III. distance wrt velocity ( $s = (v^2 - u^2) / 2*a$ )
13. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:  $P(t) = (15000(1+t)) / (15 + e)$  where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.

## **BCA 507: COMPUTER GRAPHICS**

### **Course Contents:**

#### **UNIT – I**

**Introduction:** The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Applications, Development of Hardware and Software for Computer Graphics, Conceptual Framework for Interactive Graphics.

Overview, Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses.

**Graphics Hardware:** Hardcopy Technologies, Display Technologies, Raster-Scan Display Systems, The Video Controller, Random-Scan Display Processor, Input Devices for Operator Interaction, Image Scanners, Antialiasing.

**Clipping:** Cohen-Sutherland Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision algorithm.

#### **UNIT – II**

**Geometrical Transformations:** 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, The Window-to-Viewport Transformation, Efficiency, Matrix Representation of 3D Transformations, Transformations as a Change in Coordinate System.

#### **UNIT – III**

**Representing Curves & Surfaces:** Polygon Meshes, Parametric Cubic Curves

**Solid Modeling:** Representing Solids, Regularized Boolean Set Operations, Primitive Instancing, Sweep Representations, Boundary Representations, Spatial Partitioning Representations, Constructive Solid Geometry, Comparison of Representations, User Interfaces for Solid Modeling.

#### **UNIT – IV**

**Three-Dimensional Viewing:** Introduction, Representation of Three-dimensional objects, Projections, Parallel projections: Orthographic Projections, Oblique Projections. Perspective Projection, three-dimensional clipping, Three-dimensional Cohen-Sutherland clipping algorithm.

**Hidden Surface Removal:** Depth-Buffer (Z-buffer) method, Depth-sorting Method (Painter's algorithm)

### **TEXT BOOKS:**

- [1] D. Hearn & Baker: Computer Graphics with OpenGL, Pearson Education.
- [2] Chennakesava R. Alavla "Computer Graphics", PHI Learning Pvt. Limited

### **REFERENCE BOOKS:**

- [1] Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles & Practice, Pearson
- [2] Foley, J.D. & Van Dam, A: Fundamentals of Interactive Computer Graphics.
- [3] Rogers & Adams, "Mathematical Elements for Computer Graphics", McGraw Hill.

## **BCA 508: COMPUTER NETWORK AND INFORMATION SECURITY**

### **Course Contents:**

#### **Unit – I**

**Information security: Attributes of Information Security** - Confidentiality, Integrity, Availability. Threats & Vulnerabilities: Unauthorized Access, Impersonation, Denial of Service, Malicious Software; Trap Doors, Logic Bomb, Trojan Horses; Viruses, Worms & Bacteria; Cryptography Basics: Plain Text, Cipher Text, Encryption Algorithm, Decryption Algorithm; Requirements for Cryptography, Symmetric vs Asymmetric, Block and Stream ciphers, DES.

#### **Unit – II**

##### **Public Key Infrastructure &. Message Authentication:**

Public Key Cryptography Principles & Applications, Algorithms: RSA, Message Authentication: One-way Hash Functions: Message Digest, MD5, SHA1. Public Key Infrastructure: Digital Signatures, Digital Certificates, Certificate Authorities.

#### **Unit-III**

##### **Network Security Network Attacks:**

Buffer Overflow, IP Spoofing, TCP Session Hijacking, Sequence Guessing, Network Scanning: ICMP, TCP sweeps, Basic Port Scans; Denial of Service Attacks: SYN Flood, Teardrop attacks, land, Smurf Attacks.

IP security Architecture: Overview, Authentication header, Encapsulating Security Pay Load, combining Security Associations, Key Management. Virtual Private Network Technology: Tunneling using IPSEC.

#### **Unit – IV**

##### **Web Security**

Requirements, Secure Socket Layer, and Secure Electronic Transactions, Network Management Security: Overview of SNMP Architecture- SNMPV1, SNMPV3. Firewall Characteristics & Design Principles, Types of Firewalls: Packet Filtering Router, Application Level Gateway or Proxy, Content Filters, Bastion Host.

### **TEXTBOOKS:**

1. W. Stallings, Networks Security Essentials: Application & Standards, Pearson Education, 2000.
2. TCP/IP Protocol Suite, Behrouz A. Forouzan, “Data Communication and Networking”, Tata Mc Graw Hill.

### **REFERENCE BOOKS:**

1. W. Stallings, Cryptography and Network Security, Principles and Practice, Pearson Education, 2000.

## **BCA 509: MOBILE COMPUTING**

### **Course Contents:**

#### **UNIT – I**

**Introduction to wireless communications:** Applications, Short History of Wireless Communications, Market of Mobile Communications. Elementary Knowledge on Wireless Transmission: Frequency of Radio Transmission, Signals, Antennas, Signal Propagation: Path Loss of Radio Signals, Additional Signal Propagation Effects, Multipath Propagation, Multiplexing: Space Division Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing, Modulation: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Advanced Frequency Shift Keying, Advanced Phase Shift Keying, Multicarrier Modulation, Spread Spectrum: Direct Sequence Spread Spectrum, Frequency Hopping Spread Spectrum, Cellular Systems.

#### **UNIT – II**

**Elementary Knowledge on Medium Access Control:** Motivation for a specialized MAC, Hidden and exposed terminals, Near and far terminals, Introduction to SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access, CDMA, Spread Aloha multiple access, Mobile communications, Comparison of S/T/F/CDMA.

Elementary Knowledge on Telecommunications Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, New data services, DECT: System architecture, Protocol architecture. Elementary Knowledge on Satellite systems: History, Applications, Basics: GEO, LEO, MEO, Routing, Localization, Handover.

#### **UNIT – III**

**Mobile Internet:** Introducing the Mobile Internet, Services for the mobile Internet, Business opportunities. Implementing WAP Services: WML: WML Variables and Contexts: Variable Substitution, Setting Variables, Browser Contexts, WML Tasks and Events, WML User Interaction: Problems with Web Interaction, Interaction in WAP, Elements: <input>, <select>, <option>, <optgroup>, <do>, <anchor>, <a>, The tabIndex Attribute, WML Timers, WML Decks, Templates, and Cards: Elements: <wml>, <head>, <access>, <meta>, <card>, <template>, WML Text and Text Formatting, Elements: <p>, <br>, Character Formatting, Tables, WML Images: <img> Element, The WBMP Format.

#### **UNIT -IV**

**WAP:** The Mobile Internet Standard, Making the Internet Mobile: Challenges and Pitfalls, Overview of the Wireless Application Protocol.

**Implementing WAP Services:** WML Script: Datatypes, Variables, and Conversions, Operators and Expressions: Operand Conversions, Assignment Operators, Arithmetic Operators, Bitwise Operators, Shift Operators, Logical Operators, Increment and Decrement Operators, Comparison Operators, Type Operators, The Conditional Operator, The Comma Operator, Precedence and Associativity, WML Script Statements: Expressions as Statements, Blocks of Statements, Conditions, Loops, Returning from a Function, Other Statements, WML Script.

**Functions:** Function Declarations, Function Calls, Calls to Other Script Units, Calling WML Script from WML, Standard Libraries, WML Script Pragmas: The access Pragma, The meta Pragma, Elementary Knowledge on Libraries: Lang, Float, String, URL, WML Browser, Dialogs.

**TEXT BOOKS:**

1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education.
2. Sandeep Singhal, “The Wireless Application Protocol, Writing Applications for Mobile Internet”, Pearson Education.
3. Learning WML, and WML Script, Programming the Wireless Web, Martin Frost, Publisher: O'Reilly.

**REFERENCE BOOKS:**

1. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education.
2. Theodore S Rappaport, “Wireless Communication Principles and Practice”, Pearson Education.
3. C. Y. Lee and William, “Mobile Cellular Telecommunications”, McGraw Hill.

**SEMESTER - VI**

**BCA 601: PROJECT REPORT & VIVA-VOCE**

Each student shall undergo practical training of eight weeks during the vacations after fifth semester in an approved business / industrial / service organization and submit at least two copies of the Project Report along with CD to the concerned Department or Faculty of the Institution before the commencement of the End-term Examination. The Project Report Shall Carry 200 marks. The Project Report shall be evaluated and the Viva-Voce will be taken for 100 marks by an External Examiner and rest of the 100 marks shall be given by an Internal Examiner to be appointed by the Director / Examination Controller of the Institution.



**BCA 602: SEMINAR PRESENTATION**