

# Indira Gandhi University, Meerpur, Rewari



**Scheme for BCA**

**Session –w.e.f. 2022-2023**

## BCA First Year

### Semester-I

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
BCA-2101	Computer Fundamentals & C Programming	5:0:0	5	80	20	100
BCA-2102	Mathematics	5:0:0	5	80	20	100
BCA-2103	System Analysis and Design	5:0:0	5	80	20	100
BCA-2104	PC Software	5:0:0	5	80	20	100
BCA-2105	MS Office Lab	0:0:4	2	80	20	100
BCA-2106	C Programming Lab	0:0:4	2	80	20	100
			<b>24</b>	<b>480</b>	<b>120</b>	<b>600</b>

\*Practical Examination of BCA-2105 & 2106 may be conducted on the same day in 2 sittings each maximum of 4 hours.

### Semester-II

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
BCA-2201	Computer Organization Architecture	5:0:0	5	80	20	100
BCA-2202	Data Structure	5:0:0	5	80	20	100
BCA-2203	Internet & Web Designing	5:0:0	5	80	20	100
BCA-2204	Management Information System	5:0:0	5	80	20	100
BCA-2205	Data Structure Lab	0:0:4	2	80	20	100
BCA-2206	Internet & Web Lab	0:0:4	2	80	20	100
	<b>Total Credits</b>		<b>24</b>	<b>480</b>	<b>120</b>	<b>600</b>

\*Practical Examination of BCA-2205 & 2206 may be conducted on the same day in 2 sittings each maximum of 4 hours.

**BCA Second Year**  
**Semester-III**

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
BCA-2301	Operating System	5:0:0	5	80	20	100
BCA-2302	Introduction to Database Design	5:0:0	5	80	20	100
BCA-2303	Object Oriented Programming Using C++	5:0:0	5	80	20	100
BCA-2304	Artificial Intelligence	5:0:0	5	80	20	100
BCA-2305	C++ Lab	0:0:4	2	80	20	100
BCA-2306	Database Lab	0:0:4	2	80	20	100
BCA-2307	Seminar	1:0:0	1	-	25	25
			<b>25</b>	<b>480</b>	<b>145</b>	<b>625</b>

\*Practical Examination of BCA-2305 & 2306 may be conducted on the same day in 2 sittings each maximum of 4 hours.

**Semester-IV**

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
BCA-2401	Software Engineering & Testing	5:0:0	5	80	20	100
BCA-2402	Computer Graphics & Multimedia	5:0:0	5	80	20	100
BCA-2403	Analysis and Design of Algorithms	5:0:0	5	80	20	100
BCA-2404	Python Programming	5:0:0	5	80	20	100
BCA-2405	Computer Graphics Lab	0:0:4	2	80	20	100
BCA-2406	Python Lab	0:0:4	2	80	20	100
BCA-2307	Seminar	1:0:0	1	-	25	25
			<b>25</b>	<b>480</b>	<b>145</b>	<b>625</b>

\*Practical Examination of BCA-2405 & 2406 may be conducted on the same day in 2 sittings each maximum of 4 hours.

## BCA Third Year

### Semester-V

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
BCA-2501	Data Mining and E-Commerce	5:0:0	5	80	20	100
BCA-2502	Java Programming	5:0:0	5	80	20	100
BCA-2503	C#.Net Framework	5:0:0	5	80	20	100
BCA-2504	Introduction to Cloud Computing	5:0:0	5	80	20	100
BCA-2505	Java Lab	0:0:4	2	80	20	100
BCA-2506	C# Lab	0:0:4	2	80	20	100
BCA-2507	Seminar	1:0:0	1	-	25	25
			<b>25</b>	<b>480</b>	<b>145</b>	<b>625</b>

\*Practical Examination of BCA-2505 & 2506 may be conducted on the same day in 2 sittings each maximum of 4 hours.

\* Industrial Visit may also be conducted.

### Semester-VI

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
BCA-2601	Data Science	5:0:0	5	80	20	100
BCA-2602	Cryptography & Computer Network	5:0:0	5	80	20	100
BCA-2603	PHP	5:0:0	5	80	20	100
BCA-2604	Statistical Computing and R-Programming	5:0:0	5	80	20	100
BCA-2605	Web Designing Lab	0:0:4	2	80	20	100
BCA-2606	R-Programming Lab	0:0:4	2	80	20	100
BCA-2607	Minor Project	0:0:1	1	-	25	25
			<b>25</b>	<b>480</b>	<b>145</b>	<b>625</b>

\*Practical Examination of BCA-2605 & 2606 may be conducted on the same day in 2 sittings each maximum of 4 hours.

## **BCA-2101: COMPUTER FUNDAMENTALS & C PROGRAMMING**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

Computer Fundamentals: Generations of Computers, Definition, Block Diagram along with its components, characteristics & classification of computers, Limitations of Computers, Human-Being VS Computer, Applications of computers in various fields. Memory: Concept of primary & secondary memory, RAM, ROM, types of ROM, Cache Memory, flash memory.

### **UNIT-II**

Generations of Computer, Computer hardware & software: I/O devices, definition of software, relationship between hardware and software, types of software. Secondary storage devices: Sequential & direct access devices viz. Magnetic tape, magnetic disk, optical disks i.e. CD, DVD and virtual memory. Computer Virus: Definition, types of viruses, Characteristics of viruses, anti-virus software.

### **UNIT-III**

Overview of C: History of C, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Structure of a C Program, printf(), scanf() Functions, Operators & Expression, Type casting and conversion, operator hierarchy & associativity.

### **UNIT-IV**

Decision making & branching: Decision making with IF statement, IF-ELSE statement, Nested IF statement, switch statement, goto statement. Looping: For, while, and do-while loop, jumps in loops, break, continue statement, Nested loops. Introduction to array, functions, pointer.

### **SUGGESTED READINGS**

- 1) Let Us C by Yashwant Kanetkar
- 2) Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill.
- 3) Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
- 4) Satinder Bal Gupta, Amit Singla: Computer Fundamentals & Programming in C, Shree Mahavir Book (Publishers), Delhi.
- 5) Rajaraman, V., Fundamentals of Computers, PHI
- 6) Ram, B., Computer Fundamentals, Architecture & Organization, New Age International (P) Ltd.

## BCA-2102: MATHEMATICS

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### 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. **DETERMINANTS:** Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle. **MATRICES:** Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse.

### UNIT II

**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.  
**LIMITS & CONTINUITY:** Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, and Continuity of a function at a Point, Continuity over an Interval, Sum, product and quotient of continuous functions.

### UNIT III

**Algebraic Structures:** Definitions and examples with one Binary Operation: Semi Groups, Monoids, Groups; Congruence Relation and Quotient Structures, Permutation Groups, Cyclic groups, Normal Subgroups, Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring.

### UNIT IV

**Basic Statistics:** Measure of Central Tendency, Preparing frequency distribution table, Mean, Mode, Median, Measure of Dispersion: Range, Variance and Standard Deviations, Correlation and Regression.

### SUGGESTED READINGS

- 1) Trembley, J.P & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
- 2) C.L.Liu: Elements of Discrete Mathematics, McGraw Hill.
- 3) Lipschutz, Seymour: Discrete Mathematics, Schaum's Series
- 4) Satinder Bal Gupta: Discrete Mathematics and Structures, University Science Press, Delhi.
- 5) Kenneth H. Rosen: Discrete Mathematics and its applications, TMH.
- 6) Doerr Alan & Levasseur Kenneth: Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd.
- 7) Gersting: Mathematical Structure for Computer Science, WH Freeman & Macmillan.

## **BCA-2103: SYSTEMS ANALYSIS AND DESIGN**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

Introduction to system, Definition and characteristics of a system, Elements of system, Types of system, System development life cycle, Role of system analyst, Analyst/user interface, System planning and initial investigation: Introduction, Bases for planning in system analysis, Sources of project requests, Initial investigation, Fact finding, Information gathering, information gathering tools, Fact analysis, Determination of feasibility.

### **UNIT-II**

Structured analysis, Tools of structured analysis: DFD, Data dictionary, Flow charts, Gantt charts, decision tree, decision table, structured English, Pros and cons of each tool, Feasibility study: Introduction, Objective, Types, Steps in feasibility analysis, Feasibility report, Oral presentation, Cost and benefit analysis: Identification of costs and benefits, classification of costs and benefits, Methods of determining costs and benefits, Interpret results of analysis and take final action.

### **UNIT-III**

System Design: System design objective, Logical and physical design, Design Methodologies, structured design, Form-Driven methodology(IPO charts), structured walkthrough, Input/Output and form design: Input design, Objectives of input design, Output design, Objectives of output design, Form design, Classification of forms, requirements of form design, Types of forms, Layout considerations, Form control.

### **UNIT-IV**

System testing: Introduction, Objectives of testing, Test plan, testing techniques/Types of system tests, Quality assurance goals in system life cycle, System implementation, Process of implementation, System evaluation, System maintenance and its types, System documentation, Forms of documentation.

### **SUGGESTED READINGS**

- 1) Systems Analysis and design, E.M. AWAD Galgotia Pub.(P) Ltd. 2) Data Management and Data Structures, Loomis (PHI)
- 3) System Analysis and Design. Elias Awad.
- 4) Introductory System analysis and Design, Lee Vol. I & II

## **BCA-2104: PC SOFTWARE**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT - I**

MS-Windows: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders.

### **UNIT - II**

Documentation Using MS-Word - Introduction to word processing interface, Toolbars, Menus, Creating & Editing Document, Formatting Document, Finding and replacing text, Format painter, Header and footer, Drop cap, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Previewing and printing document, Advance Features of MS-Word-Mail Merge.

### **UNIT - III**

Electronic SpreadSheet using MS-Excel - Introduction to MS-Excel, Cell, cell address, Creating & Editing Worksheet, Formatting and Essential Operations, Moving and copying data in excel, Header and footer, Formulas and Functions, Charts, Cell referencing, Page setup, Macros.

### **UNIT - IV**

Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect.

### **SUGGESTED READINGS**

- 1) Microsoft Office – Complete Reference – BPB Publication
- 2) Satinder Bal Gupta, Introductory Concepts of Information Technology, Shree Mahavir Book(Publishers), Delhi
- 3) Learn Microsoft Office – Russell A. Stultz – BPB Publication
- 4) Courter, G Marquis (1999). Microsoft Office 2000: Professional Edition. BPB. 5) Nelson, S L and Kelly, J (2002). Office XP: The Complete Reference. Tata McGraw-Hill.



## **BCA-2201: COMPUTER ORGANIZATION ARCHITECTURE**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT - I**

Information Representation: Number Systems, Binary Arithmetic, Fixed-point and Floating Point representation of numbers, BCD Codes, Error detecting and correcting codes, Character Representation – ASCII, EBCDIC, Unicode

### **UNIT - II**

Binary Logic: Boolean Algebra, Boolean Theorems, Boolean Functions and Truth Tables, Canonical and Standard forms of Boolean functions, Simplification of Boolean Functions – Venn Diagram, Karnaugh Maps.

### **UNIT - III**

Digital Logic: Introduction to digital signals, Basic Gates – AND, OR, NOT, Universal Gates and their implementation – NAND, NOR, Other Gates – XOR, XNOR etc. NAND, NOR, AND-OR-INVERT and OR-AND-INVERT implementations of digital circuits, Combinational Logic – Characteristics, Design Procedures, analysis procedures, Multilevel NAND and NOR circuits.

### **UNIT - IV**

Combinational Circuits: Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor, Parallel binary adder/subtractor, Encoders, Decoders, Multiplexers, Demultiplexers, Comparators, Code Converters, BCD to Seven-Segment Decoder.

### **SUGGESTED READINGS**

- 1) Gill, Nasib Singh and Dixit J.B.: Digital Design and Computer Organisation, University Science Press (Laxmi Publications), New Delhi.
- 2) M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Pvt. Ltd.
- 3) V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, Prentice Hall of India Pvt. Ltd.
- 4) Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall of India Pvt. Ltd.
- 5) Nicholas Carter, Schaum's Outlines Computer Architecture, Tata McGraw-Hill

## BCA-2202: DATA STRUCTURE

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### UNIT - I

Introduction: Elementary data organization, Data Structure definition, Data structure operations, Applications of data structures, Algorithms complexity and time-space, Sorting: Internal & external sorting, Quick sort, Heap sort, Merge sort, Searching: Linear search, binary search, merging, Comparison of various sorting and searching algorithms on the basis of their complexity.

### UNIT – II

Arrays: Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Parallel arrays, sparse arrays. Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searching in a linked list, Header linked list, Circular linked list, Two-way linked list, Applications of linked lists.

### UNIT – III

Stack: Introduction, Array and linked representation of stacks, Operations on stacks, Applications of stacks: Polish notation, Recursion.

Queues: Introduction, Array and linked representation of queues, Operations on queues, Deques, Priority Queues, Applications of queues.

### UNIT – IV

Tree: Introduction, Definition, Representing Binary tree in memory, Traversing binary trees, Traversal algorithms using stacks. AVL Tree, Threaded Tree.

Graph: Introduction, Graph theory terminology, Sequential and linked representation of graphs.

### SUGGESTED READINGS

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

## **BCA-2203: INTERNET & WEB DESIGNING**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT - I**

Introduction to Internet, Internet Services, WWW, Working of Internet, Internet Connection Concepts, Intranet and Extranet, DNS working, Modem, ISP. Single User, Multi User, Server, Workstation, PPP, Client-Server environment, Computer Network, Types Computer Network: PAN, LAN, MAN, WAN; Network Topologies. E-Mail Concepts – Configuring E-Mail Program, Sending and Receiving Files through E-Mail, Fighting Spam, differ from Postal mail.

### **UNIT - II**

Web Browsers, Search Engines, Categories of Search Engines, Searching Criterion, Surfing the Net, Hypertext Transfer Protocol (HTTP), URL, Hypertext. Other Internet Tools. Online Chatting, Messaging, and Conferencing Concepts, Usenet newsgroup concepts – Reading usenet newsgroups, Internet Relay Chat, Web-Based chat rooms and discussion boards.

### **UNIT - III**

HTML: Internet Language, Understanding HTML, Creating a Web Page, Linking to other Web Pages, Publishing HTML Pages, Text Alignment and Lists, Text Formatting Fonts Control, Creating HTML Forms. Creating Web Page Graphics, Putting Graphics on a Web Page, Custom Backgrounds and Colors, Creating Animated Graphics.

### **UNIT - IV**

Web Page Design and layout, Advanced Layout with Tables, Using Style Sheets. Voice and Video conferencing. Streamlining, Browsing, Keeping track of Favorite Websites. WebSecurity: cryptography techniques, Substitution and Transposition, Privacy, cookies and Site- Blocking.

#### References:

1. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. Satish Jain: "O" – Level Information Technology,
3. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
4. V.K. Jain: "O" – Level Information Technology, BPB Publications.
5. Gill, Nasib Singh: Essentials of Computer and Network Technology, Khanna Books Publishing Co., New Delhi.
6. Margaret Levine Young: Internet – The Complete Reference
7. Harley Hahn: The Internet – Complete Reference, TMH.

## **BCA-2204: MANAGEMENT INFORMATION SYSTEM**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT – I**

Introduction to system and Basic System Concepts, The Systems Approach, Information System: Definition & Characteristics, Types of information, Role of Information in Decision-Making, EDP and MIS management levels.

### **UNIT –II**

An overview of Management Information System: Definition & Characteristics, Components of MIS, Framework for Understanding MIS: Information requirements & Levels of Management, Structured Vs Unstructured decisions, Formal vs. Informal systems.

### **UNIT – III**

Developing Information Systems: Analysis & Design of Information Systems: Implementation & Evaluation, Pitfalls in MIS Development. Decision support systems – Planning, Control and Decision-making, ETL, TQC, TQM.

### **UNIT – IV**

Functional MIS: A Study of Personnel, Financial and production MIS, Introduction to e business systems, E-commerce technologies, applications, E-banking: debit card, Credit card, Smart card.

### **SUGGESTED READINGS**

1. J. Kanter, "Management/Information Systems", PHI.
2. Gordon B. Davis, M. H. Olson, "Management Information Systems – Conceptual foundations, structure and Development", McGraw Hill.
3. James A. O'Brien, "Management Information Systems", Tata McGraw-Hill.
4. James A. Senn, "Analysis & Design of Information Systems", Second edition, McGraw Hill.
5. Robert G. Murdick & Joel E. Ross & James R. Claggett, "Information Systems for Modern Management", PHI.
6. Lucas, "Analysis, Design & Implementation of Information System", McGraw Hill.

## BCA-2301: OPERATING SYSTEM

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### UNIT – I

**Fundamentals of Operating system:** Introduction to Operating System, its need and operating System services, Types of operating systems: Batch, Multi programming, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Multitasking.

**Process Management:** Process concept, Operation on processes, Cooperating Processes, Threads, and Inter-process Communication.

### UNIT-II

**CPU Scheduling:** Basic concepts, scheduling criteria, scheduling algorithms: FCFS, SJF, Round Robin & Queue Algorithms.

**Deadlocks:** Deadlock characterization, Methods for handling deadlocks, Banker's Algorithm.

### UNIT-III

**Memory Management:** Logical versus Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Fragmentation.

**Virtual Memory:** Demand paging, Performance of demand paging, Page replacement, Page replacement algorithms, Thrashing.

### UNIT-IV

**File management:** File system Structure, Allocation methods: Contiguous allocation, Linked allocation, Indexed allocation, Free space management: Bit vector, Linked list, Grouping, Counting.

**Device Management:** Disk structure, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

### SUGGESTED READINGS

1. Abraham Silberschatz, Peter B. Galvin, " Operating System Concepts", Addison-Wesley publishing. Co., 7th. Ed., 2004.
2. Nutt Gary, "Operating Systems", Addison Wesley Publication, 2000.
3. Andrew S. Tannenbaum, "Modern Operating Systems", Pearson Education Asia, Second Edition, 2001.
4. William Stallings, "Operating Systems, "Internals and Design Principles", 4th Edition, PH, 2001.
5. Ekta Walia, "Operating Systems Concepts", Khanna Publishes, New Delhi, 2002.

## **BCA -2302: INTRODUCTION TO DATABASE DESIGN**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT – I**

Basic Concepts – Data, Information, Records and files. Traditional file, Limitations of File, Database: advantages and disadvantages, Database Management System, Components of DBMS, Functions, Database Administrator, Database Limitations, Data Independence.

### **UNIT – II**

Database System Architecture, Classification of Database Management System, Centralized and Client Server architecture to DBMS, Data Models: Records- based Data Models. Entity-Relationship Model – Entity Types, Entity Sets, Attributes Relationship Types, Relationship Instances and ER Diagrams, abstraction and integration, Generalization and Specialization, Database Relations, Properties of Relations.

### **UNIT – III**

Relational algebra, Relational calculus, Relational database design: Functional dependencies, Modification anomalies, 1<sup>st</sup> to 3<sup>rd</sup> NFs, BCNF, 4<sup>th</sup> and 5<sup>th</sup> NFs, computing closures of set FDs, Keys, Relational Constraints.

### **UNIT – IV**

SQL: Data types, Basic Queries in SQL, Insert, Delete and Update Statements, Views, Query processing: General strategies of query processing, query optimization, query processor, concept of security, concurrency and recovery.

### **SUGGESTED READINGS**

1. Thomas Connolly Carolyn Begg, “Database Systems”, 3/e, Pearson Education
2. Elmasri & Navathe, “Fundamentals of Database Systems”, 5th edition, Pearson Education.
3. Satinder Bal Gupta & Aditya Mittal, “Introduction to Database Management System”, University Science Press, New Delhi.
4. C. J. Date, “An Introduction to Database Systems”, 8<sup>th</sup> edition, Addison Wesley N. Delhi.

## BCA-2303: OBJECT ORIENTED PROGRAMMING USING C++

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### UNIT-I

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

### UNIT-II

**Abstracting Mechanism:** classes, private and public, Constructor and Destructor, member function, static members, references.

**Memory Management:** new, delete, object copying, copy constructor, assignment operator, this input/output.

### UNIT-III

**Inheritance and Polymorphism:** Derived Class and Base Class, Different types of Inheritance, Overriding member function, Abstract Class, Public and Private Inheritance, Ambiguity in Multiple inheritance, Virtual function, Friend function, Static function.

### UNIT-IV

**Exception Handling:** Exception and derived class, function exception declaration, unexpected exception, exception when handling exception, resource capture and release.

**Template and Standard Template Library:** Template classes, declaration, template functions, namespace, string, iterators, hashes, iostreams and other types.

### SUGGESTED READINGS

1. Herbert Schildts : C++ - The Complete Reference, Tata McGraw Hill Publications.
2. BalaguruSwamy : C++, Tata McGraw Hill Publications.
3. Balaguruswamy : Object Oriented Programming and C++, TMH.
4. Shah & Thakker : Programming in C++, ISTE/EXCEL.
5. Johnston : C++ Programming Today, PHI.
6. Object Oriented Programming and C++, Rajaram, New Age International.
7. Samanta : Object Oriented Programming with C++ & JAVA, PHI.

## BCA-2304: ARTIFICIAL INTELLIGENCE

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### UNIT – I

**Overview of A.I:** Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success.

**Problems, problem space and search:** Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem. **Heuristic search techniques:** Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction

### UNIT - II

**Knowledge Representation:** Definition and importance of knowledge, Knowledge representation, various approaches used in knowledge representation, Issues in knowledge representation.

**Using Predicate Logic:** Representing Simple Facts in logic, Representing instances and is\_a relationship, Computable function and predicate.

### UNIT - III

**Natural language processing:** Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing.

**Learning:** Introduction learning, Rote learning, learning by taking advice, learning in problem solving, learning from example-induction, Explanation based learning.

### UNIT - IV

**Expert System:** Introduction, Representing using domain specific knowledge, Expert system shells. Architecture of an expert system.

### SUGGESTED READINGS:

1. Elaine Rich, Kevin Knight : Artificial Intelligence, Tata McGraw Hill.
2. David W. Rolston : Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
3. Satinder Bal Gupta, “ Artificial Intelligence”, Mahavir Book Publications, Delhi.
4. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1999 .
5. Nils J Nilsson , "Artificial Intelligence -A new Synthesis" 2nd Edition (2000), Harcourt Asia Ltd.



## BCA-2401: SOFTWARE ENGINEERING & TESTING

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### 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, 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, Function Oriented Design, Object Oriented Design, Software Metrics: Software measurements: What & Why, Design Metrics.

**Software Implementation:** Relationship between design and implementation, Implementation issues and programming support environment, coding the procedural design, Good coding style.

### UNIT - IV

**Software Testing:** Testing Process, Design of Test Cases, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing, Debugging Activities, WBT and BBT.

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

### Suggested Readings

1. Jalote, Pankaj : An Integrated Approach to Software Engineering, Narosa Publications.
2. Gill, Nasib Singh : Software Engineering, Khanna Book Publishing Co. (P) Ltd. N. Delhi.
3. Pressman : Software Engineering, TMH.
4. Satinder Bal Gupta, " Software Engineering", Shree Mahavir Book Depot (Publishers), New Delhi.
5. Chhillar Rajender Singh : Software Engineering : Testing, Faults, Metrics, Excel Books, New Delhi.
6. Ghezzi, Carlo : Fundamentals of Software Engineering, PHI.
7. Fairly, R.E. : Software Engineering Concepts, McGraw-Hill.

## BCA-2402: COMPUTER GRAPHICS & MULTIMEDIA

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### UNIT-I

**Graphics Primitives:** Introduction to computer graphics, Basics of Graphics systems, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices.

**Output Primitives:** Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary fill and flood fill algorithms.

### UNIT-II

**2-D Geometrical Transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

**2-D Viewing:** The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions.

### UNIT-III

**3-D Geometric Transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations.

**3-D Viewing:** Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

### UNIT-IV

**Multimedia:** Introduction to Multimedia: Classification of Multimedia, Multimedia Software, MIDI, Components of Multimedia – Audio: Analog to Digital conversion, Audio play backing and recording Video, Text: Hypertext, Hyper media and Hyper Graphics, Graphics and Animation: Classification of Animation, process of animation.

### SUGGESTED READINGS

1. Donald Hearn and M. Pauline Baker : Computer Graphics, PHI Publications.
2. Plastock : Theory & Problem of Computer Graphics, Schaum Series.
3. Foley & Van Dam : Fundamentals of Interactive Computer Graphics, Addison-Wesley.
4. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
5. Tosijasu, L.K. : Computer Graphics, Springer-Verlag.

## **BCA – 2403: ANALYSIS AND DESIGN OF ALGORITHMS**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT – I**

Introduction-Algorithm definition, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Randomized Algorithms. Divide and conquer- General method, applications – Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

### **UNIT – II**

Disjoint set operations, union and find algorithms, AND/OR graphs, Connected Components and Spanning trees, Bi-connected components Backtracking-General method, applications, the 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

### **UNIT – III**

Greedy method- General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

### **UNIT – IV**

NP Hard and NP Complete Problems: Basic concepts, NP hard graph and NP scheduling problems some simplified NP hard problems.

## **SUGGESTED READINGS**

1. Algorithm Design: Foundations, Analysis and Internet examples, M. T. Goodrich and R. Tomassia, John Wiley and sons.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson Education.
4. Foundations of Algorithms,, R. Neapolitan and K. Naimipour, 4th edition, Jones and Bartlett Student edition.
5. Introduction to Algorithms, 3rd Edition, T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, PHI

## **BCA-2404: PYTHON PROGRAMMING**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **Learning Objectives:**

1. Understanding the importance of Python in Machine Learning and Data analysis.
2. Getting knowledge of Machine learning algorithms in Python.
3. Develop the Python programming skills to solve computational problems.
4. Make the students aware about the usefulness of various python packages as per the application requirements.

### **UNIT – I**

Introduction to Python Programming, History of Python, its features, Scope of Python, Downloading and installing Python, Python code execution process, run a simple program on Python interpreter and IDLE. The concept of data types; variables, assignments; numerical types; arithmetic operators and expressions; comments in the program.

### **UNIT-II**

Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation, Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

### **UNIT-III**

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling, inheritance, polymorphism, operator overloading; exception handling, try block.

### **UNIT-IV**

Installing and exploring different python libraries used in Graphical User Interface design, Basics of File handling in python, Introduction to Matplotlib.

### **Learning Outcomes**

1. Exploring the different ways of running Python.
2. Teach the students to deal with real world data by importing data and performing various data analysis operations.
3. Plotting the data for data visualization.

### **SUGGESTED READINGS**

1. Fundamentals of Python: First Programs Author: Kenneth Lambert Publisher: Course Technology, Cengage Learning, 2012 ISBN-13:978-1-111-82270-5
2. Michael Urban And Joel Murach, Python Programming, Shroff /Murach,2016
3. Mark Lutz, Programming Python, O`Reilly, 4<sup>th</sup> Edition, 2010
4. Sheetal Taneja & Naveen Kumar, Python Programming - A Modular Approach with Graphics, Database, Mobile and Web Applications, Based on Python 3.

## **BCA-2501: DATA MINING AND E-COMMERCE**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

Business View of Information Technology applications: Business Enterprise Organization, Its functions, and core business process, Types of digital data, structured data, unstructured data, Semi-structured data. Introduction to OLTP and OLAP, Difference between OLAP and OLTP.

### **UNIT-II**

Types of Data Model: Data Modelling techniques, Fact table, Dimension table, Basics of Enterprise Reporting: Reporting perspectives common to all levels of Enterprise, Report Standardization and Presentation practices, Enterprise Reporting characteristics in OLAP World, Balanced scorecard, Dash boards.

### **UNIT-III**

Basics of data integration, Need for data Warehouse, Definition of data Warehouse, ODS, Goals of data warehouse, Constituents of data Warehouse, Data integration, Data integration technologies, Data Quality, Data Profiling.

### **UNIT-IV**

E-commerce and Types of E-commerce: Evolution of E-Commerce, Major Issues in Implementing, Comparison between Traditional Commerce and E-Commerce, Advantages and Disadvantages to Customers, Types of E-Commerce- B2B, B2C,C2B,C2C,B2G, Architectural Framework for E-Commerce, Impact on Business, Importance and Uses of E-Commerce, Applications of E-Commerce.

### **SUGGESTED READING:**

1. R.N.Prasad, Seema Acharya , Fundamentals of Business analytics, First Edition , 2011, Wiley-India.
2. GaliShmueli,. Nitin R Patel , Peter C . Bruce, “ Data mining for Business Intelligence ” Wiley-India, 2011.
3. Ralph Kimball ,Margy Ross, “Practical tools for Data Warehousing and Business Intelligence” , second Edition Wiley-India 2011.

## BCA-2502: JAVA PROGRAMMING

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of a total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### UNIT-I

**Object Oriented Methodology-1:** Paradigms of Programming Languages, Evolution of OO Methodology, Basic Concepts of OO Approach, Comparison of Object Oriented and Procedure Oriented Approaches, Benefits of OOPs, Introduction to Common OO Language, Applications of OOPs .

**Object Oriented Methodology-2:** Classes and Objects, Abstraction and Encapsulation, Inheritance, Method Overriding and Polymorphism.

### UNIT-II

**Java Language Basics:** Introduction To Java, Basic Features, Java Virtual Machine Concepts, Primitive Data Type And Variables, Java Operators, Expressions, Statements and Arrays.

**Object Oriented Concepts:** Class and Objects-- Class Fundamentals, Creating objects , Assigning object reference variables; Introducing Methods, Static methods, Constructors , Overloading constructors; This Keyword; Using Objects as Parameters, Argument passing, Returning objects , Method overloading, Garbage Collection, The Finalize ( ) Method.

**Inheritance and Polymorphism:** Inheritance Basics, Access Control, Multilevel Inheritance, Method Overriding, Abstract Classes, Polymorphism, Final Keyword.

### UNIT-III

**Packages :** Defining Package, CLASSPATH, Package naming, Accessibility of Packages , using Package Members.

**Interfaces:** Implementing Interfaces, Interface and Abstract Classes, Extends and Implements together.

**Exceptions Handling :** Exception , Handling of Exception, Using try-catch , Catching Multiple Exceptions , Using finally clause , Types of Exceptions, Throwing Exceptions, Writing Exception Subclasses.

### UNIT-IV

**Multithreading :** Introduction , The Main Thread, Java Thread Model, Thread Priorities, Synchronization in Java, Inter thread Communication.

**I/O in Java :** I/O Basics, Streams and Stream Classes ,The Predefined Streams, Reading from, and Writing to, Console, Reading and Writing Files , The Transient and Volatile Modifiers , Using Instance of Native Methods.

**Strings and Characters:** Fundamentals of Characters and Strings, The String Class , String Operations , Data Conversion using Value Of ( ) Methods , String Buffer Class and Methods.

### SUGGESTED READINGS

1. Programming in Java, E Balagurusamy .
2. The Complete Reference JAVA, TMH Publication.
3. Beginning JAVA, Ivor Horton, WROX Public.
4. JAVA 2 UNLEASHED, Tech Media Publications.
5. Patrick Naughton and Herbertz Schildt, “Java-2 The Complete Reference”, 1999, TMH.

## **BCA-2503: C# .NET FRAMEWORK**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

The Framework of .Net: Building blocks of .Net Platform (the CLR, CTS and CLS), Features of .Net, Deploying the .Net Runtime, Architecture of .Net platform, Introduction to namespaces & type distinction. Types & Object in .Net, the evolution of Web development.

### **UNIT – II**

Class Libraries in .Net, Introduction to Assemblies & Manifest in .Net, Metadata & attributes. Introduction to C#: Characteristics of C#, Data types: Value types, reference types, default value, constants, variables, scope of variables, boxing and unboxing.

### **UNIT – III**

Operators and expressions: Arithmetic, relational, logical, bitwise, special operators, evolution of expressions, operator precedence & associativity, Control constructs in C#: Decision making, loops, Classes & methods: Class, methods, constructors, destructors, overloading of operators & functions.

### **UNIT – IV**

Inheritance & polymorphism: visibility control, overriding, abstract class & methods, sealed classes & methods, interfaces. Advanced features of C#: Exception handling & error handling, automatic memory management, Input and output (Directories, Files, and streams).

### **SUGGESTED READINGS**

1. Introduction to C# using .NET By Robert J. Oberg, PHI, 2002.
2. Programming in C# By E. Balaguruswamy, Tata McGraw Hill.
3. The Complete Guide to C# Programming by V. P. Jain.
4. C# A Beginner's Guide, Herbert Schildt, Tata McGraw Hill.
5. C# and .NET Platform by Andrew Troelsen, Apress, 1st edition, 2001.

## **BCA-2504: INTRODUCTION TO CLOUD COMPUTING**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

**Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT - I**

Cloud Computing introduction: Basic structure of cloud computing, working model for cloud computing- deployment and service model, benefits, risks, limitations, components, Types of cloud Environment, characteristics, architecture from front end and back end, Evolution. Applications (Business, Data storage & backup, Management, Social etc.)

### **UNIT -II**

Public, Private, Hybrid, Community cloud model introduction with advantages and, (SaaS IaaS-PaaS) application, characteristics, Benefits, issues, GRID Computing- advantages, disadvantages, Cloud Computing infrastructure: Hypervisor, Technologies- virtualization, SOA Hardware virtualization with Characteristics, Types of Hardware Virtualization.

### **UNIT -III**

Security concerns threats in cloud computing security, security mechanism- IAM (Identify and access management), PKI (Public key infrastructure), Encryption (Symmetric vs asymmetric), SSO (Single sign on), specialized cloud architecture- Direct I/O access architecture, mLoad-balanced virtual switches, multiple resource access architecture, Federated cloud.

### **UNIT -IV**

Mobile Cloud Computing, cloud based ERP, CRM software, supply chain management (SCM), its Benefits, CC architecture, advantages, issues and applications, Introduction of various applications offered by AWS, Microsoft AZURE, GCP, Fog Computing.

### **SUGGESTED READINGS**

1. Cloud Computing a practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-HILL,2010 Edition.
2. Cloud Computing-web Based applications that change the way you work and collaborate online, Michael Miller, Pearson Education,2009 Edition.
3. “Cloud Computing for Dummies” by Judith Hurwitz , Bloor Robin, Marcia Kaufman & Fern Halper, November 2009.



## **BCA-2601: DATA SCIENCE**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting, Collection, storing, processing, describing and modeling, statistical modeling and algorithm modeling, AI and data science, Myths of Data science.

### **UNIT-II**

Introduction to Programming Tools for Data Science: Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web.

### **UNIT-III**

Data Science Methodology: Business Understanding, Analytic Approach, Data Requirements, Data Collection, Data Understanding, data Preparation, Modeling, Evaluation, Deployment, feedback.

### **UNIT-IV**

Data Science Application: Prediction and elections, Recommendations and business analytics, clustering and text analytics.

### **SUGGESTED READINGS :**

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Geron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.

## **BCA -2602: CRYPTOGRAPHY & COMPUTER NETWORK**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

Attacks on Computers and Computer Security: Introduction, Principles of security, Types of Security attacks, Security services, Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, encryption and decryption, symmetric and asymmetric key cryptography.

### **UNIT – II**

Symmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES), Differential and Linear Cryptanalysis, Block cipher modes of operation, Key distribution, Asymmetric key Ciphers: Principles of public key cryptography to systems, Algorithms (RSA, ECC), Key Distribution.

### **UNIT – III**

Network Reference Models: Layered architectures, protocol hierarchies, interface and services: ISO-OSI reference model; internet protocol stacks. Data Link Layer Functions and Protocols: Framing, Error-control, Flow-control; sliding window protocol; HDLC; Link State and Distance Vector Routing

### **UNIT – IV**

Medium Access Sublayer: CSMA/CD Protocol, Token Bus, Token Ring, FDDI; satellite networks. Network functions and protocols: Switching Concept; cell switching, routing and congestion control, TCP/IP protocol architecture. Network Device: Repeater, hub, switch, router and gateway; IRC ; TCP and UDP.

### **SUGGESTED READING:**

1. Cryptography and Network Security: C K Shyamala, N Harin i, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup>.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, MCGraw Hill, 2<sup>nd</sup> Edition.
3. Information Security, Principles and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

## **BCA-2603: PHP**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

PHP: Versions of PHP, Installation of PHP, Php.ini basics. Testing Installation. Building Blocks of PHP: Variables, data types, Operators & Expressions, Constants, Switching, Flow, Loops, Code Blocks and Browser Output.

### **UNIT - II**

Functions: Meaning, Calling, Defining a function. Return value from user defined function. Saving state with 'static' function. Arrays: Creating arrays, Array related functions. Working with String.

### **UNIT - III**

Date & Time: Formatting String with PHP, Using Date and time Functions with PHP. Forms: Creating simple input forms. Accessing Form input with user defined arrays, HTML and PHP Code on a single page.

### **UNIT - IV**

Redirecting User. Working with File Upload. Uploading & Downloading. Pattern matching in Php, Replacing text, splitting a string with a Regular Expression. Email: Sending Email, Headers, Reviewing SMTP, PHP Mailer.

### **SUGGESTED READINGS :**

1. Deitel, Deitel and Nieto : Internet & WWW. How to program, 2nd Edition, Pearson Education Asia.
2. Teach Yourself PHP, MYSQL & Apache Meloni, Pearson Education.
3. Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl & PHP By James Lee, Pearson Education.
4. PHP: A Beginner's Guide By Vaswani, Vikram Tata Mc-Graw Hill.

## **BCA-2604: STATISTICAL COMPUTING & R PROGRAMMING**

**External Marks: 80**

**Internal Marks: 20**

**Time: 3 hours**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Students will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory questions, students will have to attempt four more questions selecting one question from each Unit.

### **UNIT-I**

Introducing R , Installing R and RStudio, R data types and objects, Control structures, functions, scoping rules, dates and times. R Data Structures , Help functions in R , Vectors , Scalars , Declarations , recycling , Common Vector operations , Using all and any , Vectorized operations , NA and NULL values , Filtering , Vectorised if-then else , Vector Equality , Vector Element names.

### **UNIT-II**

Creating matrices , Matrix operations , Applying Functions to Matrix Rows and Columns , Adding and deleting rows and columns , Vector/Matrix Distinction, Avoiding Dimension Reduction , Higher Dimensional arrays , lists , Creating lists , General list operations , Accessing list components and values , applying functions to lists , recursive lists .

### **UNIT-III**

Creating Data Frames , Matrix-like operations in frames , Merging Data Frames , Applying functions to Data frames , Factors and Tables , factors and levels , Common functions used with factors , Working with tables , Other factors and table related functions , Control statements , Arithmetic and Boolean operators and values , Default values for arguments , Returning Boolean values , functions are objects.

### **UNIT-IV**

Classes, Managing your objects, Input/Output, accessing keyboard and monitor , reading and writing files , accessing the internet , String Manipulation , Graphics , Creating Graphs , Customizing Graphs , Saving graphs to files , Creating three-dimensional plots.

### **SUGGESTED READINGS:**

1. Norman Matloff, The Art of R Programming: A Tour of Statistical Software Design, No Starch Press, 2011.
2. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Addison-Wesley Data & Analytics Series, 2013.
3. Beginning R – The Statistical Programming Language, Mark Gardener, Wiley, 2013
4. Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R, Robert Knell, Amazon Digital South Asia Services Inc, 2013.