

JIS UNIVERSITY, Agarpara, Kolkata, WB

**Syllabus for Bachelor of Computer Application (BCA) Programme
(Effective for Students Admitted in Academic Session 2019-2020)**

COURSE STRUCTURE

1ST YEAR

S. No.	Paper Code	Paper Name	Contact periods per week			Total Contact Hours	Credit
			L	T	P		
SEMESTER - I							
Theory							
1	JBCA101	Computer Fundamentals and C Programming	3	1	-	4	4
2	JBCA102	Environmental Studies	3	1	-	4	4
3	JBCA103	Digital Electronics	3	1	-	4	4
4	JMBCA101	Basic Mathematics	3	1	-	4	4
Practical							
1	JBCA193	C Programming Lab	-	-	6	6	3
2	JBCA194	Office Tools	-	-	4	4	3
Sessional							
1	JXBCA181	Skillx	-	-	1	1	1
Total Credit						23	

S. No.	Paper Code	Paper Name	Contact periods per week			Total Contact Hours	Credit
			L	T	P		
SEMESTER - II							
Theory							
1	JBCA201	Computer Organization and Architecture	3	1	-	4	4
2	JBCA202	Software Engineering	3	1	-	4	4
3	JBCA203	Data Structure with C	3	1	-	4	4
4	JMBCA201	Advanced Mathematics	3	1	-	4	4
5	JHBCA201	Communicative English	3	1	-	4	2
Practical							
1	JBCA293	Data Structure Lab	-	-	6	6	3
2	JHBCA291	Language Lab	-	-	4	4	2
Sessional							
1	JXBCA281	Skillx	-	-	1	1	1
Total Credit						24	

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**COURSE STRUCTURE
2ND YEAR**

S. No.	Paper Code	Paper Name	Contact periods per week			Total Contact Hours	Credit
			L	T	P		
SEMESTER - III							
Theory							
1	JBCA301	Operating System	3	1	-	4	4
2	JBCA302	OOPS with C++	3	1	-	4	4
3	JBCA303	Computer Graphics	3	1	-	4	4
4	JMBCA301	Mathematics for Computing	3	1	-	4	4
Practical							
1	JBCA391	Operating System Lab	-	-	6	6	3
2	JBCA392	C++ Lab	-	-	6	6	3
3	JBCA393	Graphics Lab	-	-	6	6	3
Sessional							
1	JBCA381	NPTEL courses	-	-	-	-	2
2	JBCA382	Seminar and GD	-	-	1	1	1
3	JXBCA383	Skillx	-	-	1	1	1
Total Credit						29	

S. No.	Paper Code	Paper Name	Contact periods per week			Total Contact Hours	Credit
			L	T	P		
SEMESTER - IV							
Theory							
1	JBCA401	Data Base Management System	3	1	-	4	4
2	JBCA402	Programming with Java	3	1	-	4	4
3	JBCA403	Computer Networking	3	1	-	4	4
4	JMBCA401	Numerical Analysis	3	1	-	4	4
Practical							
1	JBCA491	DBMS Lab	-	-	6	6	3
2	JBCA492	JAVA Lab	-	-	6	6	3
3	JBCA493	Network Lab	-	-	6	6	3
Sessional							
1	JBCA481	Soft Skill Development	-	-	3	3	2
2	JBCA482	Seminar and GD	-	-	1	1	1
3	JXBCA483	Skillx	-	-	1	1	1
Total Credit						29	

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COURSE STRUCTURE**

3RD YEAR

S. No.	Paper Code	Paper Name	Contact periods per week			Total Contact Hours	Credit
			L	T	P		
SEMESTER - V							
Theory							
1	JBCA501	Web Technology	3	1	-	4	4
2	JBCA502	Network Administration with Linux/Unix	3	1	-	4	4
3	JBCA(BBA)501	Management and Accounting	3	1	-	4	4
Practical							
1	JBCA591	Web Technology Lab	-	-	6	6	3
2	JBCA592	Network Administration Lab	-	-	6	6	3
3	JBCA593	Minor Project	-	-	9	9	6
Sessional							
1	JBCA581	Industrial Training	-	-	-	-	3
2	JBCA582	Seminar and GD	-	-	1	1	1
3	JXBCA583	Skillx	-	-	1	1	1
Total Credit						29	

S. No.	Paper Code	Paper Name	Contact periods per week			Total Contact Hours	Credit
			L	T	P		
SEMESTER - VI							
Theory							
1	JBCA-E601A/B/C	Elective – I	3	1	-	4	4
2	JBCA-E602A/B/C	Elective – II	3	1	-	4	4
3	JHBCA601	Values and Ethics	3	1	-	4	4
Practical							
1	JBCA-E691A/B/C	Lab for Elective – I	-	-	6	6	3
3	JBCA691	Major Project with viva voce	-	-	15	15	12
Sessional							
1	JBCA681	Seminar and GD	-	-	1	1	1
2	JXBCA682	Skillx	-	-	1	1	1
Total Credit						29	

List of Electives

Code	Paper Name
JBCA-E601A	Python Programming
JBCA-E601B	Artificial Intelligence
JBCA-E601C	PHP/MySQL
JBCA-E602A	Machine Learning
JBCA-E602B	Mobile Computing
JBCA-E602C	Cyber Law and Security
JBCA-E602D	E Commerce

Syllabus for Bachelor of Computer Application (BCA) Programme

Detailed Syllabus

Semester I

Paper: Digital Electronics

Code : JBCA-103

Contacts Hours / Week: 3L+1L

Credits : 4

1. Module I: Number Systems & Codes (6L)

Decimal Number, Binary Number, Octal Number, Hexadecimal Number, Conversion – Decimal to Binary, Binary to Decimal, Octal to Binary, Binary to Octal, Hexadecimal to Binary, Binary to Hexadecimal, Octal to Binary to Hexadecimal, Hexadecimal to Binary to Octal; Floating Point Number Representation, Conversion of Floating Point Numbers, Binary Arithmetic, 1's and 2's Complement, 9's and 10's Complement, Complement Arithmetic, BCD, BCD addition, BCD subtraction, Weighted Binary codes, Non- weighted codes, Parity checker and generator, Alphanumeric codes

2. Module II: Logic Gates (2L)

OR, AND, NOT, NAND, NOR, Exclusive – OR, Exclusive – NOR, Mixed logic

3. Module III: Boolean Algebra (4L)

Boolean Logic Operations, Basic Law of Boolean Algebra, Demorgan's Theorem, Principle of Duality

4. Module IV: Minimization Techniques (5L)

Sum of Products, Product of Sums, Karnaugh Map (up to 4 variables)

5. Module V: Multilevel Gate Network (3L)

Implementation of Multilevel Gate Network, Conversion to NAND-NAND and NOR-NOR Gate Networks

6. Module VI: Arithmetic Circuits (5L)

Half Adder, Full Adder, Half Subtractor, Full Subtractor, Carry Look Ahead Adder, 4-Bit Parallel Adder

7. Module VII: Combinational Circuits (5L)

Basic 2-input and 4-input multiplexer, Demultiplexur, Basic binary decoder, BCD to binary converters, Binary to Gray code converters, Gray code to binary converters, Encoder.

8. Module VIII: Sequential Circuits (5L)

Introduction to sequential circuit, Latch, SR Flip Flop, D Flip Flop, T Flip Flop, JK Flip Flop, Master Slave Flip Flop

9. Module IX: Basics of Counters (2L)
Asynchronous (Ripple or serial) counter, Synchronous (parallel) counter

10. Module X: Basics of Registers (3L)

SISO, SIPO, PISO, PIPO, Universal Registers

Suggested Readings:

1. Digital Circuit & Design, Salivahan, VIKAS
2. Digital Design, M. Morris. Mano & Michael D. Ciletti, PEARSON
3. Fundamentals of Digital Circuits; Anand Kumar; PHI
4. Digital Electronics; Tokheim; TMH
5. Digital Electronics; S. Rangnekar; ISTE/EXCEL

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Environment Studies

Code : JBCA-102

Contacts Hours / Week: 3L+1L

Credits : 4

Module I: Introduction (5L)

1. Introduction to environment and ecology 2. Components of the environment, environmental degradation, natural cycles of environment.

Module II: Ecology (2L)

1. Elements of Ecology, Ecological balance, Effects of afforestation and deforestation

Module III: Air Pollution and Control (15L)

1. Atmospheric composition, Segments of atmosphere climate, weather 2. Atmospheric Stability, dispersion of pollutants 3. Sources and effects of air pollutants, primary and secondary pollutants 4. Criteria Pollutants:PM10, Source, Effect, Control 5. CO, NOx, Source, Effect, Control 6. SOx, Source, Effect, Control 7. Lead, Ozone, Source, Effect, Control 8. Green house effect, Control Measures 9. Depletion of ozone layer, Effects of UV exposers, Control Measures

Module IV: Water Pollution and Control (10L)

1. Hydrosphere, natural water resources and reserves 2. Pollutants: their origin and effects 3. COD and BOD test, NBOD and CBOD 4. River / lake / ground water pollution 5. Control Measures of water pollution 6. Drinking water and waste water treatment

Module V: Land Pollution (5L)

1. Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes) their origin and effects 2. Collection and disposal of solid waste, recycling and treatment methods

Module VI: Noise Pollution (3L)

1. Sources, effects, standards and control

Suggested Readings:

1. Environmental Chemistry by A. K. Dey, New Age international
2. Environmental Engineering by G.M. Masters, Prentice Hall India

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Computer Fundamentals and C Programming

Code : JBCA-101

Contacts Hours / Week : 3L+1L

Credits : 4

Unit-I Introduction to Computers: Introduction, Characteristics of Computers, Block diagram of computer, Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers, Types of Programming Languages, Machine Languages, Assembly Languages, High Level Languages, Data Organization, Drives, Files, Directories. Types of Memory: Primary And Secondary Memory, RAM, ROM, PROM, EPROM, Secondary Storage Devices, CD, HD, Pen drive. I/O Devices: Scanners, Plotters, LCD, Plasma Display. Number Systems: Decimal, Binary, Octal, Hexadecimal

Unit-II Algorithm and Flowcharts: Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples. Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples

Unit-III Operating System and Services in O.S.: DOS History, Files and Directories, Internal and External Commands, Batch Files, Types of O.S.

Unit-IV Windows Operating Environment: Features of MS Windows, Control Panel, Task Bar, Desktop, Windows Application, Icons, Windows Accessories, Notepad

UNIT-V Overview of C – Constants, Variables & Data Types – #Operators and Expressions#.

UNIT-VI Decision Making and Branching Statements – Looping Statements – User Defined Functions.

UNIT-VII Arrays – Strings – #Structures and Unions#.

UNIT-VIII Pointers – Pointer Expressions – Pointers and Arrays – #Pointers and Functions#.

UNIT-IX Files Management in C– I/O Operations on Files – #Random Access Files#.

Suggested Readings:

1. Computer Today by S. K. Basandra, Galgotia Publications, New Delhi
2. Programming in ANSI C by E Balagurusamy
3. Programming With C, Gottfried, TMH
4. The C Answer Book, Tondo, PHI
5. Programming & Problem Solving Through C Language, EXCEL BOOKS

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Basic Mathematics

Code: JMBCA-101

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Linear Algebra (12L)

Determinant and its properties (up to third order), Minor and cofactors, Matrices, addition, multiplication and transpose of a matrix, Symmetric and skew -symmetric matrices and their properties, Adjoint, Inverse matrix, Solution of linear equations in three variables by Cramer's rule and matrix inversion method, Permutation and Combinations, Binomial theorem.

2. Module II: Two dimensional Geometry (8L)

Locus, Straight lines, Circle, Conic section. Transformation of axes, Plane polar curves

3. Module III: Differential Calculus (12L)

Limits of function and continuity, fundamental properties of continuous functions (without proof), Derivatives, Geometric meaning of derivative, successive differentiation, Rolle's theorem, Mean value theorems, Taylor's and Maclaurin's theorem, Taylor's series, Functions of several variables, Limit and Continuity, Partial derivatives, Total differential, Euler's theorem on homogeneous functions of two variables. Tangents and normal

4. Module IV: Integral Calculus (8L)

Indefinite integrals, Definite integrals and their elementary properties, Definite integral as the limit of sum, Idea of improper integrals. Area under a plane curve

Suggested Readings:

1. Higher Algebra, S. K. Mapa, Levant Books.
2. Advanced Higher Algebra, Chakravorty and Ghosh, U N Dhar Pvt. Ltd.
3. Co-ordinate Geometry, S. L. Loney
4. Integral Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd.
5. Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd.
6. Advanced Engineering Mathematics, E Kreyszig, Wiley

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Computer Organization and Architecture

Code : JBCA-201

Contacts Hours / Week : 3L+1L

Credits : 4

1. Module I: Data Representation (4L)

1. Number Systems – decimal, binary, octal, hexadecimal, alphanumeric representation, 2. Complements – 1's complement, 2's complement, 9's complement, 10's complement, (r-1)'s complement, r's complement, 3. Fixed point representation – Integer representation, arithmetic addition, arithmetic subtraction, overflow, decimal fixed point representation, 4. Floating point representation, 5. IEEE 754 floating point representation

2. Module II: Computer Arithmetic (5L)

1. Addition algorithm of sign magnitude numbers, 2. Subtraction algorithm of sign magnitude numbers, 3. Addition algorithm of signed 2's complement data, 4. Subtraction algorithm of signed 2's complement data, 5. Multiplication algorithm, Booth's algorithm, 6. Division algorithm

3. Module III: Register transfer and micro operations (5L)

1. Register transfer language, 2. Register transfer, 3. Bus system for registers, 4. Memory transfers – memory read, memory write, 5. Micro operations – register transfer micro operations, arithmetic micro operations, logic micro operations, shift micro operations, 6. Binary adder, binary adder subtractor, binary incremter, arithmetic circuit for arithmetic micro operations, 7. One stage logic circuit, 8. Selective set, Selective complement, Selective clear, Mask, Insert, Clear

4. Module IV: Basic Computer organization and design (4L)

1. Instruction codes, 2. Direct address, Indirect address & Effective address, 3. List of basic computer registers, 4. Computer instructions: memory reference, register reference & input – output instructions, 5. Block diagram & brief idea of control unit of basic computer, 6. Instruction cycle

5. Module V: Micro programmed control (2L)

Control memory, Address sequencing, Micro program examples

6. Module VI: Central processing unit (5L)

1. General register organization, 2. Stack organization, Register stack, Memory stack, Stack operations – push & pop, 3. Evaluation of arithmetic expression using stack, 4. Instruction format, 5. Types of CPU organization (single accumulator, general register & stack organization) & example of their instructions, 6. Three, two, one & zero address instruction, 7. Definition and example of data transfer, data manipulation & program control instructions, 8. Basic idea of different types of interrupts (external, internal & software interrupts), 9. Difference between RISC & CISC

7. Module VII: Introduction to Microprocessors (3L)

Evolution of Microprocessors – Single Chip Microcontrollers – Embedded Microprocessors – Hardware, Software and Firmware – Central Processing Unit – Memory – Buses – Processing Speed of a Computer – Classification of Computers – Von Neumann Architecture – Harvard Architecture – Data Flow Architecture – Types of Microprocessors – Microprocessor Applications.

8. Module VIII: Input Output Organization (6L)

Peripheral devices, Input – output interface, Isolated I/O, Memory mapped I/O, Asynchronous data transfer: strobe & handshaking, Programmed I/O, Interrupt initiated I/O, Basic idea of DMA & DMAC Input – output processor

9. Module IX: Memory Organization (6L)

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Memory hierarchy, Main memory definition, types of main memory, types of RAM, ROM, difference between SRAM & DRAM, Cache memory, Cache memory mapping – Direct, Associative, Set Associative, CAM, hardware organization of CAM, Virtual memory, mapping using pages, page fault, mapping using segments, TLB, Auxiliary memory, diagrammatic representation of magnetic disk & hard disk drive, Definitions of seek time, rotational delay, access time, transfer time, latency.

Suggested Readings:

1. Computer System Architecture, M. Morris Mano, PEARSON
2. Computer Organization & Architecture – Designing For Performance, William Stallings, PEARSON
3. Computer Architecture & Organization, J.P. Hayes, TATA MCGRAW HILL
4. Computer Organization and Architecture, T. K. Ghosh, TATA MCGRAW-HILL
5. Computer Architecture, Behrooz Parhami, OXFORD UNIVERSITY PRESS
6. Badri Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications, Sixth Revised and Enlarged Edition, 2010.

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Software Engineering

Code: JBCA-202

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I:

Overview of Computer Based Information System- TPS, OAS, MIS, DSS, KBS Development Life Cycles- SDLC and its phases Models- Waterfall, Prototype, Spiral, Evolutionary Requirement Analysis and Specification, SRS System analysis- DFD, Data Modeling with ERD, Cost Benefit Analysis

2. Module II:

Feasibility Analysis, System Design Tools – data dictionary, structured chart, decision table, decision tree, Concept of User Interface, Essence of UML, CASE tool.

3. Module III:

Testing- Test case, Test suit, Types of testing - unit testing, system testing, integration testing, acceptance testing Design methodologies: top down and bottom up approach, stub, driver, black box and white box testing.

4. Module IV:

ERP, MRP, CRM, Software maintenance SCM, concept of standards (ISO and CMM), Risk Management, Configuration Management

Suggested Readings:

1. System analysis and design, Igor Hawryszkiewicz, Pearson
2. Analysis and design of Information System, V Rajaraman, PHI
3. Software Engineering, Ian Sommerville, Addison-Wesley

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Data Structure with C

Code : JBCA -203

Contacts Hours / Week : 3L+1L

Credits : 4

1. Module I: Concept of Abstract Data types (4L)

Concept of abstract data types, Structure, union, enum, pointer to structure, Self referential structure, Pointer to pointer

2. Module II: Dynamic Memory Allocation (4L)

Difference between static and dynamic memory allocation, Using functions such as malloc(), calloc(), realloc(), free().

3. Module III: File Management (4L)

Application of functions such as fopen(), fclose(), getc(), putc(), fprintf(), fscanf(), getw(), putw(), command line argument.

4. Module IV: Data Structure using array (4L)

Stack, queue, circular queue, priority queue, dequeue and their operations and applications.

5. Module V: Searching and Sorting (6L)

Searching: linear search, Binary search, their comparison, sorting: insertion sort, Selection sort. Quick sort, Bubble sort Heap sort, Comparison of sorting methods, Analysis of algorithm, complexity using big 'O' notation

6. Module VI: Linked Lists (4L)

Linear link lists, doubly linked lists, stack using linked list, queue using linked list, circular linked list and their operations and applications.

7. Module VII: Trees (5L)

Binary trees, binary search trees, representations and operations, thread representations, sequential representations, B tree , B+ tree

8. Module VIII: Graphs (5L)

Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs, Graph Traversal: Depth first search and Breadth first search. Spanning Trees, minimum spanning Tree, Shortest path algorithm

9. Module IX: Hashing (4L)

Definition, Hashing functions, Load factor and collision, open addressing (linear probing) and chaining method to avoid collision.

Suggested Readings:

1. Data Structures in C, Ajay Agarwal, Cyber Tech
2. Data Structures Using C, Radhakrishnan & Shrinivasan, ISTE/EXCEL BOOKS
3. C and Data Structure, Radhaganesan, Scitech
4. Data Structure Using C & C++, Tannenbaum, PHI
5. Mastering Algorithms with C, Loudon, SPD/O'REILLY

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Advanced Mathematics

Code : JMBCA-201

Contacts Hours / Week: 3L+1L

Credits : 4

1. Module I: Algebra (20L)

Abstract Algebra: Sets, Algebra of sets and their applications, Relations, Mapping, Compositions, Groups, Abelian groups, Sub-groups, Cyclic groups, Notion of ring and fields. Complex numbers, Modulus and amplitudes, De Moivre's theorem
Polynomials, Division algorithm, Fundamental theorem of classical algebra (statement only), Descart's rule of sign, Relation between roots and coefficients, symmetric function of the roots, transformation of polynomial equations, Binomial equations

2. Module II: Differential Equations (14L)

Order, degree, formation of a differential equation, Solutions of ODE, First order and first degree: Variable separation method, Homogeneous equations, Exact equations, Condition of exactness (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree, Clairaut's equation, second order linear ODE with constant coefficients, Solutions using D operator method. Cauchy-Euler equations and their solutions

3. Module III: Sequence and Series (6L)

Bounded and unbounded sequences, convergence or divergence of a sequence, behaviour of monotone sequences, algebra of convergent sequences, Cauchy's sequence, Cauchy's general principle of convergence, infinite series – its convergence and sum, series with positive terms and standard tests of convergence (without proof), alternating series, Leibnitz test, absolute convergence.

Suggested Readings:

1. Higher Algebra, S. K. Mapa, Levant Books
2. Advanced Higher Algebra, Chakravorty and Ghosh, U N Dhar Pvt. Ltd
3. Differential Equations, Shepley L Ross, Wiley
4. Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Communicative English

Code : JHBCA-201

Contacts Hours / Week : 3L+1L

Credits : 2

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- a. Meaning and Importance
 - b. Process of Communication
 - c. Channels of Communication
 - d. Nature of Technical Communication
 - e. Formal and Informal Communication Networks, Grapevine
 - f. Barriers to effective Communication
 - g. Case Studies
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- a. Corporate Etiquette and Office Dynamics
 - b. SWOT Analysis
 - c. Principles of Oral Presentation- i) Factors affecting presentation
ii) Presentation with Multimedia
 - d. GD- Protocol and Practice iii) Learning Effective Presentation skills
PI- Protocol and Practice
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- a. Planning Business Messages: Rewriting & edition- The First Draft, Reconstruction of the Final Draft. Business Letters: Sales Letter, Complaint Letter, Reply To Complaint, Placing Order, Enquiry Letter, Reply to enquiry, Request Letter & Job Application Letter & Resume, CV, Memo, Notice, Agenda, Minutes ,
- b. Modern Forms of Communication: Fax and E-Mail Writing Practices
- c. Reports
 - i) Nature & Significance
 - ii) Types of Report
 - iii) Different Formats of Report
 - iv) Writing Strategies
- d. Proposals
 - i) Nature & Significance
 - ii) Types of Proposal
 - iii) Structure & Writing Strategies

Note Taking and Note Making

- a. Significance and Importance
Body Language: Meaning

- a. Strategies for reading Comprehension
- b. Comprehension of Technical Materials Précis Writing

6. Module VI: Effective Listening (4L)

- a. Process
- b. Hearing and Listening
- c. Types of Listening

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- d. Barriers**
- e. Listening Exercise**

Suggested Readings:

1. Monipally: Business Communication Strategies, Tata McGraw Hill
2. Madhukar: Business Communication; Vikas Publishing House
3. Lakshinarayanan: English For Technical Communication; SciTech
4. Ghanekar: Communication Skill for Effective Management; EPH
5. Sharma: Business Correspondence & Report Writing; TMH

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Operating Systems

Code : JBCA-301

Contacts Hours / Week : 3L+1L

Credits : 4

1. Module I: Introduction (3L)

Importance of OS, Basic concepts and terminology, Types of OS, Different views, Journey of a command execution, Design and implementation of OS

2. Module II: Process (10L)

Concept and views, OS view of processes, OS services for process management, Scheduling algorithms, Performance evaluation; Inter-process communication and synchronization, Mutual exclusion, Semaphores, Hardware support for mutual exclusion, Queuing implementation of semaphores, Classical problem of concurrent programming, Critical region and conditional critical region, Monitors, Messages, Deadlocks

3. Module III: Resource Management (8L)

Memory management, File management, Processor management, Device management

4. Module IV: Security and related Issues (5L)

Security and protection, Authentication, Protection and access control, Formal models of protection, Worms and viruses

5. Module V: Multiprocessor System (6L)

Multiprocessor system, Classification and types, OS functions and requirements, Introduction to parallel computing, Multiprocessor interconnection synchronization

6. Module VI: Distributed OS (4L)

Introduction to distributed processing

7. Module VII:

Case studies

Suggested Readings:

1. Operating Systems, Galvin, John Wiley
2. Operating Systems, Milankovic, TMH
3. An Introduction to Operating System, Bhatt, PHI
4. Modern Operating System, Tannenbaum, PHI
5. Guide to Operating Systems, Palmer, VIKAS
6. Operating Systems, Prasad, Scitech

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Object Oriented Programming with C++

Code: JBCA-302

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Concept of OOP (3L)

Introduction OOP, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP

2. Module II: C++ Basics (3L)

Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures

3. Module III: C++ Functions (5L)

Simple functions, Call and return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions

4. Module IV: Objects and Classes (8L)

Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion

5. Module V: Inheritance (8L)

Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class

6. Module VI: Polymorphism (6L)

Pointers in C++, Pointers and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism

7. Module VII: I/O and File Management (5L)

Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, manipulators, File stream, C++ File stream classes, File management functions, File modes, Binary and random Files

8. Module VIII: Templates, Exceptions and STL (2L)

About template, Function templates and class templates, Introduction to exception, try-catch-throw, Overview and use of Standard Template Library

Suggested Readings:

1. Object Oriented Programming With C++, E Balagurusamy, TMH
2. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
3. The Complete Reference C++, Herbert Schilitz, TMH

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Computer Graphics

Code: JBCA-303

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Introduction to Computer Graphics (4L)

Introduction to Computer Graphics & Graphics systems, Graphics Display Devices, Raster and Random Scan Display

2. Module II: Line Drawing and Circle Drawing Algorithms (10L)

Points & Lines, Line Drawing Algorithms (DDA Algorithm, Bresenham's Line Drawing Algorithm) Circle Generation algorithm (Midpoint Circle Algorithm, Bresenham's Algorithm)

3. Module IV: 2D Transformations (12L)

Translation, Rotation, Scaling, Reflection, Shear etc. Homogenous Coordinates, Composite Transformation

4. Module V: Projection (2-dimension) (5L)

Line of Sight, Plane of Projection, Projection methods (Perspective and Parallel)

5. Module VI: Viewing and Clipping (5L)

Window to Viewport co-ordinate transformation, Point Clipping, Line Clipping (Cohen-Sutherland Line Clippings, Midpoint Sub-division Algorithm)

6. Module VII: Curves and Surfaces (4L)

Bezier Curves, B-splines, Hidden line/surface removal methods (Depth Buffer(Z-Buffer)Method)

Suggested Readings:

1. Introduction to Computer Graphics, A. Mukherjee, VIKAS
2. Computer Graphics, Rajiv Chopra, S. Chand
3. Procedural & Mathematical Elements in Computer Graphics, Rogers, TMH
4. Computer Graphics, Hearn & Baker, PHI

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Mathematics for Computing

Code: JMBCA-301

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Propositional Logic (8L)

Construction of truth table, Tautology, Contradiction, Contingency, Logical equivalence, Generating functions, Recurrence relations

2. Module II: Graph Theory (16L)

Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Bipartite graph, Degree of a graph, Theorems on graph, Complement of a graph, Regular graph, Complete graph, Sub-graph, Walks, Paths, Circuits, Hamiltonian and Euler Graph, Cut sets and cut vertices, Adjacency and incidence matrices of a graph, Graph isomorphism, Dijkstra's Algorithm for shortest path problem, Definition and properties of tree, Binary tree, Spanning tree of a graph, Minimal spanning tree, Algorithms: DFS, BFS, Kruskal's and Prim's algorithms

3. Module III: Probability Theory (10L)

Basics of Probability Theory: Axiomatic definition of probability. Conditional probability, Independent events and related problems, Bay's theorem (Statement only) & its application, One dimensional random variable, Probability distributions-discrete and continuous, Expectation, Binomial, Poisson, Uniform, Exponential, Normal distributions

1. Module IV: Frequency Distribution (6L)

Collection of data, Charts and diagram, Measure of central tendency, Measure of dispersion

Suggested Readings:

1. Discrete Structure & Graph Theory, Rathore, EPH.
2. Discrete Mathematical Structure, G.S. Rao, New Age International
3. Fundamental of Statistics, Goon, Gupta and Dasgupta
4. Mathematical Probability, Banerjee, Dey and Sen, U N Dhar Pvt. Ltd.
5. Engineering Mathematics, Vol. 1 & 2, Sastry, PHI

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Database Management System

Code: JBCA-401

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Introduction to data and data management (4L)

Introduction, Data and Information, Database and Data Base Management System, Components of Database System, Basics of Database Management System, File-based System and Database Management System, Advantages of using Database over File based system, Data Dictionary and Metadata, ANSI-SPARC Architecture, Database Users, Role of Database Administrator (DBA) and Data Administrator(DA), Database Environment, Need for a Database, Characteristics, or Features, or Advantages of Database Systems, Limitations of Database

2. Module II: Data Models and Architecture of DBMS (6L)

Schemas and Instances, DBMS Architecture, Three Level Architecture of Database(ANSI SPARC architecture), Evolution of Data Models, Hierarchical Data Model, Network Data Model, Relational Data Model Object-oriented Data Model, Object-relational Data Model, Data and Structural Independence, Database Languages DDL, DML, DCL, TCL, Database Access, Database Structure

3. Module III: Data Modeling using ER Modeling (6L)

Basic Terminology related to ER Model, Relational Model – Introduction, Advantages and Disadvantages, Identifying Entities, and Relationships, Types of Relationships, Relationship Participation, Notations in ER Model, Strong and Weak entity sets Composite entity, Managing Many-to-many, Relationship, Example of E-R Model, Types of Integrity Constraints, Extended E-R Model, Translating the ER Model into Relational Model, Object Modeling, Subclass and Super class, Specialization, Generalization and Aggregation, Class Diagram

4. Module IV: Relational Model and RDBMS (6L)

Introduction, RDBMS Terminology, Various Types of Keys, Relational Integrity Rules Entity integrity Rule, referential integrity rule, Functional Dependency, Armstrong Axioms, Relational Set Operators, Retrieval Operators, CODD's Twelve Rules of Relational Database, ACID properties, Views and their purpose, Database Life Cycle, Data Dictionary, Relational Algebra and relational calculus, exercise on Relational calculus and relational algebra, Comparisons of relational algebra and calculus Tuple Relational Calculus, Domain Relational Calculus, Introduction to SQL

5. Module V: Normalization (6L)

Introduction, Need for Normalization, Types of Dependencies - Functional Partial functional and Transitive, Multi-valued Dependency, Join Dependency, Lossless and Lossy Decompositions, Normalizing Tables, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Examples on Normalization, Determining, Candidate Key and further decomposition, Closure of a set and FD's and MVD's, Armstrong's AXIOMS, Minimal or canonical cover of FD's, Lossless Decomposition

6. Module VI: Managing Data Using Structured Query Language (SQL) (6L)

Introduction, Features of SQL, Database Languages - data definition and Data manipulation languages, Data Definition Commands, Data Manipulation Commands, (SELECT Statement and different Clauses, SQL Functions - Aggregate, Date and Time Functions, String Functions, Conversion Functions, Mathematical Functions, Special Operators), Types of Constraints, Different types of Join and Set Operators, Group by and having clauses, Sub-query, Views, Advances SQL Roll-up, Commit and Save point, Create user grant revoke, Introduction to PL/SQL – conditional statements, loop, variable binding, Embedded SQL.

Syllabus for Bachelor of Computer Application (BCA) Programme

7. Module VII: Transaction and Query Processing (5L)

Transaction Processing States, ACID Properties of Transaction, read and write operations in transaction, concurrency problems and reasons for recovery, System log, Steps of Query Processing, Query Optimization

8. Module VIII: Indexing and Hashing (1L)

Introduction, Overview, Primary Secondary Multi level, Dense and Space Index

Suggested Readings:

1. Korth, Silberschatz, Sudarshan – Database System Concepts; Tata Mc. Graw Hill
2. Ramez Elmasri, Shamkant B Navathe - Fundamentals of Database Systems; Pearson
3. C.J. Date - An Introduction to Database Systems, 8e, Pearson Education
4. Rajiv Chopra - Database Management Systems ; S CHAND
5. Atul Kahate - Introduction to Database Management Systems , Pearson
6. P.S. Deshpande - SQL and PL/SQL for Oracle 10g Black Book; Wiley Dreamtech

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Programming with Java

Code: JBCA-402

Contacts Hours / Week: 3L+1L

Credits: 4

Module I: OOPS Concept (4L)

Object, Class, Data abstraction, Data encapsulation, Inheritance, Polymorphism, Dynamic binding.

Module II: An overview of Java (2L)

Java features, JVM, Comparison between Java and C++, Idea of any Java Development Kit (JDK), learn to run java program through command line and with any JDK.

Module III: Data Concept (2L)

Data Types, variables and constants Tokens in Java (Identifiers, Literals, Keywords, Operator)

Module IV: Control and Iteration Statements (4L)

Simple if statement, if...else statement, Nesting of if-else statement, switch statement

For loop, While loop, Do-While loop

Module V: Array and Vector (2L)

1D and 2D array, vector concepts

Module VI: Class and Object (3L)

Creating main() in a separate class, Methods with parameters, Methods with a return type, Method overloading, Passing Objects as Parameters, Passing Values to methods and Constructor, Abstract classes

Module VII: Inheritance (2L)

Basic concepts, types of inheritance, use of super keyword, overriding methods.

Module VIII: String and String Buffer (2L)

Use of different functions

Module IX: Packages, Interfaces (3L)

User defined package, import package, Class path, How to create interface, use and extend interface

Module X: Exception Handling (2L)

Overview, What is Exceptions and handling exception?, Compile time errors Run time errors, try...catch, Using Multiple catch Blocks, finally Block, Throwing an Exception, Using the throw and throws Statement.

Module XI: Stream (3L)

Byte Streams, Input Stream, Output Stream Character Streams (Reader, Writer), How Files and Streams Work, Working with Reader classes (InputStreamReader, BufferedReader)

Module XII: Multithreaded Programming (3L)

Overview, Thread Life cycle, Advantages of multithreading over multi-tasking Thread Creation and simple programs, Synchronized threads, Synchronized Methods

Module XIII: Applets (4L)

Applet vs. Application, Applet class, Advantages of Applet, Applet Lifecycle My First Applet, Applet tag, How to run applet

Module XIV: Abstract Windows Toolkit (4L)

GUI Components, Interface and Classes of AWT Package, Labels, Buttons, Check Boxes, Radio button, Text Area, Text Field, Scrollbar, Panels, Layout managers, Simple event driven programming with Text Field and Button.

Suggested Readings:

1. Let Us JAVA 2 Edition, Yashavant Kanetkar BPB Publications
2. Programming with JAVA 5th Edition, E Balagurusamy

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Computer Networking

Code: JBCA-403

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: (8L)

Data Communication, Analog-Digital Signals. TCP/IP and OSI Model, Client, Server and Peers, Client/Server architecture, Wired & Wireless transmission, Guided-Unguided Media, Bus, Star, Ring, Mesh, Hybrid, LAN, MAN, WAN, Simplex, Half duplex and Full duplex, Asynchronous and Synchronous Transmission, Parallel and Serial Transmission, Base band and Broadband transmission.

2. Module II:

Different networking devices, IEEE 802.3, IEEE 802.4, IEEE 802.5, FDDI, DQDEB, ATM, Physical Addressing, Logical Addressing, Port Addresses, IPV4, IPV6, Classfull-Classless Addressing, Subnetting and Masking, NAT, DHCP, BOOTP, ARP, RARP, ICMP

3. Module III: (10L)

Different Encoding Techniques, FDM, TDM, Circuit Switching, Packet Switching, Message Switching. Routing, Routing Protocols: Distance Vector, Link State, Congestion Control: Leaky Bucket and Token Bucket Algorithm, ISDN

4. Module IV: (8L)

TCP, UDP, Firewalls, Proxy Router, DNS, FTP, TFTP, SMTP, TELNET, NFS, WWW, E-mail, HTTPS, Cable Network, Telephone Network

Suggested Readings:

1. B. Fourauzan, "Data Communications and Networking", 4th Edition, Tata McGraw-Hill
2. Tanenbaum, Computer Networks, 3rd Edition, PHI, New Delhi
3. D. Comer, "Computer Networks and Internet", 2nd Edition, Pearson Education

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Numerical Analysis

Code: JMBCA-401

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I:

Numerical errors and their computations, Truncation and rounding-off errors

Calculus of differences: Forward, Backward, Shift, Average, Central, Differential and Divided difference operators, Relation between the operators, Problems on missing terms

Interpolation: Newton's forward and backward interpolation, Lagrange's interpolation, Newton's divided difference Numerical Integration: General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Expression for corresponding error terms.

2. Module II: (20L)

Solutions of Nonlinear Equations: Bisection method, Regula-Falsi method, Method of Iteration, Newton Raphson method Numerical solution of a system of linear equation Gauss elimination method, LU factorization method, Gauss Seidel method Numerical solution of ordinary differential equation: Euler's method, Modified Euler's method, Runga-Kutta method, Predictor-Corrector method

Suggested Readings:

1. Introductory Methods of Numerical Analysis, S.S.Sastry, PHI
2. Numerical Methods, Jain, Iyenger & Jain, New Age International Publishers.
3. Numerical Analysis and Computational Procedure, S.A.Mollah, Books & Allied Pvt. Ltd

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Web technology

Code: JBCA-501

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Visual Basic .NET and the .NET Framework (8L)

Introduction to .net framework - Features, Common Language Runtime (CLR), Framework Class Library (FCL), Visual Studio.Net – IDE, Languages Supported, Components, Visual Programming, VB.net- Features, IDE- Menu System, Toolbars, Code Designer, Solution Explorer, Object Browser, Toolbox, Class View Window, Properties Window, Server Explorer, Task List, Output Window, Command Window

2. Module II: Elements of Visual Basic .net (8L)

Properties, Events and Methods of Form, Label, Text Box, List Box, Combo Box, Radio Button, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box, Scroll bar, Group Box, ToolTip Timer

3. Module III: Programming in Visual basic .net (8L)

Data Types, Keywords, Declaring Variables and Constants, Operators, Understanding Scope and accessibility of variables, Conditional Statements- If- Then, If-Then- Else, Nested If, Select Case, Looping Statement- Do loop, For Loop, For Each-Next Loop, While Loop, Arrays-Static and Dynamic

4. Module IV: Functions, Built in Dialog Boxes, Menus and Toolbar (8L)

Menus and toolbars- Menu Strip, Tool Strip, Status Strip, Built-In Dialog Boxes – Open File Dialogs, Save File Dialogs, Font Dialogs, Color Dialogs, Print Dialogs, Input Box, Message Box, Interfacing With End user - Creating MDI Parent and Child, Functions and Procedures- Built-In Functions- Mathematical and String Functions, User Defined Functions and Procedures

5. Module V: Object Oriented Programming (8L)

Object Oriented Programming- Creating Classes , Objects, Fields, Properties, Methods, Events , Constructors and destructors, Exception Handling - Models, Statements, File Handling- Using File Stream Class, File Mode, File Share, File Access Enumerations, Opening or Creating Files with File Stream Class, Reading and Writing Text using StreamReader and StreamWriter Classes, Data Access withADO.Net – What are Databases?, Data Access with Server Explorer, Data Adapter and Data Sets, ADO.NET Objects and Basic SQL. Connection with Sql Server.

Suggested Readings:

1. Fred Barwell, " Professional VB.NET" ,2nd edition, WROX Publication
2. Jesse Liberty," Learning Visual Basic. NET",O'RELLY
3. Paul Vick," The Visual Basic .Net Programming Language"

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Network Administration with Linux/Unix

Code: JBCA-502

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I:

1. Introduction to UNIX

UNIX operating system, UNIX architecture: Kernel and Shell, Files and Processes, System calls, Features of UNIX, POSIX and single user specification, Internal and external commands

2. Utilities of UNIX

Calendar (cal), Display system date (date), Message display (echo), Calculator (bc), Password changing (password), Knowing who are logged in (who), System information using uname, File name of terminal connected to the standard input (tty)

3. UNIX file system

File system, Types of file, File naming convention, Parent – Child relationship, HOME variable, inode number, Absolute pathname, Relative pathname, Significance of dot (.) and dotdot (..), Displaying pathname of the current directory (pwd), Changing the current directory (cd), Make directory (mkdir), Remove directories (rmdir), Listing contents of directory (ls), Very brief idea about important file systems of UNIX: /bin, /usr/bin, /sbin, /usr/sbin, /etc, /dev, /lib, /usr/lib, /usr/include, /usr/share/man, /temp, /var, /home

2. Module II: Files (8L)

1. Ordinary file handling

Displaying and creating files (cat), Copying a file (cp), Deleting a file (rm), Renaming/ moving a file (mv), Paging output (more), Printing a file (lp), Knowing file type (file), Line, word and character counting (wc), Comparing files (cmp), Finding common between two files (comm), Displaying file differences (diff), Creating archive file (tar), Compress file (gzip), Uncompress file (gunzip), Archive file (zip), Extract compress file (unzip), Brief idea about effect of cp, rm and mv command on directory

2. File attributes

File and directory attributes listing and very brief idea about the attributes, File ownership, File permissions, Changing file permissions – relative permission & absolute permission, Changing file ownership, Changing group ownership, File system and inodes, Hard link, Soft link, Significance of file attribute for directory, Default permissions of file and directory and using umask, Listing of modification and access time, Time stamp changing (touch), File locating (find)

3. Module III: Shell and Process (8L)

1. Shell

Interpretive cycle of shell, Types of shell, Pattern matching, Escaping, Quoting, Redirection, Standard input, Standard output, Standard error, /dev/null and /dev/tty, Pipe, tee, Command substitution, Shell variables

2. Process

Syllabus for Bachelor of Computer Application (BCA) Programme (Effective for Students Admitted in Academic Session 2018-2019)

Basic idea about UNIX process, Display process attributes (ps), Display System processes, Process creation cycle, Shell creation steps (init -> getty -> login -> shell), Process state, Zombie state, Background jobs (& operator, nohup command), Reduce priority (nice), Using signals to kill process, Sending job to background (bg) and foreground (fg), Listing jobs (jobs), Suspend job, Kill a job, Execute at specified time (at and batch)

4. Module IV:

1. Customization

Use of environment variables, Some common environment variables (HOME, PATH, LOGNAME, USER, TERM, PWD, PS1, PS2), Aliases, Brief idea of command history

2. Filters

Prepare file for printing (pr), Custom display of file using head and tail, Vertical division of file (cut), Paste files (paste), Sort file (sort), Finding repetition and non-repetition (uniq), Manipulating characters using tr, Searching pattern using grep, Brief idea of using Basic Regular Expression (BRE), Extended Regular Expression (ERE), and egrep, grep -E

5. Module V:

1. Introduction to shell script

Simple shell scripts, Interactive shell script, Using command line arguments, Logical operator (&&), Condition checking (if, case), Expression evaluation (test, [[), Computation (expr), Using expr for strings, Loop (while, for), Use of positional parameters

2. System Administration

Essential duties of UNIX system administrator, Starting and shutdown, Brief idea about user account management (username, password, home directory, group id, disk quota, terminal etc.)

Suggested Readings:

- 1. UNIX-Concepts & Applications, Sumitava Das, TMH**
- 2. Learning UNIX Operating System, Peek, SPD/O'REILLY**
- 3. Understanding UNIX, Srirengan, PHI**
- 4. Essentials Systems Administration, Frisch, SPD/O'REILLY**

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Management and Accounting

Code: JBCA (BBA)-501

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Financial Accounting (15L)

1. Basic Concept of Accounting 2. Concepts and Conventions of Accounting 3. Journal Entries and Ledger Posting 4. Trial Balance. 5. Financial Statement

2. Module II: Cost Accounting (10L)

1. Basic Concept of Cost 2. Classification of Cost 3. Cost Sheet 4. Materials - EOQ, LIFO and FIFO 5. Labor - Wage payment System (Piece Rate, Time Rate, Halsey and Rowan Scheme) 6. Overheads - Meaning and Distribution (Primary Distribution)

3. Module III: Management Accounting (15L)

1. Basics of Management (Planning, Scheduling, Organizing, Staffing, Directing and Controlling) 2. Sources of Finance- long Term and Short Term 3. Cost-Volume -Profit Analysis 4. Capital Budgeting 5. Budget and Budgetary Control (Cash and Flexible Budget) 6. Investment of Funds [Conceptual Framework of Mutual Fund and Systematic Investment Plan (SIP)]

Suggested Readings:

1. Management Accounting, Khan & Jain, TMH
2. Cost and Management Accounting, Basu & Das, Rabindra Library
3. Economics for Engineers, Partha Chatterjee, Vrinda Publications P Ltd
4. Modern Accountancy, Hanif & Mukherjee, TMH

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Python Programming

Code: JBCA-E601A

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I:

1. Introduction to Python

2. Python variables, expressions, statements

2.1 Variables, 2.2 Keywords, 2.3 Operators & operands, 2.4 Expressions, 2.5 Statements, 2.6 Order of operations, 2.7 String operations, 2.8 Comments, 2.9 Keyboard input, 2.10 Example programs

3. Functions

3.1 Type conversion function, 3.2 Math functions, 3.3 Composition of functions, 3.4 Defining own function, parameters, arguments, 3.5 Importing functions, 3.6

Example programs

2. Module II:

1. Conditions 1.1 Modulus operator, 1.2 Boolean expression, 1.3 Logical operators, 1.4 if, if-else, if-elif-else, 1.5 Nested conditions, 1.6 Example programs

2. Iteration

2.1 while, 2.2 for, 2.3 break, 2.4 continue, 2.5 Nested loop, 2.6 Example programs

3. Module III:

1. Recursion 1.1 Python recursion, 1.2 Examples of recursive functions, 1.3 Recursion error, 1.4 Advantages & disadvantages of recursion

2. Strings

2.1 Accessing values in string, 2.2 Updating strings, 2.3 Slicing strings, 2.4 String methods – upper(), find(), lower(), capitalize(), count(), join(), len(), isalnum(), isalpha(), isdigit(), islower(), isnumeric(), isspace(), isupper() max(), min(), replace(), split(), 2.5 Example programs

3. List

3.1 Introduction, 3.2 Traversal, 3.3 Operations, 3.4 Slice, 3.5 Methods, 3.6 Delete element, 3.7 Difference between lists and strings, 3.8 Example program

4. Dictionaries

4.1 Introduction, 4.2 Brief idea of dictionaries & lists 5 Tuples (1L)

5.1 Introduction, 5.2 Brief idea of lists & tuples, 5.3 Brief idea of dictionaries & Tuples

4. Module IV:

1. Classes & Objects

1.1 Creating class, 1.2 Instance objects, 1.3 Accessing attributes, 1.4 Built in class attributes, 1.5 destroying objects, 1.6 Inheritance, 1.7 Method overriding, 1.8 Overloading methods, 1.9 Overloading operators, 1.10 Data hiding, 1.11 Example program

Suggested Readings:

- 1. Learn Python The Hard Way, Zed A. Shaw, ADDISON-WESLEY**
- 2. Learning Python, Mark Lutz, O'REILY**
- 3. Programming In Python, Dr. Pooja Sharma, BPB**
- 4. Python Programming - Using Problem Solving Approach, Reema**

Thareja, OXFORD UNIVERSITY PRESS

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Artificial Intelligence

Code: JBCA-E601B

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Introduction to AI (1L)

Overview of Artificial Intelligence – Introduction – History of AI – Application of AI – Objectives of AI-feature of AI

2. Module II: Symbolic Logic (6L)

Normal Forms in Propositional Logic – Logical Consequences – Resolution Principal – Predicate Calculus – Well Formed Formulas – Clausal Form – Rules of Inference – Unification – Resolution

3. Module III:

State Space Search, Blind Search Techniques (Depth First Search, Breadth First Search, Depth Limited Search, Bidirectional Search), Heuristic Search Techniques (Best First Search, Hill Climbing Search, A* Search, AND/OR Graphs, Problem reduction and AO* algorithm), Game Searches (Minmax Search Procedure, Alpha-Beta Cut offs)

4. Module IV: Knowledge representation (8L)

Procedural verses declarative knowledge, forward verses backward reasoning, Structured Knowledge: Graphs, Frames, and Related Structures, Object-Oriented Representations, Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics

5. Module V: Expert system (2L)

Characteristic features of expert systems Applications, importance of expert systems Rule based system architectures (the knowledge base, the inference process, explaining how or why, building a knowledge base, the I/O interface)

6. Module VI: Learning (9L)

Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning (Human neurons to artificial neurons-Learning Algorithms – Difference Network Architectures and their applications – Comparisons of Neural Networks and rule based Methods - – Comparisons of Neural Networks and Expert System – Benefits of Neural Computing – Limitations of Neural Computing) & genetic learning (different operators of Genetic Algorithm ,Analysis of selection operations)

7. Module VII: AI Programming (4L)

Basic knowledge of programming language - Prolog & Lisp

Suggested Readings:

- 1. Artificial Intelligence, Ritch & Knight, TMH**
- 2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson**
- 3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI**
- 4. Logic & Prolog Programming, Saroj Kaushik, New Age International**
- 5. Expert Systems, Giarranto, VIKAS**

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: PHP / MySQL

Code: JBCA-E601C

Contacts Hours / Week: 3L+1L

Credits: 4

UNIT-I 12 hours

Introduction: What is PHP? – History of PHP – Installing PHP – Language Basics: Lexical Structure – Data types – What's a Variable?– PHP variable and value types – Using PHP Variables – Expression and Operators – #Flow Control statements#.

UNIT-II 12 hours

Functions: Calling a function – Defining a function – Introduction to Strings – Comparing Strings – Manipulating and Searching strings – #Arrays: Types of Arrays# – Array functions – Storing data in Arrays.

UNIT-III 12 hours

Form Handling – Form Validation – \$_GET variable – \$_POST variable – \$_REQUEST variable – Creating the Form –#Creating the Upload script# – Using your File system: File paths and permissions – Displaying directory contents – Working with fopen() and fclose().

UNIT-IV 12 hours

Using Cookies: What are Cookies? – Setting Cookies – Using Cookie variables – Session Basics: What's a session? – Understanding Session variables – Managing User preferences with Sessions – Graphics: Drawing functions – #Creating and Drawing images#.

UNIT-V 12 hours

Installing and Configuring MySQL – Establishing a connection and poking around – Creating a database table – Inserting data into the table – #Selecting and displaying data#.

Suggested Readings:

1. Julie Meloni and Matt Telles, PHP 6, Course Technology, CENGAGE Learning, India Edition, 2008
2. Kevin Tatroe, Peter MacIntyre and RasmusLerdorf, Programming PHP, O'REILLY media , 3rd edition, 2013.

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Machine Learning

Code: JBCA-E602A

Contacts Hours / Week: 3L+1L

Credits: 4

Module – 1: Introduction [3L]

Applications and problems, learning scenarios, concepts of tasks (problems to be solved by machine learning), models (output of machine learning) and features (workhorses of machine learning). geometric models, probabilistic models, logical models.

Module – 2 Classification Schemes [5L]

Binary classification, assessing and visualizing performance of classification, scoring and ranking, turning rankers into classifiers, class probability estimation.

Multiclass classification, multiclass scores and probabilities, regression, unsupervised and descriptive learning, predictive and descriptive clustering.

Module - 3: Various Models[15L]

Tree Models [3L]

Decision trees, ranking and probability estimation trees, tree learning as variance reduction, regression trees.

Rule Models [2L]

Learning ordered rule lists, learning unordered rule sets, descriptive rule learning, rule learning for subgroup discovery, association rule mining, first-order rule learning.

Linear Models [4L]

Least squares method, multivariate linear regression, regularized regression. Perceptron, support vector machine, soft margin SVM, probabilities from linear classifiers, beyond linearity with kernel methods.

Distance-based Models [3L]

Nearest neighbour classification, distance[-based clustering, K-means algorithm, clustering around medoids. Hierarchical clustering.

Probabilistic Models [3L]

Normal distribution, probabilistic models for categorical data, naïve Bayes model for classification, probabilistic models with hidden variables, Gaussian mixture model, compression-based model.

Module - 4 : Features [4L]

Types of features, calculation on features, categorical, ordinal and quantitative features, structured features, thresholding and discretization, normalization and calibration, incomplete features, feature selection - matrix transformations and decompositions.

Module - 5 : Model Ensembles and Machine Learning Experiments [4L]

Model Ensembles [2L]

Bagging and random forests, boosted rule learning, mapping the ensemble landscape – bias, variance and margins, meta learning. [2L]

Machine Learning Experiments [2L]

What to measure, how to measure, how to interpret, interpretation of results over multiple data sets.

[2L]

Module - 6 : More Selected Topics in Machine Learning [4L]

Support vector machines – separable and un separable cases, primal optimization and dual optimization problems, kernel methods – positive definite symmetric kernels and negative definite symmetric kernels, kernel-based algorithms.

Suggested Readings:

1. Peter Flach, Machine Learning. Cambridge University Press, 2012.
2. M. Mohri, A. Rostamizadeh and A. Talwalkar, Foundations of Machine Learning, MIT Press, 2012.
3. Kevin P. Murphy, Machine Learning : A Probabilistic Perspective. MIT Press, 2012.

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Mobile Computing

Code: JBCA-E602B

Contacts Hours / Week: 3L+1L

Credits: 4

Module I: Introduction [6L]:

Evolution of different types of wireless communication devices; Effects of mobility of devices; Cellular mobile networks – mobility management (call setup, handoff, interoperability and internetworking), bandwidth management, energy management, security; Brief introduction about different generations of wireless communication technology – 1G, 2G, 3G, 4G, 5G.

Module II: Mobile Data Communication [5L]

Mobile Data Communication, WLANs (Wireless LANs) IEEE 802.11 standard, Bluetooth technology, Bluetooth Protocols, Ad hoc networks initialization, leader election, location identification, communication protocols, energy and security.

Module III: Mobility Management in Cellular Networks [4L]

Call setup in PLMN (location update, paging), GPRS, Call setup in mobile IP networks; Handoff management; Mobility models- random walk, random waypoint, map-based, group-based.

Module IV: Bandwidth Management in Cellular Mobile networks [3L]

Mathematical formulation of the channel assignment problem (CAP); CAP and generalized graph coloring; Benchmark instances; Lower bound on bandwidth.

Module V: Localization of Nodes in a Mobile Network [4L]

Different approaches, Indoor and outdoor localizations, LOS and NLOS signals, Outdoor localization techniques –triangulation (TOA-based, AOA- based), errors due to inaccuracies in coordinates of beacon nodes and in measurements.

Module VI: Message Communication in Ad Hoc Networks [6L]

Collision avoidance mechanism (different schemes for a deterministic transmission schedule), collision resolution mechanism – successive partitioning approach; Time slot assignment based on location information, Point-to-point routing in ad hoc networks – proactive, reactive and hybrid approaches, different protocols - DSDV, DSR, AODV, TORA, ZRP

Module VII: Energy-efficient Communication [3L]

Energy efficiency at various layers - Physical layer, MAC layer, Network layer, Application layer, performance analysis in noisy channel environment.

Module VIII: Secure Wireless Communication [4L]

Introduction-different types of attacks, internal attacks, external attacks; measures against attacks (authentication, intrusion detection, encryption); RC4 algorithm

Suggested Readings:

1. K. Sinha, S.Ghosh and B. P. Sinha, Wireless Networks and Mobile Computing. CRC Press : New York, 2015.
2. Research articles published on secure wireless communication (authentication, mitigation of DoS, DDoS, eavesdropping) published in leading journals.
3. Mark Ciampa, Guide to Designing and Implementing wireless LANs, Thomson learning, Vikas Publishing House, 2001.

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Cyber Law and Security

Code: JBCA-E602C

Contacts Hours / Week: 3L+1L

Credits: 4

Module – 1A: Introduction of Cybercrime: [7]

Cybercrime, Forgery, Hacking, Software Piracy, Computer Network intrusion
Jurisdiction to prescribe/Legislative Jurisdiction; Jurisdiction to adjudicate to enforce; Cyber
Jurisdiction in Civil, Criminal & International Cases.

Module – 1B: Category of Cybercrime: [5]

Criminals plan attacks, passive attack, Active attacks, cyber stalking. Unicitral Model Law,
Information Technology Act.

Module – 2: Cybercrime Mobile & Wireless devices: [8]

Security challenges posted by mobile devices, cryptographic security for mobile devices,
Attacks on mobile/cell phones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

Module -3: Tools and Methods used in Cyber crime: [8]

Proxy servers, pan word checking, Random checking, Trojan Horses and Backdoors; DOS &
DDOS attacks; SQL injection: buffer over flow. Most Common Attacks, Scripts Kiddies and
Packaged Defense.

Module – 4A: Phishing & Identity Theft: [4]

Phishing methods, ID Theft; Online identity method.

Module – 4B: Cybercrime & Cyber security: [3]

Legal aspects, Indian laws, IT act, Public key certificate

Suggested Readings:

1. Cyber security by Nina Gobole & Sunit Belapune; Pub: Wiley India.
2. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
3. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
4. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: E-Commerce

Code: JBCA-E602D

Contacts Hours / Week: 3L+1L

Credits: 3

1. Module I: Introduction to E Commerce (5L)

E-Commerce and its types (B2B, B2C, C2B, C2C etc), Advantages, Disadvantages and Application areas of E-Commerce, E-Commerce Framework, Introduction to M-Commerce

2. Module II: Internet and Network Security (8L)

E- Commerce and Internet, IP Address, DNS, ISP, URL, Modes of Internet Connectivity with reference to E -Commerce transactions, Web Architecture, VPN

3. Module III: Electronic payment methods and digital currencies (12L)

Differences between Traditional Payment Methods and Electronic Payment Methods, Types of Electronic Payment Methods, E-Commerce Secure Payment System, Digital Certificate and Digital Signature, SSL, SET, Cyber Cash Model, Digicash, Smart Card, EDI.

4. Module IV: Introduction to MIS and ERP (7L)

MIS-Definition, Working, Application, DSS, Data Processing, End-user Computing, Introduction to ERP and ERP Systems, ERP Functional Modules, ERP selection issues

5. Module V: Information System Prospective of ERP (8L)

Introduction to OLAP, OLTP, Knowledge Base System, MRP, Supply Chain Management – Definition, Components, Process, Customer Relationship Management – Definition, Objectives, Benefits, Process, Business Process Reengineering – Definition, Advantages, Process.

Suggested Readings:

1. Adesh K Pandey – Introduction to E-Commerce and ERP; S K Kataria and Sons
2. Ritender Goel - E-Commerce; New Age International
3. M.M. Oka – E-Commerce; Everest Publishing House
4. Joseph – E-Commerce and Managerial Perspective; PHI

Syllabus for Bachelor of Computer Application (BCA) Programme

Paper: Values and Ethics of Profession

Code: JHBCA-601

Contacts Hours / Week: 3L+1L

Credits: 4

1. Module I: Introduction to Ethical Theories (4L)

Consequentialist and Non-consequentialist theories, Hedonism, Utilitarianism, Virtue Ethics, Ethical Relativism, Ethical Naturalism

2. Module II: Ethics and Morality (6L)

Ethics and Morals, Ethics in Indian Tradition, Building character in workplace, Moral and Ethical Judgement: Canons of ethics, Ethics of duty, Ethics of responsibility

3. Module III: Ethics and Environment (8L)

Rapid technological growth and depletion of resources, Sources of energy, Energy crisis, Reports of Club of Rome, Environmental degradation, Environmental Regulations, Environmental Ethics, Eco-friendly technologies, Sustainable Development, Important and recent national and international conventions on environment, Appropriate Technology Movement of Schumacher: Later developments

4. Module IV:

Problems of technology transfer, Stages of technology transfer, Problems of technology transfer, Technology Impact Assessment, Problems of man machine interaction, Impact of Assembly line, Automation, Corporate Social Responsibility

5. Module V: Ethics of Profession (8L)

Attributes of a profession, Science, Technology and Engineering as Knowledge and as Social and Professional Activities, Engineering profession: Ethical issues in engineering practice, Conflicts between business demands and professional ideals, Social and ethical responsibilities of Technologists, Codes of professional ethics, Whistle blowing and beyond. Case studies

6. Module VI: Profession and Human Values (6L)

Value Crisis in contemporary society, Nature of values: Value Spectrum of a 'good' life, Psychological values: Integrated personality; mental health, Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution, Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity.

Suggested Readings:

- 1. Ethics in Mgmt & Indian Ethos, Ghosh, VIKAS**
- 2. Business Ethics, G. Pherwani, EPH.**
- 3. Ethics, Indian Ethos & Mgmt, Balachandran, Raja & Nair, SHROFF Publishers**
- 4. Human Values, A. N. Tripathi, New Age International**