MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

Syllabus for Bachelor of Computer Application (BCA) Programme

(Effective for Students Admitted in Academic Session 2018-2019)

COURSE STRUCTURE

1ST YEAR

SL No	CODE	Paper	Contact Periods per week			Total Contact Hours	Credits
			L	CE	P		
SEMESTER I							
Theory							
1	BCAN-101	Digital Electronics	4	1	-	5	3
2	BCAN-102	Environment Studies	4	1	-	5	2
3	BCAN-103	C Programming	4	1	-	5	4
4	BMN-101	Basic Mathematical Computation	4	1	-	5	3
	Practical						
1	BCAN-193	Programming Lab with C	-	-	6	6	3
	Sessional						
1	BCAN-181	PC Software Lab	-	-	4	4	3
Total Credit			18				
SEMESTER II							
Theory							
1	BCAN-201	Computer Architecture	4	1	-	5	3
2	BCAN-202	Software Engineering	4	1	-	5	4
3	BCAN-203	Data Structure with C	4	1	-	5	4
4	BMN-201	Advanced Mathematical Computation	4	1	-	5	3
5	HUN-201	English Language and Communication	4	1	-	5	3
Practical							
1	BCAN-293	Data Structure Lab using C	-	-	6	6	3
2	HUN-291	Business Presentation and Language Lab	-	-	4	4	3
Total Credit			23				

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

Syllabus for Bachelor of Computer Application (BCA) Programme

(Effective for Students Admitted in Academic Session 2018-2019)

2ND YEAR

SL No	CODE	Paper	Contact Periods per week			Total Contact Hours	Credits
			L	CE	P		
SEMESTER III							
Theory							
1	BCAN-301	Operating Systems	4	1	-	5	4
2	BCAN-E302A BCAN-E302B	Object Oriented Programming with C++ GUI Programming with .NET	4	1	-	5	4
3	BCAN-303	Computer Graphics	4	1	-	5	3
4	BMN-301	Mathematics for Computing	4	1	-	5	3
Practical							
1	BCAN-E392A BCAN-E392B	Programming Lab with C++ Programming Lab with .NET	-	-	6	6	3
Sessional							
1	BCAN-381	Web Technology Lab	-	-	4	4	3
Total Credit			20				
SEMESTER IV							
		Theory					
1	BCAN-401	Database Management System	4	1	-	5	4
2	BCAN-402	Programming with Java	4	1	-	5	4
3	BCAN-403	Computer Networking	4	1	-	5	3
4	BMN-401	Numerical Analysis	4	1	-	5	3
		Practical					
1	BCAN-491	Database Lab	-	-	6	6	3
2	BCAN-492	Programming Lab withJava	-	-	6	6	3
		Sessional					
1	BCAN-481	Soft Skill Development	-	-	3	3	2
Total Credit			22				

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

Syllabus for Bachelor of Computer Application (BCA) Programme

(Effective for Students Admitted in Academic Session 2018-2019)

3RD YEAR

SL No	CODE	Paper	Contact Periods per week			Total Contact Hours	Credits
			L	CE	P		
SEMESTER V							
Theory							
1	BCAN-501	Cyber Security	4	1	-	5	3
2	BCAN-502	Unix and Shell Programming	4	1	-	5	4
3	BCA(BBA)N -501	Management and Accounting	4	1	-	5	2
Practical							
1	BCAN-591	Minor Project	-	-	9	9	6
2	BCAN-592	Linux Lab	-	-	6	6	3
Sessional							
1	BCAN-583	Industrial Training	-	-	-	-	3
Total Credit							21
SEMESTER VI							
Theory							
1	BCAN-E601A BCAN-E601B BCAN-E601C	Python Programming Artificial Intelligence E-Commerce	4	1	-	5	3
2	BCAN-E602A BCAN-E602B BCAN-E602C	WebTechnologywithPHP- MySQL Advanced DBMS with PLSQL Digital Marketing	4	1	-	5	3
3	HUN-601	Values and Ethics of Profession	4	1	-	5	2
Practical							
1	BCAN-691	Major Project with Viva-Voce	-	-	15	15	8
Total Credit			16				

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

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

Detailed Syllabus

Semester I

Paper: Digital Electronics
Code : BCAN-101
Contacts Hours / Week : 4L+1CE
Credits : 3

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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Environment Studies
Code : BCAN-102
Contacts Hours / Week : 4L+1CE
Credits : 2

1. Module I: Introduction (5L) 1. Introduction to environment and ecology 2. Components of the environment, environmental degradation, natural cycles ofenvironment.
1. Module II: Ecology (2L) 1. Elements of Ecology, Ecological balance, Effects of Aforestation and deforestation
3. 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, NO_x, Source, Effect, Control 6. SO_x, Source, Effect, Control 7. Lead, Ozone, Source, Effect, Control 8. Green house effect, Control Measures 9. Depletion of ozone layer, Effects of UV exposer, Control Measures
4. 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
5. 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
6. Module VI: Noise Pollution (3L) 1. Sources, effects, standards andcontrol

Suggested Readings:

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

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

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

Paper: C Programming
Code : BCAN-103
Contacts Hours / Week : 4L+1CE
Credits : 4

1. Module I: Programming Basics (2L) Problem analysis, Flowchart, algorithms, Pseudo codes, structured programming, Example of Flowchart and Algorithm representation, Brief History of Development of C language, Features of C language, Process of compiling and running a C program.
2. Module II: Variable and Constants (4L) Definition of Tokens, variables, Constant, Classification of constants, data types (Primary data types, User defined data types, Derived data types)
3. Module III: Operators and Expressions (6L) Different types of Operators (Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special), expressions, type conversion, Operator precedence, associatively rules on operators.
4. Module IV: Formatted Input/output (4L) scanf() Format code, printf() Format code, reading and writing character variable, character testing functions (isdigit(), islower(), isupper(), tolower(), toupper()).
5. Module V: Decision Making And Branching (5L) If statement, if..else, Nested if ..else, else if ladder, switch, ternary operator, goto statement (forward and backward jump)
6. Module VI: Looping (5L) Different types of loop (while, for, do), entry control loop , exit control loop, Applying break and continue within loop.
7. Module VII: Array (4L) One dimensional array , Two dimensional array, Example using integer and floating array.
8. Module VIII: String (3L) Character Array, Library functions related to string (strcat(), strcmp(), strcpy(), strlen())
9. Module IX: Function (4L) Definition, Standard library functions, user-defined functions, recursion, scope of variables in function (auto, extern, static, register)
10. Module X: Pointer And Header File (3L) Pointer Definition, pointer expression, pointer to an array, pointer to a function. Definition of Header file, Use of header files, Different header files.

Suggested Readings:

1. Programming in ANSI C by E Balagurusamy
2. Programming With C, Gottfried, TMH
3. The C Answer Book, Tondo, PHI
4. Programming & Problem Solving Through C Language, EXCEL BOOKS

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

Paper: Basic Mathematical Computation
Code : BMN-101
Contacts Hours / Week : 4L+1CE
Credits : 3

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 normals
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
(Effective for Students Admitted in Academic Session 2018-2019)

Detailed Syllabus
Semester II

Paper: Computer Architecture
Code : BCAN-201
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Data Representation (4L) 1. Number Systems – decimal, binary, octal, hexadecimal, alphanumeric representation, 2. Complements – 1's complement, 2' complement, 9's complement, 10' 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 incrementer, 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) 1. Control memory, 2. Address sequencing, 3. 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: Pipeline and vector processing (3L) 1. Parallel processing, 2. Flynn's classification, 3. Pipelining, Example of pipeline, space time diagram, speedup, 4. Basic idea of arithmetic pipeline, example of floating point addition/ subtraction using pipeline
8. Module VIII: Input – output organization (6L) 1. Peripheral devices, 2. Input – output interface, 3. Isolated I/O, Memory mapped I/O, 4. Asynchronous data transfer: strobe & handshaking, 5. Programmed I/O, 6. Interrupt initiated I/O, 7. Basic idea of DMA & DMAC 8. Input – output processor
9. Module IX: Memory organization (6L)

1. Memory hierarchy, 2. Main memory definition, types of main memory, types of RAM, ROM, difference between SRAM & DRAM, 3. Cache memory, Cache memory mapping – Direct, Associative, Set Associative, 4. CAM, hardware organization of CAM, 5. Virtual memory, mapping using pages, page fault, mapping using segments, TLB, 6. Auxiliary memory, diagrammatic representation of magnetic disk & hard disk drive, 7. 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 & Organisation, 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**

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

Paper: SoftwareEngineering
Code : BCAN-202
Contacts Hours / Week : 4L+1CE
Credits : 4

1. Module I: (12L) 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
2. Module II: (9L) Feasibility Analysis System design tools- data dictionary, structure chart, decision table, decision tree. Concept of User Interface, Essence of UML. CASE tool.
3. Module III: (9L) 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: (10L) ERP, MRP, CRM, Software maintenance SCM, concept of standards (ISO and CMM)

Suggested Readings:

1. **System analysis and design, Igor Hawryszkiewycz, 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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Data Structure with C
Code : BCAN-203
Contacts Hours / Week : 4L+1CE
Credits : 4

1. Module I: Concepts of Abstract data type(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 List (4L) Linear link lists, doubly linked lists, stack using linked list, queue using linked list, circular linked list and their operations andapplications.
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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: AdvancedMathematicalComputation
Code : BMN-201
Contacts Hours / Week : 4L+1CE
Credits : 3

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, Sheplay L Ross, Wiley**
4. **Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd**

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

Paper: English Language and Communication
Code : HUN-201
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Introduction to Business Communication (7L)

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

2. Module II: Corporate Communication (10L)

a. Corporate Etiquette and Office Dynamics
b. SWOT Analysis
c. Principles of Oral Presentation- i) Factors affecting presentation
   ii) Presentation with Multimedia
   iii) Learning Effective Presentation skills
d. GD- Protocol and Practice
e. PI- Protocol and Practice

3. Module III: Writing Skills (12L)

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
e. Note Taking and Note Making

4. Module IV: Non-Verbal Communication (3L)

a. Significance and Importance
b. Body Language: Meaning

5. Module V: Reading and Language Comprehension (4L)

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

6. Module VI: Effective Listening (4L)

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

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
(Effective for Students Admitted in Academic Session 2018-2019)

Detailed Syllabus
Semester III

Paper: Operating Systems
Code : BCAN-301
Contacts Hours / Week : 4L+1CE
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 synchronisation, 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 Manager (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: Introduction to UNIX OS / DOS (4L) 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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Object Oriented Programming with C++
Code : BCAN-E302A
Contacts Hours / Week : 4L+1CE
Credits : 4

1. Module I: Concepts 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++, Pointes 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 Compete Reference C++, Herbert Schlitz, TMH**

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

Paper: GUI Programming with .NET
Code : BCAN-E302B
Contacts Hours / Week : 4L+1CE
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 Dynami
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 with ADO.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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Computer Graphics
Code : BCAN-303
Contacts Hours / Week : 4L+1CE
Credits : 3

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 (5L) Points & Lines, Line Drawing Algorithms (DDA Algorithm, Bresenham's Line Drawing Algorithm)
3. Module III: Circle Drawing Algorithm (5L) Circle Generation algorithm (Midpoint Circle Algorithm, Bresenham's Algorithm)
4. Module IV: 2D Transformations (12L) Translation, Rotation, Scaling, Reflection, Shear etc. Homogenous Coordinates, Composite Transformation
5. Module V: Projection (2-dimension) (5L) Line of Sight, Plane of Projection, Projection methods (Perspective and Parallel)
6. Module VI: Viewing and Clipping (5L) Window to Viewport co-ordinate transformation, Point Clipping, Line Clipping (Cohen-Sutherland Line Clippings, Midpoint Sub-division Algorithm)
7. 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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Mathematics for Computing
Code : BMN-301
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Propositional Logic (8L) Construction of truth table, Tautology, Contradiction, Contigency, 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
4. 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**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

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

Detailed Syllabus

Semester IV

Paper: Database Management System
Code : BCAN-401
Contacts Hours / Week : 4L+1CE
Credits : 4

1. Module I: Introducing 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 Relational Database Management System (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
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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Programming with Java
Code : BCAN-402
Contacts Hours / Week : 4L+1CE
Credits : 4

1. Module I: Oops Concept (4L) Object, Class, Data abstraction, Data encapsulation, Inheritance, Polymorphism, Dynamic binding
2. 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
3. Module III: Data Concept (2L) Data Types, variables and constants Tokens in Java (Identifiers, Literals, Keywords, Operator)
4. Module IV: Control Statements (2L) Simple if statement, if…else statement, Nesting of if-else statement, switch statement
5. Module V: Iteration Statement (2L) For loop, While loop, Do-While loop
6. Module VI: Arrays and Vector (2L) 1D and 2D array, vector concepts
7. Module VII: Classes and Objects (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
8. Module VIII: Inheritance (2L) Basic concepts, types of inheritance, use of super keyword, overriding methods.
9. Module IX: String and String Buffer (2L) Use of different functions
10. Module X: Packages, Interfaces (3L) User defined package, import package, Class path, How to create interface, use and extend interface
11. Module XI: 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.
12. Module XII: Stream (3L) Byte Streams, Input Stream, Output Stream Character Streams (Reader, Writer), How Files and Streams Work, Working with Reader classes (InputStreamReader, BufferedReader)
13. Module XIII: Multithreaded Programming (3L) Overview, Thread Life cycle, Advantages of multithreading over multi-tasking Thread Creation and simple programs, Synchronized threads, Synchronized Methods
14. Module XIV: Applets (4L) Applet vs. Application, Applet class, Advantages of Applet, Applet Lifecycle My First Applet, Applet tag, How to run applet
15. Module XV: Abstract Window 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, TMH**

Paper: Computer Networking
Code : BCAN-403
Contacts Hours / Week : 4L+1CE
Credits : 3

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: (14L) 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**

Paper: Numerical Analysis
Code : BMN-401
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: (20L) 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 factorisation 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

(Effective for Students Admitted in Academic Session 2018-2019)

Detailed Syllabus

Semester V

Paper: Cyber Security
Code : BCAN-501
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Fundamentals (4L) Fundamentals of data communication and networking, Network Reference Models: OSI and TCP/IP Models, 3 way handshake and TCP flags, Network address translation (NAT) concept, Network Transmission media and network devices Information Security definition, Information security goals (Confidentiality, Integrity and availability)
2. Module II: Hacking concepts (6L) Hacking, Types of Hacking/Hackers, what is Cybercrime, Types of cybercrime, Classifications of Security attacks (Passive Attacks and Active Attacks) Essential Terminology (Threat, Vulnerability, Target of Evaluation, Attack, Exploit). Concept of ethical hacking, Phase of Ethical Hacking, Hacktivism
3. Module III: Cyber Law (4L) Cyber terrorism, Cyber laws, What offences are covered under these laws (Hacking, Data theft, Identity theft (including Password Theft), Email spoofing, Sending offensive messages, Voyeurism, Cyber terrorism) Punishment for cyber crime in India
4. Module IV: Protocols & Proxy (6L) Some protocols (HTTP, HTTPS, FTP, SSH, TELNET, SMTP, DNS, POP3, and related ports), proxy concept, different types of proxy (forward and reverse proxy concept), proxy chain
5. Module V: Cryptography and Steganography (3L) Basic concepts of Cryptography and Steganography
6. Module VI: Malware (3L) About Malware, Types of Malware (Virus, worm, Trojan horse, spyware, adware, ransomware), Type of Computer Viruses(File Virus, Boot sector virus, Macro virus, Electronic mail (email) virus, Multi-variant virus) some indications of a malware attacks, Popular Antivirus programs, basic idea of how antivirus identifies a virus (Signature-based detection, Heuristics-based detection , Cloud- based detection) about VirusTotal website
7. Module VII: DOS, IDS, IPS (3L) Denial of service attack, Distributed Denial of service attack, Intrusion Detection System, snooping, Eavesdropping, Key loggers and Firewall, BOTs/BOTNETS, Intrusion Detection System, Intrusion Prevention System
8. Module VIII: Password (2L) About Password, Different types of password (Biometric, Pattern based Graphical password, Strong Password technique, Types of Password attacks
9. Module IX: Web Application Based Threats(2L) Cross-site scripting, SQL injection, Command injection, Buffer overload, Directory traversal, Phishing scams, Zombies, Drive by downloads
10. Module X: Wireless Networking (4L) Concept of wireless networking, Wireless standards, Common term used in wireless networking (WLAN, Wireless, Wireless Access point, cellular, Attenuation, Antenna, Microwave, Jamming, SSID, Bluetooth, Wi-Fi hotspots) What is Wi-Fi, Wireless attacks(War Driving, War Walking: War Flying, War Chalking, Blue Jacking) , How to secure wireless networks
11. Module XI: Stay Secure in digital World(3L) How to stay secure in digital World, have strong password, encrypt your data, security suit software, firewall setup, update os

Suggested Readings:

1. **Data communication and Networking by Behrouz A. Forouzan, McGraw Hill Education (India) Pvt. Ltd.**
2. **Certified Ethical Hacker Certification Exam by William Manning**
3. **Fundamentals of Cyber Security By Mayank Bhushan, BPB Publications**

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

Paper: Unix and Shell Programming
Code : BCAN-502
Contacts Hours / Week : 4L+1CE
Credits : 4

1. Module I: Introduction to UNIX Operating System (8L)

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

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: Customization and Filters (8L)

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: Shell script & System Administration (8L)

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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Management and Accounting
Code : BCA(BBA)N-501
Contacts Hours / Week : 4L+1CE
Credits : 2

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.BasicConceptofCost2.ClassificationofCost3.CostSheet4.Materials-EOQ,LIFOandFIFO 5. Labour - 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**

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

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

Detailed Syllabus
Semester VI

Paper: Python Programming
Code : BCAN-E601A
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Introduction to Python (12L)

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: Conditions & Iterations (8L)

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: Recursion, Strings, List, Dictionaries, Tuples (10L)

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: Classes & Objects (10L)

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
(Effective for Students Admitted in Academic Session 2018-2019)

Paper: Artificial Intelligence
Code : BCAN-E601B
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Introduction to AI (1L) OverviewofArtificialIntelligence–Introduction–HistoryofAI–ApplicationofAI–ObjectivesofAI-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: Search Techniques (10L) 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 Neutral Networks and rule based Methods - – Comparisons of Neutral 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**

Paper:E-Commerce
Code : BCAN-E601C
Contacts Hours / Week : 4L+1CE
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**

Paper: Web Technology with PHP-MYSQL
Code : BCAN-E602A
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Introduction and Installation (4L) Introduction to PHP, MySQL and Apache, Installation of WAMP and XAMPP.
2. Module II: PHP Basic (6L) Syntax, variables, data types, Operators, Strings and constants
3. Module III: Control Statements (4L) If....Else....Else if, Switch
4. Module IV: IterationStatement(4L) while and for
5. Module V: Arrays (4L) Create an array and access array elements
6. Module VI: Functions (4L) Create a user defined function in PHP, PHP function arguments, Returning values
7. Module VII: PHP Interface Design (6L) Form Creation, Form validation (server side), $_GET, $_POST, $_REQUEST
8. Module VIII: PHP Advanced (4L) PHP include, PHP cookies, PHP Sessions, PHP date and time
9. Module IX: Database Connectivity (4L) Create database and table using PHP INSERT data, SELECT data, DELETE data, UPDATE data using PHP

Suggested Readings:

1. **Php & Mysql 1st Edition (English,Mike Mcgrath) Publisher: Mcgraw Higher Ed**
2. **Beginning PHP, Apache, MySQL Web Development**
3. **Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner (Wiley Publishing)**
4. **PHP & MySQL In Easy Steps By Mike Mc Grath (BPB Publications)**
5. **PHP- Beginner's Practical Guide Author: Pratiyush Guleria (BPB Publications)**

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

Paper: Advanced DBMS with PLSQL
Code : BCAN-E602B
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Transaction and Concurrency Control (10L) Transaction processing states and ACID properties, Basic operations of transaction – read, write, commit, abort Concept of System Log. Concurrency Problems Schedules - Serializability, Precedence Graph Concurrency Control Techniques – Binary Lock and Two phase lock, Timestamp oriented concurrency control. Deadlock and Livelock
2. Module II: Recovery (4L) Reasons for database recovery, Deferred and Immediate Update, Log-based recovery, In-place updating, Shadow paging
3. Module III: Normalization and File Organization (10L) Normalization – Multivalued Dependency and 4NF, Join Dependency and 5NF, Domain Key Normal Form (DKNF), 6NF.File Organization – Concept of Dynamic Indices, B Tree and B+ Tree Indices, Hashed File Organization – Hash Functions, Collisions and their Resolution. Record Organization – Fixed Length and Variable Length Records, Spanned and Un-spanned Records. Secondary Storage Structure, RAID
4. Module IV: PL/SQL (6L) Conditional Statements, Loop, Variable Binding, Working with Strings, Function, Procedure, Exception Handling. Cursor, Trigger, View
5. Module V: Advanced Topics (10L) Reference Architecture for Distributed DBMS, Fragmentation, Replication and Allocation Techniques, Top-down and Bottom-up Design, Correctness rules of fragmentation. Introduction to Object Oriented Database, XML Database, Data Warehousing and Data Mining, ODBC

Suggested Readings:

1. **RamezElmasri, Shamkant B Navathe - Fundamentals of Database Systems; Pearson**
2. **Rajiv Chopra - Database Management Systems (DBMS); S. Chand Publications**
3. **Chhanda Ray – Distributed Database Systems; Pearson**
4. **P.S. Deshpande - SQL and PL/SQL for Oracle 10g Black Book; Wiley Dreamtech**

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

Paper: Digital Marketing
Code : BCAN-E602C
Contacts Hours / Week : 4L+1CE
Credits : 3

1. Module I: Overview (4L) About Digital Marketing, Difference between Traditional Marketing and Digital Marketing, Benefits of using digital media, Inbound and Outbound Marketing, Online marketing POEM: (Paid, Owned, and Earned Media), Components of Online Marketing (Email, Forum, Social network, Banner, Blog)
2. Module II: Search Engine Optimization (SEO) (4L) About SEO, Need of an SEO friendly website, Search Engine, Role of Keywords in SEO, Off-page Optimization, On-page Optimization concepts, Organic SEO vs Non-organic SEO
3. Module III: Social Media Marketing (SMM) (4L) About Social Media Marketing, Different types of Social Media Marketing
4. Module IV: Content Marketing (4L) About Content Marketing, Goals of Content Marketing, Types Of Contents, etc.
5. Module V: Online Advertising (4L) About Online Advertising, Advantages of Online Advertising, Paid versus Organic, Pay Per Click (PPC) Model. Basic concepts CPC, PPC, CPM, CTR, CR
6. Module VI: Email Marketing (4L) About Email marketing, Email newsletters, Digests, Dedicated Emails, Lead Nurturing, Sponsorship Emails and Transactional Emails, Drawbacks of Email Marketing
7. Module VII: MobileMarketing(4L) About Mobile Marketing, Objectives of Mobile Advertising, Creating a Mobile Marketing Strategy, About SMS Marketing
8. Module VIII: Online Marketing Types (4L) Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing. Referral Marketing
9. Module IX: Web analytics (4L) About Web Analytics, Types of Web Analytics (On-site, Off-site), Importance of Web Analytics
10. Module X: OnlineMarketingImpact(4L) Impact, Pros & Cons

Suggested Readings:

1. **Digital Marketing 1st Edition (English, Vandana Ahuja), Oxford**
2. **Digital Marketing (PROF. SURABHI SINGH), MEWAR UNIVERSITY PRESS**

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

Paper: Values and Ethics of Profession
Code : HUN-601
Contacts Hours / Week : 4L+1CE
Credits : 2

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: Cannons 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: Technology and Developing Nations- Technology transfer (8L) 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**

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

(Practical/Sessional)

Paper: Programming Lab with C
Code: BCAN-193
Contacts Hours / Week: 6P
Credits: 3

1. Module I: Programming Basics Write C program to -Implement (main(), printf, scanf) , Print your (name , college name and address), Input an integer number and print it, Input two integer numbers and find sum and difference, Input floating point number and print it, Understand the purpose of header files such as <stdio.h> and <conio.h>
2. Module II: Variable and Constants Write C program to - Declare variable of different data types and print them, Implement different types of integer and floating point constants
3. Module III: Operators and Expressions Write C program to - Input integer number and apply different arithmetic operators (+,-,*,/,%), Implement ++ and – operators, Implement assignment operators, Implement bitwise operators.
4. Module IV: Formatted Input/output Write C programs to - Input character constant and print, Implement scanf() Format code, Implement printf() Format code, Implement isdigit(), islower(), isupper(), tolower() and other functions within <ctype.h>
5. Module V: Decision Making and Branching Write C programs to – Implement relational operators using if statements, Implement logical operators using if statements, Implement simple if statement, Input two number and find larger number, Input three numbers and find largest, Implement else if ladder, Implement switch … case, Input two numbers and find larger number using ternary operator, Implement nested ternary operator, Implement pseudo loop using goto statement.
6. Module VI: Looping Write C programs to - Implement while loop, Implement for loop, Implement do-while loop, Print all even numbers from 2 to 20, Print all odd numbers from 1 to 30, Print all prime numbers from 1 to 50, Print the first 15 Fibonacci terms, Implement nested loop, Print different number patterns, Apply break statement within a loop, Apply continue statement within a loop, Input a 3-digit number to find sum of digits, Input a 3-digit number and print in reverse order, Find factorial of a number.
7. Module VII: Array Write C programs to - Implement an array arr[10] scanf value and print, Implement an array arr[10] scanf value and print value in reverse order, Implement an array arr[3][3] scanf value and print values, Find the sum of even and odd numbers within an array separately, Find the row wise sum of an 2-d array arr[4][4].
8. Module VIII: String Write C programs to - Implement scan and print string, implement different string functions such as strcat(), strcmp(), strcpy(), strlen() ,Note - include<string.h> in the programs.
9. Module IX: Function Write C program to –Implement different library functions, Implement UDF with no argument and no return type, Implement UDF with argument and no return value, Implement UDF with argument and with return value, Implement UDF with no return value and with return value, Implement auto, extern, static and register variables, Implement chaining of UDF, Implement recursion to find factorial.
10. Module X: Pointer and Header File Write C program to -Implement Pointer, Implement pointer expression, Implement pointer to an array, Implement pointer to a function, Implement simple macro, Implement nested macro.

Paper: PC Software Lab
Code: BCAN-181
Contacts Hours / Week: 4P
Credits: 3

1. Module I: Introduction to Software (Windows 7, Office 2010 (or, respective higher versions))
Introduction to Windows 7 – Change Date and Time, Task Bar, Start Button,
Creating a File and folder, Saving/Renaming, Moving Files, Renaming, Making a Copy, Copy Files onto a disk Shortcuts, Deleting, Trash Finding Lost or Misplaced Files, Folders and Printing of documents Basic Internet, Email and protection of PC Windows Settings

2. Module II: Microsoft Word
Ribbon, Command Tabs, Hiding the Ribbon, Quick Access Toolbar, Office Menu
Starting a new Document, Saving a document, Previewing a document, Printing a document Text, Formatting text, Text Boxes, Inserting Clip Art, Working with shapes, Line and Paragraph Spacing Selecting Text, Cut, Copy, Paste, Font, Size, Color, Bold, Italics, Underline Spelling and Grammar Check, Auto Correct, Auto Format Indenting Paragraphs, Paragraph Borders and Shading, Paragraph Alignment and Breaking Creating a table, Editing a table, Sizing a table, Formatting a table Inserting pictures, Setting picture position and text wrapping, Resizing and cropping Using clip art organizer, Creating with Word Art Columns, Headers and Footers, Applying Styles and themes, Mail Merge

3. Module III: Microsoft Excel:

Introduction to MS Excel 2010, Cells, Rows, and Columns, Sheet Tabs, Labeling and Naming Worksheets, Adding and Deleting Worksheets, Hiding/ Unhiding Worksheets, Hiding Columns and Rows, Saving Workbooks Printing Worksheets and Workbooks, Select Print Area , Print a Range of Pages, Printing Copying Cells, Rows, and Columns, Pasting Cells, Rows, and Columns, Inserting and Deleting Rows and Columns, Insert Cells Filling Cells with a Series of Data, Editing Cell Data, Find and Replace, Go To Locking Rows and Columns By Splitting Panes, Freezing Panes Change Font Styles and Sizes, Adding Borders and Colors to Cells, Changing Column Width Changing Row Height, Merge Cells, Applying Number Formats, Creating Custom Number Formats Align Cell Contents, Cell Styles, Conditional Formatting Header and Footer, Adding Images, Modifying Images, Rotating an image, Compressing a Picture Adding WordArt, Inserting AutoShapes, Adding Clip Art, Adding a Hyperlink, Embedding an Object Charts, Chart Tools, Modifying and Moving a Chart, Organizational Charts Formulas and Calculations, Mathematical operators, Creating a Formula Absolute, Relative and Mixed Cell References Excel Forms, Using Data Forms, Entering Data Using a Data Form Entering Data into a Table, Sorting Data into a Table, Filters Data Validation, Auditing, Trace Precedents and Dependents Protecting a Workbook, Importing and Exporting Data, Course Materials

4. Module IV: MS PowerPoint :
Open & close presentations, Create a presentation,Apply design themes, Specify slide transitions & timings, Set up a slide show, Preview, print & run presentations Rearranging and deleting slides, Using slides from other presentations Formatting slides, Formatting text, Formatting paragraphs, Adding shapes, Modifying objects, Using text in objects WordArt, Pictures, Clip art, Tables, Charts, Diagrams Templates and themes, Slide masters, Transitions and timings, Speaker notes, Slide shows

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

Paper: **Data Structure Lab using C**
Code : BCAN-293
Contacts Hours / Week : 6P
Credits : 3

1. Module I: Concepts of Abstract data type Write C program to - Implement a structure and print structure elements, Implement union variable, Implement structure and apply pointer to print elements, Implement enum data type, Implement linked list using self-referential structure, Implement pointer to a pointer (simple).
2. Module II: Dynamic Memory Allocation Write C programs to -Implement malloc function, Implement calloc and realloc and free functions.
3. Module III: File Management Write C programs to - Create and display data file using fopen, getc, putc, fclose functions. Create binary file using fopen, putw, getw, fclose functions. Create data file using fopen, fscanf, fprintf, fclose functions. Implement argv, argc in command line.
4. Module IV: Data Structure using Array Write C programs to – Implement stack using array, Implement queue using array, Implement priority queue using array, Implement circular queue , Implement dequeue, Evaluate prefix expression, Evaluate postfix expression, convert infix to postfix.
5. Module V: Searching and Sorting Write C programs to – Implement insertion sort, Implement Selection sort, Implement Quick sort, Implement Bubble sort , Implement Heap sort.
6. Module VI: Linked List Write C programs to – Implement Linear link lists, Implement doubly linked lists, Implement stack using linked list, Implement queue using linked list, Implement circular linked list.
7. Module VII: Trees Write C programs to - Implement binary tree, Implement binary search tree, Implement non recursive version of preorder traversal using stack, Implement postorder traversal of a binary tree using stack, Implement a threaded binary tree (insert a node, Display a node, Find successor, Find predecessor).
8. Module VIII: Graphs Write C programs to - Implement Shortest path algorithm, Implement BFS, Implement DFS

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

Paper: Business Presentation and Language Lab
Code : HUN-291
Contacts Hours / Week : 4P
Credits : 3

1. Module I: Preparing Business Presentation using PowerPoint
2. Module II: Developing Structured Project Report using Word and Excel
3. Module III: Group Discussion Practice
4. Module IV: Personal Interview Practice
5. Module V: Role Play
6. Module VI: Business Conversations
7. Module VII: Poster Presentation
8. Module VIII: News Review

Paper: Programming Lab with C++
Code : BCAN-E392A
Contacts Hours / Week : 6P
Credits : 3

1. Module I: Simple C++ programs using the variables, operators, control structures, functions and I/O objects cin and cout
2. Module II: Implementation of objects and classes , Private and public members, static data and function members, inline functions, constructors and their types, destructors, function overloading, operator overloading, type conversion
3. Module III: Implementation of the concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class
4. Module IV: Implementation of pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions
5. Module V: Developing the concept of stream classes and file handling Developing the basic concept of template and exception handling

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB

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

Paper: Programming Lab with .NET
Code : BCAN-E392B
Contacts Hours / Week : 6P
Credits : 3

1. Module I: Simple VB.NET programs using the features. Showing the basic features of VB.NET IDE
2. Module II: Implementation of Elements of Visual Basic .net: 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, Scrollbar, Group Box, ToolTip, Timer
3. Module III: Programming in Visual basic .net: 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: 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: Basic Concept of Object Oriented Programming: 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, Data Access with Server Explorer, Data Adapter and Data Sets, ADO.NET Objects and Basic SQL. Connection with SQL Server

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

Paper: Web Technology Lab
Code : BCAN-381
Contacts Hours / Week : 4P
Credits : 3

1. Module I: Basic Web page design using HTML tag Background, Image, Formatting Text, Ordered Lists and Unordered Lists, Hyper Link, Table Creation, Form Creation, Frame Creation
2. Module II: Introduction to CSS Inline CSS, Classes and IDs, Formatting Text, Div, Export External CSS to a web page
3. Module III: JavaScript Introduction to JavaScript, Data types, if-else statement, Array, Loop, Function, Form validation

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

Paper: Database Lab
Code : BCAN-491
Contacts Hours / Week : 6P
Credits : 3

Introduction, Features of SQL
Database Languages - data definition and Data
manipulation languages Implementation of DDL
Commands
Implementation of Data Manipulation Commands - SELECT Statement and
different Clauses SQL Functions - Aggregate, Date and Time Functions,
String Functions, Conversion Functions Mathematical Functions, Special
Operators Nested queries and join queries
Use of different types of Constraints in
database tables Different types of
Join and Set Operators
Group by and having clauses

Use of Sub-
queries,
Views
Implementation DCL commands - Roll-back, Commit and Save point, Create
user grant revoke Introduction to PL/SQL – conditional statements, loop,
variable binding
Introduction to Embedded SQL

Paper: **Programming Lab with Java**
Code : BCAN-492
Contacts Hours / Week : 6P
Credits : 3

1. Module I: Basic java programming writing: Implement the basic functionality of a calculator using switch Print a pattern using nested loop Print sum of numerical series Implement linear search in an array Convert a decimal number into binary, octal, hexadecimal using Integer.Function Convert Fahrenheit temperature into Celsius temperature using command line Add two 2x2 matrices, where values are initialized in code Calculate area and circumference of circle using System. in Check whether a number is palindrome or not; using System. in Count total number of objects created for a class, use two classes Find the sum of the digits of a number Implement function overloading Create an application that represents single inheritance
2. Module II: Advanced Java Programming Writing Java programs to: Represent multilevel inheritance Implement the concept of multiple inheritance using interface Implement overriding of methods Illustrate the use of [length(), indexOf(), concat(), equals() versus = =] in string class Illustrate the use of [append(),reverse(),insert(),delete CharAt()] in Stringbuffer class Illustrate the use of vector and methods of vector class. Handle any three in built exceptions Implement multithreading Implement this and super keyword Implement final keyword in (class, function, variable) Implement applet cycle methods [init(),start(),stop(),destroy()] Implement applet paint() method and run in browser Create an AWT application displaying Label, Text Field, Check Box, Choice and Button

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

Paper: Soft SkillDevelopment
Code : BCAN-481
Contacts Hours / Week : 3P
Credits : 2

Developing positive attitude, Forming values, Interpersonal skills, Communication skills, Art of listening, Art of reading, Art of speaking, Art of writing, E-mailing, E-mail etiquette, Developing body language, Developing etiquette and mannerism, Time management, Stress management, Writing resume, Group discussion, Mock interview, Career planning, SWOT analysis

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

Paper: Minor Project
Code : BCAN-591
Contacts Hours / Week : 9P
Credits : 6

To carry out a small computer application based project individually or in groups

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

Paper: Linux Lab
Code : BCAN-592
Contacts Hours / Week : 6P
Credits : 3

1. Module I: LINUX Utilities
Calendar, Display system date, Message display, Calculator, Password changing, Knowing who are logged in, Knowing System information

2. Module II: Directory creation, removal, listing, navigation
Displaying pathname of the current directory (pwd), Changing the current directory (cd), Make directory (mkdir), Remove directories (rmdir), Listing contents of directory (ls and its options), Absolute pathname, Relative pathname, Using dot (.) and dotdot (..)

3. Module III: Ordinary file handling
Displaying and creating files, Copying a file, Deleting a file, Renaming/ moving a file, Paging output, Knowing file type, Line, word and character counting (wc), Comparing files, Finding common between two files, Displaying file differences

4. Module IV: File attributes
File and directory attributes listing, 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, Default permissions of file and directory and using umask, Listing of modification and access time, Time stamp changing, File locating

5. Module V: Shell
Types of shell, Pattern matching, Escaping, Quoting, Redirection, Pipe, tee, Command substitution, Shell variables

6. Module VI: Process
Display process attributes, Display System processes, Background jobs, Reduce priority, Sending job to background and foreground, Listing jobs

7. Module VII: Filters
Prepare file for printing, Custom display of file using head and tail, Vertical division of file, Paste files, Sort file, Finding repetition and non- repetition, Manipulating characters using, Searching pattern

8. Module VIII: VI/VIM Editor and Shell script
1. Introduction to VI/VIM editor, Different commands of the editor, File editing in the editor
2. Introduction to shell script
Simple shell scripts, Interactive shell script, Using command line arguments, Logical operator (&&, ||), Condition checking (if-then, if-then-else-fi, if-then—elif-else-fi, case), Expression evaluation (test, []), Computation (expr), Using expr for strings, Loop (while, for, until, continue), Use of positional parameters
3. Simple implementation of basic LINUX commands, utilities, filters etc. using shell scripts

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

Paper: Industrial Training
Code : BCAN-583
Contacts Hours / Week :
Credits : 3

To visit a compatible industry to gather practical exposure

Paper: Major Project with Viva-Voce
Code : BCAN-691
Contacts Hours / Week : 15
Credits : 8

To carry out a computer application based project individually or in groups

Repository of Digital Online Courses

Sl No.	Course Name	URL	Institution	Credit Point
1	Introduction to Python: Absolute Beginner	https://www.edx.org/course/introduction-to-python-absolute-beginner	Microsoft	1
2	Introduction to Python: Fundamentals	https://www.edx.org/course/introduction-to-python-fundamentals	Microsoft	1
3	Introduction to Python for Data Science	https://www.edx.org/course/introduction-to-python-for-data-science	Microsoft	2
4	Introduction to Computing using Python	https://www.edx.org/course/introduction-computing-using-python-gtx-cs1301x	GTx (Georgia Institute of Technology)	4
5	CS For All: Introduction to Computer Science and Python Programming	https://www.edx.org/course/cs-all-introduction-computer-science-harveymuddx-cs005x-0	HarveyMuddX (Harvey Mudd College)	3
6	Introduction to Programming Using Python	https://www.edx.org/course/introduction-to-programming-using-python	UTArlingtonX (University of Texas at Arlington)	4
7	Introduction to Artificial Intelligence (AI)	https://www.edx.org/course/introduction-to-artificial-intelligence-ai	Microsoft	1
8	Essential Mathematics for Artificial Intelligence	https://www.edx.org/course/essential-mathematics-for-artificial-intelligence	Microsoft	2
9	Knowledge Management and Big Data in Business	https://www.edx.org/course/knowledge-management-and-big-data-in-business	HKPolyUx (Hong Kong Polytechnic University)	2
10	Machine Learning for Data Science and Analytics	https://www.edx.org/course/machine-learning-for-data-science-and-analytics	ColumbiaX (Columbia	1

			University)	
11	Data Science: R Basics	https://www.edx.org/course/data-science-r-basics	HarvardX (Harvard University)	**1**
12	Supply Chain Management: A Decision-Making Framework	https://www.edx.org/course/supply-chain-management-a-decision-making-framework	LouvainX (Université catholique de Louvain (UCL))	**1**
13	Customer Relationship Management	https://www.edx.org/course/customer-relationship-management	IIMBx (Indian Institute of Management Bangalore)	**1**
14	Online Marketing Strategies	https://www.edx.org/course/online-marketing-strategies-curtinx-mkt5x	CurtinX (Curtin University)	**3**
15	E-Commerce	https://www.emarketinginstitute.org/free-courses/	eMarketing Institute	**1**
16	Email Marketing	https://www.emarketinginstitute.org/free-courses/	eMarketing Institute	**1**
17	Online marketing	https://www.emarketinginstitute.org/free-courses/	eMarketing Institute	**1**
18	Beginner PHP and MySQL Tutorial	https://www.udemy.com/php-mysql-tutorial/	https://www.udemy.com	**2**
19	Learn E-Commerce Website in PHP & MySQL From Scratch!	https://www.udemy.com/ecommerce-website-in-php-mysqli/	https://www.udemy.com	**2**
20	IT Fundamentals for Business Professionals: Software development	https://www.edx.org/course/it-fundamentals-business-professionals-upvalenciax-isc101-3x	La Universidad Politécnica de Valencia	**1**

21	Introduction to Java Programming – Part 1	https://www.edx.org/course/introduction-java-programming-part-1-hkustx-comp102-1x-5	Hong Kong University of Science and Technology	**2**
22	Software Engineering Essentials	https://www.edx.org/course/software-engineering-essentials	Technische Universität München	**4**
23	Introduction to Java Programming – Part 2	https://www.edx.org/course/introduction-java-programming-part-2-hkustx-comp102-2x-7	Hong Kong University of Science and Technology	**2**
24	Introduction to Mobile Application Development using Android	https://www.edx.org/course/introduction-mobile-application-hkustx-comp107x-6	Hong Kong University of Science and Technology	**3**
25	Introduction to the Internet of Things (IoT)	https://www.edx.org/course/introduction-to-the-internet-of-things-iot	Curtin University	**2**
26	Cyber Security Basics: A Hands-on Approach	https://www.edx.org/course/cyber-security-basics-a-hands-on-approach	Universidad Carlos III de Madrid	**4**
27	Algorithms and Data Structures	https://www.edx.org/course/algorithms-and-data-structures	Microsoft	**2**
28	Introduction to Python: Absolute Beginner	https://www.edx.org/course/introduction-to-python-absolute-beginner	Microsoft	**2**
29	Foundation of Data Structures	https://www.edx.org/course/foundations-of-data-structures	IIT Bombay	**4**
30	English Composition	https://www.edx.org/course/english-composition-asux-eng101x-6	Arizona State University	**5**
31	Take Your English Communication Skills to the Next Level	https://www.coursera.org/specializations/improve-english	Georgia Institute of Technology	**1**
32	Conversational English Skills	https://www.edx.org/course/sheng-huo-ying-yu-ting-shuo-tsinghuax-30640014x	Tsinghua University	**3**

33	Java Programming: Solving Problems with Software	https://www.coursera.org/learn/java-programming	Duke University	**2**
34	Developing Soft Skills and Personality	NPTEL		**3**
35	Soft Skills	NPTEL		**4**
36	Learn to Program: The Fundamentals	https://www.coursera.org/learn/learn-to-program	University of Toronto	**3**
37	Ethics	NPTEL		**4**
38	Learn to Program: The Fundamentals	Coursera		**3**
39	Natural Language Processing (NLP)	https://www.edx.org/course/natural-language-processing-nlp	Microsoft	**4**
40	Object Oriented Programming in Java	https://www.edx.org/course/object-oriented-programming-in-java	Microsoft	**3**
41	Programming in R for Data Science	https://www.edx.org/course/programming-in-r-for-data-science	Microsoft	**3**
42	Programming with Python for Data Science	https://www.edx.org/course/programming-with-python-for-data-science	Microsoft	**5**
43	Introduction to C#	https://www.edx.org/course/introduction-to-c-sharp	Microsoft	**1**
44	Introduction to C++	https://www.edx.org/course/introduction-to-c-plus-plus	Microsoft	**1**
45	Introduction to Artificial Intelligence (AI)	https://www.edx.org/course/introduction-to-artificial-intelligence-ai	Microsoft	**1**
46	Advanced C++	https://www.edx.org/course/advanced-c	Microsoft	**1**
47	Introduction to Java	https://www.edx.org/course/introduction-java-programming-	Universidad Carlos III de	**3**

	Programming: Fundamental Data Structures and Algorithms	uc3mx-it-1-3x	Madrid	
48	Software Engineering: Introduction	https://www.edx.org/course/software-engineering-introduction-ubcx-softeng1x	University of British Columbia	**5**
49	HTML5 and CSS Fundamentals	https://www.edx.org/course/html5-css-fundamentals-w3cx-html5-0x-0	World Wide Web Consortium (W3C)	**3**
50	CSS Basics	https://www.edx.org/course/css-basics-w3cx-css-0x-0	World Wide Web Consortium (W3C)	**3**
51	Program a Server-Side Application using ASP.NET Core	https://www.edx.org/course/program-a-server-side-application-using-aspnet-core	Microsoft	**2**
52	Introduction to Cloud Infrastructure Technologies	https://www.edx.org/course/introduction-cloud-infrastructure-linuxfoundationx-lfs151-x	Linux Foundation	**3**
53	Introduction to Internet of Things	https://onlinecourses.nptel.ac.in/noc18_cs46/preview	NPTEL	**4**
54	Social Networks	https://onlinecourses.nptel.ac.in/noc18_cs56/preview	NPTEL	**4**
55	Fundamental of Curriculum in Engineering Education	https://swayam.gov.in/learningpath/Certificate	SWAYAM	**2**
56	Introduction to Information Security - I	https://swayam.gov.in/courses/1303-introduction-to-information-security-i	SWAYAM	**2**
57	Art of C Programming	https://swayam.gov.in/courses/5012-art-of-c-programming	SWAYAM	**4**
58	Programming Fundamentals	https://www.coursera.org/learn/programming-fundamentals	Duke University	**3**
59	Cloud Computing Concepts, Part 1	https://www.coursera.org/learn/cloud-computing	University of Illinois at Urbana-Champaign	**2**
60	Object Oriented Programming in Java	https://www.coursera.org/learn/object-oriented-java	University of California San	**3**

			Diego	
61	Switching Circuits and Logic Design	https://onlinecourses.nptel.ac.in /noc18_cs30/preview	IIT Kharagpur	**4**
62	Computer Architecture	https://onlinecourses.nptel.ac.in /noc18_cs29/preview	IIT Madras	**4**
63	English Language for Competitive Exams	https://onlinecourses.nptel.ac.in /noc18_hs28/preview	IIT Madras	**2**
64	Soft Skills	https://onlinecourses.nptel.ac.in /noc18_hs29/preview	IIT Roorkee	**4**
65	Technical English for Engineers	https://onlinecourses.nptel.ac.in /noc18_hs27/preview	IIT Madras	**2**

A total of 16 (sixteen) credit points has to be accumulated by a student during the span of 3-year BCA course with a division as follows:

- First Year: 6 credits (Minimum) - 8 credits (Maximum)
- Second Year: 4 credits (Minimum) - 6 credits (Maximum)
- Third Year: 4 credits (Maximum)

Out of the requisite 16 (sixteen) credit points to be accumulated by a student during the span of 3-year BCA course, exactly 6 (six) credit points must be accumulated from courses with Sl. No. 30, 31, 32, 34, 35, 63, 64 and 65.

If a student accumulates the minimum credit point (6) during first year, he/she needs to accumulate the maximum credit point

(6) during second year. Accordingly he/she needs to accumulate the required credit point during third year to satisfy the requirement of 16 credit points.