

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**  
**Syllabus for BCA + Repository of Digital Online Courses**

**Semester I**

Theory							
Sl No	Paper Code	Paper Name	Contact Hours/Week				Credit
			L	CE	P	Total	
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				

L → "Lecture" classes, CE → "Continuous Evaluation" classes, P → "Practical" classes

**Semester II**

Theory							
Sl No	Paper Code	Paper Name	Contact Hours/Week				Credit
			L	CE	P	Total	
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
Sessional							
Total Credit			23				

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**Semester III**

Theory							
Sl No	Paper Code	Paper Name	Contact Hours/Week				Credit
			L	CE	P	Total	
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				

L → "Lecture" classes, CE → "Continuous Evaluation" classes, P → "Practical" classes

**Semester IV**

Theory							
Sl No	Paper Code	Paper Name	Contact Hours/Week				Credit
			L	CE	P	Total	
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 with Java	-	-	6	6	3
Sessional							
1	BCAN-481	Soft Skill Development	-	-	3	3	2
Total Credit			22				

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**Semester V**

Theory							
Sl No	Paper Code	Paper Name	Contact Hours/Week				Credit
			L	CE	P	Total	
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				

L → "Lecture" classes, CE → "Continuous Evaluation" classes, P → "Practical" classes

**Semester VI**

Theory							
Sl No	Paper Code	Paper Name	Contact Hours/Week				Credit
			L	CE	P	Total	
1	BCAN-E601A BCAN-E601B BCAN-E601C	Python Programming Artificial Intelligence E-Commerce	4	1	-	5	3
2	BCAN-E602A BCAN-E602B BCAN-E602C	Web Technology with PHP-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
Sessional							
Total Credit			16				

**Summary**

	Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI	Total
Credit	18	23	20	22	21	16	120

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**Detailed Syllabus**  
**(Theory)**

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**PAPER NAME:** Digital Electronics  
**PAPER CODE:** BCAN-101  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

- UNIT I:** Number Systems & Codes (6L)  
**Topics:** 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
- UNIT II:** Logic Gates (2L)  
**Topics:** OR, AND, NOT, NAND, NOR, Exclusive – OR, Exclusive – NOR, Mixed logic
- UNIT III:** Boolean Algebra (4L)  
**Topics:** Boolean Logic Operations, Basic Law of Boolean Algebra, Demorgan's Theorem, Principle of Duality
- UNIT IV:** Minimization Techniques (5L)  
**Topics:** Sum of Products, Product of Sums, Karnaugh Map (up to 4 variables)
- UNIT V:** Multilevel Gate Network (3L)  
**Topics:** Implementation of Multilevel Gate Network, Conversion to NAND-NAND and NOR-NOR Gate Networks
- UNIT VI:** Arithmetic Circuits (5L)  
**Topics:** Half Adder, Full Adder, Half Subtractor, Full Subtractor, Carry Look Ahead Adder, 4-Bit Parallel Adder
- UNIT VII:** Combinational Circuits (5L)  
**Topics:** 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
- UNIT VIII:** Sequential Circuits (5L)  
**Topics:** Introduction to sequential circuit, Latch, SR Flip Flop, D Flip Flop, T Flip Flop, JK Flip Flop, Master Slave Flip Flop
- UNIT IX:** Basics of Counters (2L)  
**Topics:** Asynchronous (Ripple or serial) counter, Synchronous (parallel) counter
- UNIT X:** Basics of Registers (3L)  
**Topics:** SISO, SIPO, PISO, PIPO, Universal Registers

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Suggested Books:

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

**PAPER NAME: Environment Studies**  
**PAPER CODE: BCAN-102**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 2**

UNIT I: Introduction (5L)

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

UNIT II: Ecology (2L)

Topics: 1. Elements of Ecology, Ecological balance, Effects of Aforestation and deforestation

UNIT III: Air Pollution and Control (15L)

Topics: 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<sub>x</sub>, Source, Effect, Control 6. SO<sub>x</sub>, 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

UNIT IV: Water Pollution and Control (10L)

Topics: 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

UNIT V: Land Pollution (5L)

Topics: 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

UNIT VI: Noise Pollution (3L)

Topics: 1. Sources, effects, standards and control

Suggested Books:

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

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**PAPER NAME:** C Programming  
**PAPER CODE:** BCAN-103  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 4

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

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Suggested Books:

- Programming in ANSI C by E Balagurusamy
- Programming With C, Gottfried, TMH
- The C Answer Book, Tondo, PHI
- Programming & Problem Solving Through C Language, EXCEL BOOKS

**PAPER NAME:           Basic Mathematical Computation**  
**PAPER CODE:           BMN-101**  
**CONTACT HOUR:       4L+1CE**  
**CREDIT:                 3**

UNIT I:                 Linear Algebra (12L)

TOPICS:               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.

UNIT II:                Two Dimensional Geometry (8L)

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

UNIT III:              Differential Calculus (12L)

TOPICS:               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

UNIT IV:              Integral Calculus (8L)

TOPICS:               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 Books:

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



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**PAPER NAME:** Computer Architecture  
**PAPER CODE:** BCAN-201  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

**UNIT I:** Data Representation (4L)

**TOPICS:** 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

**UNIT II:** Computer arithmetic (5L)

**TOPICS:** 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

**UNIT III:** Register transfer and micro-operations (5L)

**TOPICS:** 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

**UNIT IV:** Basic Computer organization and design (4L)

**TOPICS:** 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

**UNIT V:** Micro programmed control (2L)

**TOPICS:** 1. Control memory, 2. Address sequencing, 3. Micro program examples

**UNIT VI:** Central processing unit (5L)

**TOPICS:** 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

**UNIT VII:** Pipeline and vector processing (3L)

**TOPICS:** 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

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UNIT VIII: Input – output organization (6L)  
TOPICS: 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

UNIT IX: Memory organization (6L)  
TOPICS: 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 Books:

- Computer System Architecture, M. Morris Mano, PEARSON
- Computer Organization & Architecture – Designing For Performance, William Stallings, PEARSON
- Computer Architecture & Organisation, J.P. Hayes, TATA MCGRAW HILL
- Computer Organization and Architecture, T. K. Ghosh, TATA MCGRAW-HILL
- Computer Architecture, Behrooz Parhami, OXFORD UNIVERSITY PRESS

**PAPER NAME: Software Engineering**  
**PAPER CODE: BCAN-202**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 4**

UNIT I: (12L)  
TOPICS: 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

UNIT II: (9L)  
TOPICS: Feasibility Analysis  
System design tools- data dictionary, structure chart, decision table, decision tree.  
Concept of User Interface, Essence of UML. CASE tool.

UNIT III: (9L)  
TOPICS: 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.

UNIT IV: (10L)  
TOPICS: ERP, MRP, CRM, Software maintenance  
SCM, concept of standards (ISO and CMM)

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Suggested Books:

- System analysis and design, Igor Hawryskiewicz, Pearson
- Analysis and design of Information System, V Rajaraman, PHI
- Software Engineering, Ian Sommerville, Addison-Wesley

**PAPER NAME:** Data Structure with C  
**PAPER CODE:** BCAN-203  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 4

- UNIT I:** Concepts of Abstract data type (4L)  
**TOPICS:** Concept of abstract data types, Structure, union, enum, pointer to structure, Self referential structure, Pointer to pointer
- UNIT II:** Dynamic Memory Allocation (4L)  
**TOPICS:** Difference between static and dynamic memory allocation, Using functions such as malloc(), calloc(), realloc(), free().
- UNIT III:** File Management (4L)  
**TOPICS:** Application of functions such as fopen(), fclose(), getc(), putc(), fprintf(), fscanf(), getw(), putw(), command line argument.
- UNIT IV:** Data Structure using Array (4L)  
**TOPICS:** stack, queue, circular queue, priority queue, dequeue and their operations and applications.
- UNIT V:** Searching and Sorting (6L)  
**TOPICS:** 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
- UNIT VI:** Linked List (4L)  
**TOPICS:** Linear link lists, doubly linked lists, stack using linked list, queue using linked list, circular linked list and their operations and applications.
- UNIT VII:** Trees (5L)  
**TOPICS:** Binary trees, binary search trees, representations and operations, thread representations, sequential representations, B tree , B+ tree,
- UNIT VIII:** Graphs (5L)  
**TOPICS:** 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

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UNIT IX: Hashing (4L)  
TOPICS: Definition, Hashing functions, Load factor and collision, open addressing (linear probing) and chaining method to avoid collision

Suggested Books:

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

**PAPER NAME: Advanced Mathematical Computation**  
**PAPER CODE: BMN-201**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 3**

UNIT I: Algebra (20L)  
TOPICS: 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

UNIT II: Differential Equations (14L)  
TOPICS: 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

UNIT III: Sequence and Series (6L)  
TOPICS: 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 Books:

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

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**PAPER NAME:** English Language and Communication  
**PAPER CODE:** HUN-201  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

**UNIT 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

**UNIT 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

**UNIT 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

**UNIT IV:** Non-Verbal Communication (3L)

- a. Significance and Importance
- b. Body Language: Meaning

**UNIT V:** Reading and Language Comprehension (4L)

- a. Strategies for reading Comprehension

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- b. Comprehension of Technical Materials
- c. Précis Writing

- UNIT VI: Effective Listening (4L)
- a. Process
  - b. Hearing and Listening
  - c. Types of Listening
  - d. Barriers
  - e. Listening Exercise

Suggested Books:

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

**PAPER NAME: Operating Systems**  
**PAPER CODE: BCAN-301**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 4**

UNIT I: Introduction (3L)  
TOPICS: Importance of OS, Basic concepts and terminology, Types of OS, Different views, Journey of a command execution, Design and implementation of OS

UNIT II: Process (10L)  
TOPICS: 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

UNIT III: Resource Manager (8L)  
TOPICS: Memory management, File management, Processor management, Device management

UNIT IV: Security and related Issues (5L)  
TOPICS: Security and protection, Authentication, Protection and access control, Formal models of protection, Worms and viruses

UNIT V: Multiprocessor System (6L)  
TOPICS: Multiprocessor system, Classification and types, OS functions and requirements, Introduction to parallel computing, Multiprocessor interconnection synchronisation

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UNIT VI: Distributed OS (4L)  
TOPICS: Introduction to distributed processing

UNIT VII: Introduction to UNIX OS / DOS (4L)  
TOPICS: Case studies

Suggested Books:

- Operating Systems, Galvin, John Wiley
- Operating Systems , Milankovic, TMH
- An Introduction to Operating System, Bhatt, PHI
- Modern Operating System, Tannenbaum, PHI
- Guide to Operating Systems, Palmer, VIKAS
- Operating Systems, Prasad, Scitech

**PAPER NAME: Object Oriented Programming with C++**  
**PAPER CODE: BCAN-E302A**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 4**

UNIT I: Concepts of OOP (3L)  
TOPICS: Introduction OOP, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP

UNIT II: C++ Basics (3L)  
TOPICS: Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures

UNIT III: C++ Functions (5L)  
TOPICS: Simple functions, Call and return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions

UNIT IV: Objects and Classes (8L)  
TOPICS: 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

UNIT V: Inheritance (8L)  
TOPICS: Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class

UNIT VI: Polymorphism (6L)  
TOPICS: Pointers in C++, Pointers and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism

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UNIT VII: I/O and File Management (5L)  
TOPICS: 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

UNIT VIII: Templates, Exceptions and STL (2L)  
TOPICS: About template, Function templates and class templates, Introduction to exception, try-catch-throw, Overview and use of Standard Template Library

Suggested Books:

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

**PAPER NAME: GUI Programming with .NET**  
**PAPER CODE: BCAN-E302B**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 4**

UNIT I: Visual Basic .NET and the .NET Framework (8L)  
TOPICS: 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

UNIT II: Elements of Visual Basic .net (8L)  
TOPICS: 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

UNIT III: Programming in Visual basic .net (8L)  
TOPICS: 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

UNIT IV: Functions, Built-In Dialog Boxes, Menus and Toolbar (8L)  
TOPICS: 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



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UNIT V: Object Oriented Programming (8L)  
TOPICS: Object Oriented Programming- Creating Classes , Objects, Fields, Properties, Methods, Events , Constructors and destructors, Exception Handling- Models, Statements, File Handling- Using File Stream Class, File Mode, File Share, File Access Enumerations, Opening or Creating Files with File Stream Class, Reading and Writing Text using StreamReader and StreamWriter Classes, Data Access withADO.Net – What are Databases?, Data Access with Server Explorer, Data Adapter and Data Sets, ADO.NET Objects and Basic SQL. Connection with Sql Server

Suggested Books:

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

**PAPER NAME: Computer Graphics**  
**PAPER CODE: BCAN-303**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 3**

UNIT I: Introduction to Computer Graphics (4L)  
TOPICS: Introduction to Computer Graphics & Graphics systems, Graphics Display Devices, Raster and Random Scan Display

UNIT II: Line Drawing (5L)  
TOPICS: Points & Lines, Line Drawing Algorithms (DDA Algorithm, Bresenham's Line Drawing Algorithm)

UNIT III: Circle Drawing Algorithm (5L)  
TOPICS: Circle Generation algorithm (Midpoint Circle Algorithm, Bresenham's Algorithm)

UNIT IV: 2D Transformations (12L)  
TOPICS: Translation, Rotation, Scaling, Reflection, Shear etc. Homogenous Coordinates, Composite Transformation

UNIT V: Projection (2-dimension) (5L)  
TOPICS: Line of Sight, Plane of Projection, Projection methods (Perspective and Parallel)

UNIT VI: Viewing and Clipping (5L)  
TOPICS: Window to Viewport co-ordinate transformation, Point Clipping, Line Clipping (Cohen-Sutherland Line Clippings, Midpoint Sub-division Algorithm)

UNIT VII: Curves and Surfaces (4L)  
TOPICS: Bezier Curves, B-splines, Hidden line/surface removal methods (Depth Buffer (Z-Buffer) Method)

Suggested Books:

- Introduction to Computer Graphics, A. Mukherjee, VIKAS
- Computer Graphics, Rajiv Chopra, S. Chand

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- Procedural & Mathematical Elements in Computer Graphics, Rogers, TMH
- Computer Graphics, Hearn & Baker, PHI

**PAPER NAME:** Mathematics for Computing  
**PAPER CODE:** BMN-301  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

**UNIT I:** Propositional Logic (8L)  
**TOPICS:** Construction of truth table, Tautology, Contradiction, Contingency, Logical equivalence, Generating functions, Recurrence relations

**UNIT II:** Graph Theory (16L)  
**TOPICS:** 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

**UNIT III:** Probability Theory (10L)  
**TOPICS:** 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

**UNIT IV:** Frequency Distribution (6L)  
**TOPICS:** Collection of data, Charts and diagram, Measure of central tendency, Measure of dispersion

Suggested Books:

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

**PAPER NAME:** Database Management System  
**PAPER CODE:** BCAN-401  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 4

**UNIT I:** Introducing to Data and Data Management (4L)  
**TOPICS:** 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

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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

- UNIT II: Data Models and Architecture of DBMS (6L)  
TOPICS: 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
- UNIT III: Data Modeling using ER Modeling (6L)  
TOPICS: 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
- UNIT IV: Relational Model and Relational Database Management System (6L)  
TOPICS: 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
- UNIT V: Normalization (6L)  
TOPICS: 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
- UNIT VI: Managing Data Using Structured Query Language (SQL) (6L)  
TOPICS: 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

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UNIT VII: Transaction and Query Processing (5L)  
TOPICS: 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

UNIT VIII: Indexing and Hashing (1L)  
TOPICS: Introduction, Overview, Primary Secondary Multi level, Dense and Space Index

Suggested Books:

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

**PAPER NAME: Programming with Java**  
**PAPER CODE: BCAN-402**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 4**

UNIT I: Ooops Concept (4L)  
TOPICS: Object, Class, Data abstraction, Data encapsulation, Inheritance, Polymorphism, Dynamic binding

UNIT II: An overview of Java (2L)  
TOPICS: 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

UNIT III: Data Concept (2L)  
TOPICS: Data Types, variables and constants Tokens in Java (Identifiers, Literals, Keywords, Operator)

UNIT IV: Control Statements (2L)  
TOPICS: Simple if statement, if...else statement, Nesting of if-else statement, switch statement

UNIT V: Iteration Statement (2L)  
TOPICS: For loop, While loop, Do-While loop

UNIT VI: Arrays and Vector (2L)  
TOPICS: 1D and 2D array, vector concepts

UNIT VII: Classes and Objects (3L)  
TOPICS: 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

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UNIT VIII:	Inheritance (2L)
TOPICS:	Basic concepts, types of inheritance, use of super keyword, overriding methods.
UNIT IX:	String and String Buffer (2L)
TOPICS:	Use of different functions
UNIT X:	Packages, Interfaces (3L)
TOPICS:	User defined package, import package, Class path, How to create interface, use and extend interface
UNIT XI:	Exception Handling (2L)
TOPICS:	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.
UNIT XII:	Stream (3L)
TOPICS:	Byte Streams, Input Stream, Output Stream Character Streams (Reader, Writer), How Files and Streams Work, Working with Reader classes (InputStreamReader, BufferedReader)
UNIT XIII:	Multithreaded Programming (3L)
TOPICS:	Overview, Thread Life cycle, Advantages of multithreading over multi-tasking Thread Creation and simple programs, Synchronized threads, Synchronized Methods
UNIT XIV:	Applets (4L)
TOPICS:	Applet vs. Application, Applet class, Advantages of Applet, Applet Lifecycle My First Applet, Applet tag, How to run applet
UNIT XV:	Abstract Window Toolkit (4L)
TOPICS:	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 Books:

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

**PAPER NAME:** Computer Networking  
**PAPER CODE:** BCAN-403  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

UNIT I:	(8L)
TOPICS:	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

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Synchronous Transmission, Parallel and Serial Transmission, Base band and Broadband transmission.

UNIT II: (14L)  
TOPICS: 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

UNIT III: (10L)  
TOPICS: 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

UNIT IV: (8L)  
TOPICS: TCP, UDP, Firewalls, Proxy Router, DNS, FTP, TFTP, SMTP, TELNET, NFS, WWW, E-mail, HTTPS, Cable Network, Telephone Network

Suggested Books:

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

**PAPER NAME: Numerical Analysis**  
**PAPER CODE: BMN-401**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 3**

UNIT I: (20L)  
TOPICS: 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 1/3<sup>rd</sup> rule, Expression for corresponding error terms

UNIT II: (20L)  
TOPICS: 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, Runge-Kutta method, Predictor-Corrector method

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Suggested Books:

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

**PAPER NAME:** Cyber Security  
**PAPER CODE:** BCAN-501  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

- UNIT I:** Fundamentals (4L)  
**TOPICS:** 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)
- UNIT II:** Hacking concepts (6L)  
**TOPICS:** 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
- UNIT III:** Cyber Law (4L)  
**TOPICS:** 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
- UNIT IV:** Protocols & Proxy (6L)  
**TOPICS:** 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
- UNIT V:** Cryptography and Steganography (3L)  
**TOPICS:** Basic concepts of Cryptography and Steganography
- UNIT VI:** Malware (3L)  
**TOPICS:** 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
- UNIT VII:** DOS, IDS, IPS (3L)  
**TOPICS:** 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

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- UNIT VIII: Password (2L)  
TOPICS: About Password, Different types of password (Biometric, Pattern based Graphical password, Strong Password technique, Types of Password attacks
- UNIT IX: Web Application Based Threats (2L)  
TOPICS: Cross-site scripting, SQL injection, Command injection, Buffer overload, Directory traversal, Phishing scams, Zombies, Drive by downloads
- UNIT X: Wireless Networking (4L)  
TOPICS: 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
- UNIT XI: Stay Secure in digital World (3L)  
TOPICS: How to stay secure in digital World, have strong password, encrypt your data, security suit software, firewall setup, update os

Suggested Books:

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

**PAPER NAME: Unix and Shell Programming**  
**PAPER CODE: BCAN-502**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 4**

- UNIT I: Introduction to UNIX Operating System (8L)  
TOPICS: 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 (passwd), 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



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- UNIT II: Files (8L)  
TOPICS: 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)
- UNIT III: Shell and Process (8L)  
TOPICS: 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)
- UNIT IV: Customization and Filters (8L)  
TOPICS: 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
- UNIT V: Shell script & System Administration (8L)  
TOPICS: 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.)

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Suggested Books:

- UNIX-Concepts & Applications, Sumitava Das, TMH
- Learning UNIX Operating System, Peek, SPD/O'REILLY
- Understanding UNIX, Srengan, PHI
- Essentials Systems Administration, Frisch, SPD/O'REILLY

**PAPER NAME: Management and Accounting**  
**PAPER CODE: BCA(BBA)N-501**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 2**

UNIT I: Financial Accounting (15L)  
TOPICS: 1. Basic Concept of Accounting 2. Concepts and Conventions of Accounting 3. Journal Entries and Ledger Posting 4. Trial Balance. 5. Financial Statement

UNIT II: Cost Accounting (10L)  
TOPICS: 1. Basic Concept of Cost 2. Classification of Cost 3. Cost Sheet 4. Materials - EOQ, LIFO and FIFO 5. Labour - Wage payment System (Piece Rate, Time Rate, Halsey and Rowan Scheme) 6. Overheads- Meaning and Distribution (Primary Distribution)

UNIT III: Management Accounting (15L)  
TOPICS: 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 Books:

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

**PAPER NAME: Python Programming**  
**PAPER CODE: BCAN-E601A**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 3**

UNIT I: Introduction to Python (12L)  
TOPICS: 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

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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

UNIT II: Conditions & Iterations (8L)

TOPICS:

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

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

TOPICS:

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

UNIT IV: Classes & Objects (10L)

TOPICS:

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 Books:

- Learn Python The Hard Way, Zed A. Shaw, ADDISON-WESLEY
- Learning Python, Mark Lutz, O'REILY
- Programming In Python, Dr. Pooja Sharma, BPB
- Python Programming - Using Problem Solving Approach, Reema Thareja, OXFORD UNIVERSITY PRESS

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**  
**Syllabus for BCA + Repository of Digital Online Courses**

**PAPER NAME:** Artificial Intelligence  
**PAPER CODE:** BCAN-E601B  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

**UNIT 1:** Introduction to AI (1L)  
**TOPICS:** Overview of Artificial Intelligence – Introduction – History of AI – Application of AI – Objectives of AI – Future of AI

**UNIT II:** Symbolic Logic (6L)  
**TOPICS:** Normal Forms in Propositional Logic – Logical Consequences – Resolution Principal – Predicate Calculus – Well Formed Formulas – Clausal Form – Rules of Inference – Unification – Resolution

**UNIT III:** Search Techniques (10L)  
**TOPICS:** 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)

**UNIT IV:** Knowledge representation (8L)  
**TOPICS:** 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

**UNIT V:** Expert system (2L)  
**TOPICS:** 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)

**UNIT VI:** Learning (9L)  
**TOPICS:** Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning (Human neurons to artificial neurons- Learning Algorithms – Difference Network Architectures and their applications – Comparisons of Neural Networks and rule based Methods - – Comparisons of Neural Networks and Expert System – Benefits of Neural Computing – Limitations of Neural Computing) & genetic learning (different operators of Genetic Algorithm ,Analysis of selection operations)

**UNIT VII:** AI Programming (4L)  
**TOPICS:** Basic knowledge of programming language - Prolog & Lisp

**Suggested Books:**

- Artificial Intelligence, Ritch & Knight, TMH
- Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
- Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI

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- Logic & Prolog Programming, Saroj Kaushik, New Age International
- Expert Systems, Giarranto, VIKAS

**PAPER NAME:** E-Commerce  
**PAPER CODE:** BCAN-E601C  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

- UNIT 1:** Introduction to E-Commerce (5L)  
**TOPICS:** 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
- UNIT II:** Internet and Network Security (8L)  
**TOPICS:** E-Commerce and Internet, IP Address, DNS, ISP, URL, Modes of Internet Connectivity with reference to E-Commerce transactions, Web Architecture, VPN
- UNIT III:** Electronic Payment Methods and Digital Currencies (12L)  
**TOPICS:** 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
- UNIT IV:** Introduction to MIS and ERP (7L)  
**TOPICS:** MIS-Definition, Working, Application, DSS, Data Processing, End-user Computing, Introduction to ERP and ERP Systems, ERP Functional Modules, ERP selection issues
- UNIT V:** Information System Prospective of ERP (8L)  
**TOPICS:** 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 Books:**

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

**PAPER NAME:** Web Technology with PHP-MYSQL  
**PAPER CODE:** BCAN-E602A  
**CONTACT HOUR:** 4L+1CE  
**CREDIT:** 3

- UNIT I:** Introduction and Installation (4L)  
**TOPICS:** Introduction to PHP, MySQL and Apache, Installation of WAMP and XAMPP.

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UNIT II:	PHP Basic (6L)
TOPICS:	Syntax, variables, data types, Operators, Strings and constants
UNIT III:	Control Statements (4L)
TOPICS:	If...Else...Else if, Switch
UNIT IV:	Iteration Statement (4L)
TOPICS:	while and for
UNIT V:	Arrays (4L)
TOPICS:	Create an array and access array elements
UNIT VI:	Functions (4L)
TOPICS:	Create a user defined function in PHP, PHP function arguments, Returning values
UNIT VII:	PHP Interface Design (6L)
TOPICS:	Form Creation, Form validation (server side), \$_GET, \$_POST, \$_REQUEST
UNIT VIII:	PHP Advanced (4L)
TOPICS:	PHP include, PHP cookies, PHP Sessions, PHP date and time
UNIT IX:	Database Connectivity (4L)
TOPICS:	Create database and table using PHP INSERT data, SELECT data, DELETE data, UPDATE data using PHP

Suggested Books:

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

**PAPER NAME:**            **Advanced DBMS with PLSQL**  
**PAPER CODE:**           **BCAN-E602B**  
**CONTACT HOUR:**       **4L+1CE**  
**CREDIT:**                 **3**

UNIT 1:	Transaction and Concurrency Control (10L)
TOPICS:	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

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- UNIT II: Recovery (4L)  
TOPICS: Reasons for database recovery, Deferred and Immediate Update, Log-based recovery, In-place updating, Shadow paging
- UNIT III: Normalization and File Organization (10L)  
TOPICS: 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
- UNIT IV: PL/SQL (6L)  
TOPICS: Conditional Statements, Loop, Variable Binding, Working with Strings, Function, Procedure, Exception Handling. Cursor, Trigger, View
- UNIT V: Advanced Topics (10L)  
TOPICS: 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 Books:

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

**PAPER NAME: Digital Marketing**  
**PAPER CODE: BCAN-E602C**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 3**

- UNIT I: Overview (4L)  
TOPICS: 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)
- UNIT II: Search Engine Optimization (SEO) (4L)  
TOPICS: 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
- UNIT III: Social Media Marketing (SMM) (4L)  
TOPICS: About Social Media Marketing, Different types of Social Media Marketing

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- UNIT IV: Content Marketing (4L)  
TOPICS: About Content Marketing, Goals of Content Marketing, Types Of Contents, etc.
- UNIT V: Online Advertising (4L)  
TOPICS: About Online Advertising, Advantages of Online Advertising, Paid versus Organic, Pay Per Click (PPC) Model. Basic concepts CPC, PPC, CPM, CTR, CR
- UNIT VI: Email Marketing (4L)  
TOPICS: About Email marketing, Email newsletters, Digests, Dedicated Emails, Lead Nurturing, Sponsorship Emails and Transactional Emails, Drawbacks of Email Marketing
- UNIT VII: Mobile Marketing (4L)  
TOPICS: About Mobile Marketing, Objectives of Mobile Advertising, Creating a Mobile Marketing Strategy, About SMS Marketing
- UNIT VIII: Online Marketing Types (4L)  
TOPICS: Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing. Referral Marketing
- UNIT IX: Web analytics (4L)  
TOPICS: About Web Analytics, Types of Web Analytics (On-site, Off-site), Importance of Web Analytics
- UNIT X: Online Marketing Impact (4L)  
TOPICS: Impact, Pros & Cons

Suggested Books:

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

**PAPER NAME: Values and Ethics of Profession**  
**PAPER CODE: HUN-601**  
**CONTACT HOUR: 4L+1CE**  
**CREDIT: 2**

- UNIT I: Introduction to Ethical Theories (4L)  
TOPICS: Consequentialist and Non-consequentialist theories, Hedonism, Utilitarianism, Virtue Ethics, Ethical Relativism, Ethical Naturalism
- UNIT II: Ethics and Morality (6L)  
TOPICS: Ethics and Morals, Ethics in Indian Tradition, Building character in workplace, Moral and Ethical Judgement: Cannons of ethics, Ethics of duty, Ethics of responsibility
- UNIT III: Ethics and Environment (8L)  
TOPICS: Rapid technological growth and depletion of resources, Sources of energy, Energy crisis, Reports of Club of Rome, Environmental degradation, Environmental Regulations, Environmental Ethics, Eco-



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friendly technologies, Sustainable Development, Important and recent national and international conventions on environment, Appropriate Technology Movement of Schumacher: Later developments

- UNIT IV: Technology and Developing Nations- Technology transfer (8L)  
TOPICS: 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
- UNIT V: Ethics of Profession (8L)  
TOPICS: 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
- UNIT VI: Profession and Human Values (6L)  
TOPICS: 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 Books:

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

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**  
**Syllabus for BCA + Repository of Digital Online Courses**

**Detailed Syllabus**  
**(Practical/Sessional)**

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**Syllabus for BCA + Repository of Digital Online Courses**

**PAPER NAME:** Programming Lab with C  
**PAPER CODE:** BCAN-193  
**CONTACT HOUR:** 6P  
**CREDIT:** 3

- UNIT 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>
- UNIT 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
- UNIT 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.
- UNIT 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>
- UNIT 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.
- UNIT 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.
- UNIT 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].

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UNIT 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.

UNIT 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.

UNIT 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 NAME: PC Software Lab**  
**PAPER CODE: BCAN-181**  
**CONTACT HOUR: 4P**  
**CREDIT: 3**

UNIT I: Introduction to Software (Windows 7, Office 2010 (or, respective higher versions))  
TOPICS: 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

UNIT II: Microsoft Word  
TOPICS: 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

UNIT III: Microsoft Excel:  
TOPICS: 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

**MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**  
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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

UNIT IV: MS PowerPoint :  
TOPICS: 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

**PAPER NAME: Data Structure Lab using C**  
**PAPER CODE: BCAN-293**  
**CONTACT HOUR: 6P**  
**CREDIT: 3**

UNIT 1: 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).

UNIT II: Dynamic Memory Allocation  
Write C programs to -Implement malloc function, Implement calloc and realloc and free functions.

UNIT 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.

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- UNIT 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.
- UNIT V: Searching and Sorting  
Write C programs to – Implement insertion sort, Implement Selection sort, Implement Quick sort, Implement Bubble sort , Implement Heap sort.
- UNIT 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.
- UNIT 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).
- UNIT VIII: Graphs  
Write C programs to - Implement Shortest path algorithm, Implement BFS, Implement DFS

**PAPER NAME: Business Presentation and Language Lab**  
**PAPER CODE: HUN-291**  
**CONTACT HOUR: 4P**  
**CREDIT: 3**

Preparing Business Presentation using PowerPoint  
Developing Structured Project Report using Word and Excel  
Group Discussion Practice  
Personal Interview Practice  
Role Play  
Business Conversations  
Poster Presentation  
News Review

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**PAPER NAME:** Programming Lab with C++  
**PAPER CODE:** BCAN-E392A  
**CONTACT HOUR:** 6P  
**CREDIT:** 3

- UNIT I: Simple C++ programs using the variables, operators, control structures, functions and I/O objects cin and cout
- UNIT 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
- UNIT III: Implementation of the concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class
- UNIT IV: Implementation of pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions
- UNIT V: Developing the concept of stream classes and file handling  
Developing the basic concept of template and exception handling

**PAPER NAME:** Programming Lab with .NET  
**PAPER CODE:** BCAN-E392B  
**CONTACT S:** 6P  
**CREDIT:** 3

- UNIT I: Simple VB .NET programs using the features. Showing the basic features of VB.NET IDE
- UNIT 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
- UNIT 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.
- UNIT 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
- UNIT 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

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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

**PAPER NAME:** Web Technology Lab  
**PAPER CODE:** BCAN-381  
**CONTACT HOUR:** 4P  
**CREDIT:** 3

UNIT 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

UNIT II: Introduction to CSS  
Inline CSS, Classes and IDs, Formatting Text, Div, Export External CSS to a web page

UNIT III: JavaScript  
Introduction to JavaScript, Data types, if-else statement, Array, Loop, Function, Form validation

**PAPER NAME:** Database Lab  
**PAPER CODE:** BCAN-491  
**CONTACT HOUR:** 6P  
**CREDIT:** 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



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**PAPER NAME:** Programming Lab with Java  
**PAPER CODE:** BCAN-492  
**CONTACT HOUR:** 6P  
**CREDIT:** 3

**UNIT I:** Basic Java Programming  
Writing Java programs to:  
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

**UNIT 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(),deleteCharAt()] 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

**PAPER NAME:** Soft Skill Development  
**PAPER CODE:** BCAN-481  
**CONTACT HOUR:** 3P  
**CREDIT:** 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

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**PAPER NAME:** Minor Project  
**PAPER CODE:** BCAN-591  
**CONTACT HOUR:** 9P  
**CREDIT:** 6

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

**PAPER NAME:** Linux Lab  
**PAPER CODE:** BCAN-592  
**CONTACT HOUR:** 6P  
**CREDIT:** 3

**UNIT I:** LINUX Utilities  
**TOPICS:** Calendar, Display system date, Message display, Calculator, Password changing, Knowing who are logged in, Knowing System information

**UNIT II:** Directory creation, removal, listing, navigation  
**TOPICS:** 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 (..)

**UNIT III:** Ordinary file handling  
**TOPICS:** 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

**UNIT IV:** File attributes  
**TOPICS:** 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

**UNIT V:** Shell  
**TOPICS:** Types of shell, Pattern matching, Escaping, Quoting, Redirection, Pipe, tee, Command substitution, Shell variables

**UNIT VI:** Process  
**TOPICS:** Display process attributes, Display System processes, Background jobs, Reduce priority, Sending job to background and foreground, Listing jobs

**UNIT VII:** Filters  
**TOPICS:** 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

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UNIT VIII: VI/VIM Editor and Shell script

TOPICS: 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

**PAPER NAME: Industrial Training**

**PAPER CODE: BCAN-583**

**CONTACT HOUR:**

**CREDIT: 3**

To visit a compatible industry to gather practical exposure

**PAPER NAME: Major Project with Viva-Voce**

**PAPER CODE: BCAN-691**

**CONTACT HOUR: 15**

**CREDIT: 8**

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

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**Repository of Digital Online Courses**

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

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			University)	
11	<b>Data Science: R Basics</b>	<a href="https://www.edx.org/course/data-science-r-basics">https://www.edx.org/course/data-science-r-basics</a>	HarvardX (Harvard University)	1
12	<b>Supply Chain Management: A Decision-Making Framework</b>	<a href="https://www.edx.org/course/supply-chain-management-a-decision-making-framework">https://www.edx.org/course/supply-chain-management-a-decision-making-framework</a>	LouvainX (Université catholique de Louvain (UCL))	1
13	<b>Customer Relationship Management</b>	<a href="https://www.edx.org/course/customer-relationship-management">https://www.edx.org/course/customer-relationship-management</a>	IIMBx (Indian Institute of Management Bangalore)	1
14	<b>Online Marketing Strategies</b>	<a href="https://www.edx.org/course/online-marketing-strategies-curtin-mkt5x">https://www.edx.org/course/online-marketing-strategies-curtin-mkt5x</a>	CurtinX (Curtin University)	3
15	<b>E-Commerce</b>	<a href="https://www.emarketinginstitute.org/free-courses/">https://www.emarketinginstitute.org/free-courses/</a>	eMarketing Institute	1
16	<b>Email Marketing</b>	<a href="https://www.emarketinginstitute.org/free-courses/">https://www.emarketinginstitute.org/free-courses/</a>	eMarketing Institute	1
17	<b>Online marketing</b>	<a href="https://www.emarketinginstitute.org/free-courses/">https://www.emarketinginstitute.org/free-courses/</a>	eMarketing Institute	1
18	<b>Beginner PHP and MySQL Tutorial</b>	<a href="https://www.udemy.com/php-mysql-tutorial/">https://www.udemy.com/php-mysql-tutorial/</a>	<a href="https://www.udemy.com">https://www.udemy.com</a>	2
19	<b>Learn E-Commerce Website in PHP &amp; MySQL From Scratch!</b>	<a href="https://www.udemy.com/ecommerce-website-in-php-mysql/">https://www.udemy.com/ecommerce-website-in-php-mysql/</a>	<a href="https://www.udemy.com">https://www.udemy.com</a>	2
20	<b>IT Fundamentals for Business Professionals: Software development</b>	<a href="https://www.edx.org/course/it-fundamentals-business-professionals-upvalenciawisc101-3x">https://www.edx.org/course/it-fundamentals-business-professionals-upvalenciawisc101-3x</a>	La Universidad Politécnica de Valencia	1
21	<b>Introduction to Java Programming – Part 1</b>	<a href="https://www.edx.org/course/introduction-java-programming-part-1-hkustx-comp102-1x-5">https://www.edx.org/course/introduction-java-programming-part-1-hkustx-comp102-1x-5</a>	Hong Kong University of Science and Technology	2

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

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

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	<b>Programming: Fundamental Data Structures and Algorithms</b>	uc3mx-it-1-3x	Madrid	
48	<b>Software Engineering: Introduction</b>	<a href="https://www.edx.org/course/software-engineering-introduction-ubcx-softeng1x">https://www.edx.org/course/software-engineering-introduction-ubcx-softeng1x</a>	University of British Columbia	5
49	<b>HTML5 and CSS Fundamentals</b>	<a href="https://www.edx.org/course/html5-css-fundamentals-w3cx-html5-0x-0">https://www.edx.org/course/html5-css-fundamentals-w3cx-html5-0x-0</a>	World Wide Web Consortium (W3C)	3
50	<b>CSS Basics</b>	<a href="https://www.edx.org/course/css-basics-w3cx-css-0x-0">https://www.edx.org/course/css-basics-w3cx-css-0x-0</a>	World Wide Web Consortium (W3C)	3
51	<b>Program a Server-Side Application using ASP.NET Core</b>	<a href="https://www.edx.org/course/program-a-server-side-application-using-aspnet-core">https://www.edx.org/course/program-a-server-side-application-using-aspnet-core</a>	Microsoft	2
52	<b>Introduction to Cloud Infrastructure Technologies</b>	<a href="https://www.edx.org/course/introduction-cloud-infrastructure-linuxfoundationx-lfs151-x">https://www.edx.org/course/introduction-cloud-infrastructure-linuxfoundationx-lfs151-x</a>	Linux Foundation	3
53	<b>Introduction to Internet of Things</b>	<a href="https://onlinecourses.nptel.ac.in/noc18_cs46/preview">https://onlinecourses.nptel.ac.in/noc18_cs46/preview</a>	NPTEL	4
54	<b>Social Networks</b>	<a href="https://onlinecourses.nptel.ac.in/noc18_cs56/preview">https://onlinecourses.nptel.ac.in/noc18_cs56/preview</a>	NPTEL	4
55	<b>Fundamental of Curriculum in Engineering Education</b>	<a href="https://swayam.gov.in/learningpath/Certificate">https://swayam.gov.in/learningpath/Certificate</a>	SWAYAM	2
56	<b>Introduction to Information Security - I</b>	<a href="https://swayam.gov.in/courses/1303-introduction-to-information-security-i">https://swayam.gov.in/courses/1303-introduction-to-information-security-i</a>	SWAYAM	2



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57	<b>Art of C Programming</b>	<a href="https://swayam.gov.in/courses/5012-art-of-c-programming">https://swayam.gov.in/courses/5012-art-of-c-programming</a>	SWAYAM	4
58	<b>Programming Fundamentals</b>	<a href="https://www.coursera.org/learn/programming-fundamentals">https://www.coursera.org/learn/programming-fundamentals</a>	Duke University	3
59	<b>Cloud Computing Concepts, Part 1</b>	<a href="https://www.coursera.org/learn/cloud-computing">https://www.coursera.org/learn/cloud-computing</a>	University of Illinois at Urbana-Champaign	2
60	<b>Object Oriented Programming in Java</b>	<a href="https://www.coursera.org/learn/object-oriented-java">https://www.coursera.org/learn/object-oriented-java</a>	University of California San Diego	3
61	<b>Switching Circuits and Logic Design</b>	<a href="https://onlinecourses.nptel.ac.in/noc18_cs30/preview">https://onlinecourses.nptel.ac.in/noc18_cs30/preview</a>	IIT Kharagpur	4
62	<b>Computer Architecture</b>	<a href="https://onlinecourses.nptel.ac.in/noc18_cs29/preview">https://onlinecourses.nptel.ac.in/noc18_cs29/preview</a>	IIT Madras	4
63	<b>English Language for Competitive Exams</b>	<a href="https://onlinecourses.nptel.ac.in/noc18_hs28/preview">https://onlinecourses.nptel.ac.in/noc18_hs28/preview</a>	IIT Madras	2
64	<b>Soft Skills</b>	<a href="https://onlinecourses.nptel.ac.in/noc18_hs29/preview">https://onlinecourses.nptel.ac.in/noc18_hs29/preview</a>	IIT Roorkee	4
65	<b>Technical English for Engineers</b>	<a href="https://onlinecourses.nptel.ac.in/noc18_hs27/preview">https://onlinecourses.nptel.ac.in/noc18_hs27/preview</a>	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.

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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.