Learning Outcome based Curriculum Framework (LOCF)

For

Choice Based Credit System (CBCS)

Syllabus

BACHELOR OF COMPUTER APPLICATION

w.e.f. Academic Session 2020-21

Kazi Nazrul University

Asansol, Paschim Bardhaman

West Bengal 713340

Preamble

The objective of any programme at a Higher Education Institution is to create for its students a sound foundation for their character development which directly contributes to the well-being of a nation. Kazi Nazrul University envisions all its programmes in the spirit of its "motto" which is to inspire the youth to show steadfastness and devotion in a fearless pursuit of truth. The LOCF aims at preparing young minds for constructive and productive character development by honing their creative and humanistic skills for their own betterment as well as for the greater good of the society. In order to provide an opportunity to students to discover a method of thinking which will help them realise their true potential, the University offers a Learning Outcome-based Curriculum Framework (LOCF) for all its Under Graduate programmes.

The LOCF approach is intended to provide focused, outcome-based syllabi at the undergraduate level with an agenda to structure the teaching-learning experiences in a more student-centric manner by making the courses flexible and by offering students more choices. The LOCF approach has been adopted to strengthen the teacher- learner interaction as students engage themselves in programmes of their choice and learn to realize their inner calling. As the Under- Graduate Programmes focus on 'preparing minds', they will create individuals who will have intellectual prowess, interactive competence, courage to lead the world and also compassion and empathy for fellow human beings. The LOCF thus aims at strengthening not merely students' employability skills but also at imparting to them vital life-skills required to lead a happy personal and social life.

Each programme vividly elaborates its nature and promises the outcomes that are to be accomplished by studying the courses. The programmes also state the attributes that they offer to inculcate at the graduation level. The graduate attributes encompass values related to students' well-being, emotional stability, critical thinking etc. intermingled with a sense of social justice and harmony. In short, each programme prepares students for employability, sustainability and life-long learning. The new curriculum will empower students to innovate and also inspire them to convert their innovations into real business models for the country's economic and social prosperity. The proposed LOCF offers better understanding of the business world and aims at building students' entrepreneurial skills by giving them hands-on training. The Kazi Nazrul University hopes the LOCF approach of the programme will motivate students to transition from being passive knowledge-seekers to becoming active and aware knowledge-creators.

Semester- I

Course Name: Computer Fundamentals

Course Code: BCAC101

<table>
<tr><td>Course Type: Core (Theoretical)</td><td colspan="2">Course Details: CC-1</td><td colspan="2">L-T-P: 3-1-0</td></tr>
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<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
</table>

Course Content:

Theory

Unit I: Introduction to Computer-Definition of Computer System; Evolution of Computer – a brief history; Classification of computer; Generation of Computers.

Unit II: Computer System Architecture – Definition of Hardware; Basic units of Computer System; CPU – Control Unit, ALU; System Buses, Memory module – Primary Memory, Secondary Memory, Cache Memory, Virtual Memory – definition, classification, features and functions; measuring unit of memory – Bit, Byte, KB, MB, GB; Input Devices – Keyboard, Mouse, Scanner, Output Devices – Monitor, Printer.

Unit III: Introduction to Number System – Positional and Non Positional number system; Various Number system-Decimal, Binary, Octal Hexadecimal; Number system conversions – working with integer and 8 LH fractional number; Simple binary arithmetic – addition, subtraction multiplication, division.

Unit IV: Introduction to Software – Definition of Software; Classification of Software; Introduction to Operating System – Definition of OS; Application Softwares, Functions of OS, basic concept of different type of OS- batch processing OS, Multitasking OS, Multi-user OS, Network OS.

Unit V: Introduction to Programming Languages: Machine Language, Assembly Language, High Level Language

Unit VI: Problem Solving: Flow Charts, Decision Tables and Pseudo code.

Unit VII: Familiarization and using MS packages – Word, Excel, PowerPoint, basic skills in using these tools.(Version MS-Office’2007)

References/ Suggested Readings:

1. Fundamentals of Computers – U. Rajaraman.
2. Computers Fundamentals – P. K. Sinha and Preeti Sinha.
3. Computer Concepts and Applications – Sanders H. Donald.

Course Name: Programming in C

Course Code: BCAC102

Course Type: Core (Theoretical)	Course Details: **CC-2**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

Unit I: Introduction: Problem analysis, need for programming languages, Over view of C, Basic Structure, Character sets, Keywords, Identifiers, Constants, Variables, Data Types, Program Structure, loops and variables, Introduction to pointer.

Unit II: Operators: Arithmetic, Relational, Logical and Assignment; Increment, Decrement and Conditional, Operator

Unit III: Precedence and Associations; Expressions.Expression evaluation and type conversion.Formatted input and output.

Unit IV: Statements: Assignment, Initialization, Decision making, looping and control structures, Array, String, String handling functions, Functions – Arguments passing, Return values and their types, recursion. Enumerated data types.Structures.Arrays of structures.Arrays within structures.

Unit V: Pointers: Declaration and initialization, accessing variables through pointer arithmetic, Pointers and arrays, String, Pointer to Functions and Structures, Union, Dynamic Storage Allocation.

Unit VI: File handlings: Opening, Closing, I/O operations.

References/ Suggested Readings:

1. Programming in C-B.S. Gottfried, TMH
2. Programming in ANSI C- E. Balaguruswami, TMH
3. A First Course in Pragramming with C, Jeyapoovan, VIKAS

Course Name: Mathematics -I

Course Code: BCAC103

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<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
</table>

Course Content:

Theory

Unit I: Algebra: Sets, Union and Intersection, Complement, Mapping, Composition, notion of a Group, Ring , Field with simple examples.

Unit II: Complex Number: Modulus and amplitude, De Moiver’s theorem

Unit III: Polynomials, Division algorithm, Fundamental theorem of classical algebra (Proof not required), Descartes rule of sign and their application, Relation between roots and coefficients; symmetric function of roots, Transformation of polynomial equation, Cardon's solution of cubic equation, Determinants, Addition and Multiplication of Matrices, Inverse of a Matrix ; Solution of linear equations in three variables by Cramer's rule and solution of three line linear equations by matrix inversion methods

Unit IV: Permutation and Combinations: Basics and Numerical.

Unit V: Vector spaces, Subspaces, Bases and Dimensions, Co-ordinates, Linear Transformation, The Algebra of Linear Transformations.

Unit VI: Vector Algebra: Scalars & vectors, vector addition, linear combination of vectors, condition of colinearity of three points, scalar and vector products, scalar triple product and vector triple product.

Unit VII: Analytical Geometry: Translation and rotation of rectangular axes, invariants, general equation of second degree-reduction to standard forms and classification. Plane polar equation of a straight line, circle, ellipse, parabola and hyperbola.

References/ Suggested Readings:

1. A Text book of Algebra- B.K. Lahiri& K. C. Roy
2. Linear Algebra- Das & Roy
3. Co-ordinate Geometry- S. L. Loney
4. Differential Calculus- Das and Mukherjee
5. Integral Calculus - Das and Mukherjee

Course Name: Software Lab - I : PC Software Lab

Course Code: BCAC104

Course Type: **Core (Practical)**	Course Details: **CC-4**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**…**	**40**	**….**

Course Content:

Practical

Unit I: MS Windows: Windows 7, Desk top cell user interface action, icon on desktop, closing windows, renaming icons, resizing windows(maximizing and minimizing), control panel.

Unit II: MS Word: Overview, creating, saving, opening, importing, exporting, and inserting files, formatting pages, paragraphs and sections, indents and outdents, creating lists and numbering. Headings, styles, fonts and font size, editing, positioning, viewing texts, searching and replacing text, inserting page breaks, page numbers, bookmarks, symbols, and dates. Using tabs and tables, header, footer, and printing,

Unit III: MS Excel: Worksheet overview, entering information, worksheet creation, opening and saving workbook, formatting numbers and texts, protecting cells, producing charts, and printing operations. Application of Excel for obtaining statistical parameters, Mean, Median, Mode, average, co-relation, Regression.

Unit IV: MS Access: Introduction, understanding databases, creating tables, queries, forms, reports, adding graphs to your reports.

Unit V: PowerPoint: Slide creation with PowerPoint.

References/ Suggested Readings:

1. Introduction to Computers with MS-Office, Leon, TMH

Course Name: Software Lab - II : Programming in C

Course Code: BCAC105

Course Type: **Core (Practical)**	Course Details: **CC-5**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**….**	**40**	**….**

Course Content:

Practical

Unit I: Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code, execute and test it. Students should be given assignments on following:

a. To learn elementary techniques involving arithmetic operators and mathematical expressions, appropriate use of selection (if, switch, conditional operators) and control structures

b. Learn how to use functions and parameter passing in functions, writing recursive programs.

Unit II: Write Programs to learn the use of strings and string handling operations.

a. Problems which can effectively demonstrate use of Arrays. Structures and Union.

b. Write programs using pointers.

c. Write programs to use files for data input and output.

d. Write programs to implement search algorithms.

References/ Suggested Readings:

1. Practical C Programming, Oualline, SPD/O'REILLY

Semester- II

Course Name: Digital Logic

Course Code: BCAC201

Course Type: **Core (Theoretical)**	Course Details: **CC-6**			L-T-P: **3-1-0**
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Number systems: Positional number systems; Binary, Octal , Hexadecimal and Decimal number systems; conversion of a number in one system to the other; Representation of signed numbers- signed magnitude, one's complement, 2's complement representation techniques, Merits of 2's complement representation scheme; Various binary codes- BCD, excess -3, Gray code; Binary arithmetic- addition, subtraction, multiplication and division of unsigned binary numbers.

UNIT II. Logic gates: Basic logic operations- logical sum(or), logical product (AND), complementation (not), Anti coincidence (EX-OR)and coincidence (EX-NOR) operations: Truth tables of Basic gates; Boolean Variables and Expressions; Demorgan's theorem; Universal gates- NAND and NOR; Boolean expressions Simplification- Algebraic technique, Karnaugh map technique, 3 variable and 4 variable Karnaugh map.

UNIT III. Combinational Circuits: Half adder, full adder, binary magnitude comparator, adder /subtractor circuits, multiplexer and demultiplexer circuits, BCD adder/ subtractor; ALU; parity generators, code converters, priority encoders, PLAs.

UNIT IV. Sequential circuits: flip- flops, - RS, clocked RS, D, JK, T flip-flops,: Race condition, Master Slave JK: Registersuniversal shift registers; Counters- Binary, decade; modulo-r divider; Practical IC's; Sequential Machine design.

References/ Suggested Readings:

1. Digital Logic: M. Morris Mano, Pearson.
2. Digital Principles and Applications: Malvino and Leach
3. Modern Digital Electronics: R.P. Jain

Course Name: Data Structure

Course Code: BCAC202

Course Type: **Core (Theoretical)**	Course Details: **CC-7**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Introduction: Introduction to algorithm, analysis for space and time requirements.

UNIT II. Linear data structures and their sequential representation: Array, Stack, queue, circular queue, dequeue and their operation's and applications.

UNIT III. Linear data structures and their linked representation:linear linked list, doubly linked list, linked stack and linked queue and their operations and applications.

UNIT IV. Nonlinear data structure: Binary trees, binary search trees, representations and operations. Thread representations, sequential representations, graphs, and their representation.

UNIT V. Searching: linear search and binary search

UNIT VI. Sorting: bubble, insertion, selection, quick and merge sort.

References/ Suggested Readings:

1. Fundamentals of Data Structures in C, Horowitz and Sahni, Computer Science Press.
2. Data Structure using C- A.M. Tanenbaum, PHI
3. Data Structures in C, Ajay Agarwal, Cyber Tech
4. Data Structures Using C, Radhakrishnan&Shrinivasan, ISTE/EXCEL BOOKS
5. C and Data Structure,Radhaganesan,Scitech

Course Name: Accounting & Costing

Course Code: BCAC203

Course Type: **Core (Theoretical)**	Course Details: **CC-8**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Basic Accounting and Conventions underlying preparation of Financial statements (balance sheet highlighting accounting process, basic accounts, trial balance and financial statements, issue such as provisions for bad debts tax, dividends, losses such as bad debts, missing information, classification effects, cost of assets, rentals etc.), income measurement (revenue; recognition and matching costs and revenues; inventory valuation);depreciation accounting; intangible assets accounting; understanding published annual accounts including fund flow statements

UNIT II. Basic Cost Concepts (Introduction; Cost Classification; Allocation, Appointment and Absorption; Cost Centres); Cost Analysis for Managerial Decisions (Direct Costing, Break-Even Analysis; Relevant Fixed Costs and Sunk Costs). Cost Analysis for Control (Standard Costing; Variences; Material, Labour; Overhead, Sales and Profit)

UNIT III. Standard Cost accounting (Budgeting and Control; Elements of Budgeting; Control of Manufacturing and Manufacturing Expenses; Performances Appraisal, Evaluation of Cost Control Systems)

References/ Suggested Readings:

1. Modern Accountancy-Amitabha Mukherjee & Mohammed Hanif; Tata McGraw-Hill.
2. Accountancy –Basu and Das,Rabindra Library

Course Name: Software Lab - III : Data Structure

Course Code: BCAC204

<table>
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<tr><td>60</td><td>…</td><td>40</td><td>….</td></tr>
</table>

Course Content:

Practical

Program should be developed using C Language to implement the problems related to paper Data Structure.

References/ Suggested Readings:

1. Data Structure using C- A.M. Tanenbaum, PHI

Course Name: Hardware Lab - I : Digital Logic

Course Code: BCAC205

<table>
<tr><td colspan="2">Course Type: Core (Practical)</td><td colspan="2">Course Details: CC-10</td><td colspan="2">L-T-P: 0-0-8</td></tr>
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<tr><td>60</td><td>…</td><td>40</td><td>….</td></tr>
</table>

Course Content:

Practical

UNIT I. Study on the characteristic of AND, OR, NAND, NOR, EX-OR, EX-NOR gates

UNIT II. Design of different combinational circuit such as half adder/subtractor, full adder/subtractor, decoder/encoder, priority encoder, multiplexer, demultiplexer, magnitude comparator etc.

UNIT III. Study on the characteristic of different flip-flops-JK, RS, T, D etc.

UNIT IV. Design and implementation of different sequential circuit such as shift register, counter-decimal, ripple.

References/ Suggested Readings:

1. Digital Logic: M. Morris Mano, Pearson.
2. Modern Digital Electronics: R.P. Jain

Semester- III

Course Name: Object Oriented Programming with C ++

Course Code: BCAC301

Course Type: **Core (Theoretical)**	Course Details: **CC-11**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Introduction: Principles of Object-Oriented-Programming (OOP), comparison of procedural programming and OOP, Advantages of OOP, Overview of OOP using C++

UNIT II. Classes and Objects: Declaration of classes and objects, Objects as function arguments, Arrays of objects, returning objects from function, structures and classes.

UNIT III. Constructors and Destructors: Constructors, Basic constructors, parameterized constructors, constructors with default argument, dynamic initialization of objects, copy constructors, dynamic constructors, destructors, constraints on constructors and destructors.

UNIT IV. Operator Overloading: Overloading unary operators, binary operators and arithmetic operators, multiple overloading, comparison operators, conversion between objects and basic types, conversion between objects of difference classes, constraints on type conversion.

UNIT V. Derived Classes and Inheritance: Derived classes and base classes, defining a derived class, accessing base class member, Protected access specifier, derived class constructors, overriding the member function, class hierarchies, abstract base class, constructors and member function.

UNIT VI. Inheritance- public and private, access combinations and usage of access specifiers, classes and structures, Multiple Inheritance.

UNIT VII. Pointers: Pointers to objects, Virtual functions and Polymorphism.

UNIT VIII. Streams: Stream classes, stream class hierarchy, stream manipulators, string streams, character stream classes.

UNIT IX. Templates: Function templates and class templates

UNIT X. Introduction to Exception handling.

References/ Suggested Readings:

1. Object Oriented Programming through C++ E.Balagurusamy, TMH
2. Object Oriented Programming in Turbo C++ Lafore Robert, Galgotia Publications.

Course Name: Operating Systems

Course Code: BCAC302

Course Type: **Core (Theoretical)**	Course Details: **CC-12**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Operating system as an extended machine and a resource manager, operating system concepts- process, files, shell, Operating system structure: monolithic system, layered systems, virtual machines, client server model. Idea of multiprogramming, multiprocessing, batch processing and time sharing. Real time systems.

UNIT II. Concurrent processes: Critical section problem, Semaphores & Synchronization.

UNIT III. CPU scheduling: Scheduling concepts and algorithms.

UNIT IV. Memory management: Static & dynamic partitioning, Dynamic relocation, Paging & demand paging memory management, Virtual memory, Replacement algorithm, Segmented memory management, Thrashing.

UNIT V. Device management: Scheduling concept and algorithm, spooling.

UNIT VI. Deadlock detection, prevention and avoidance.

UNIT VII. File management: File concept, access methods, allocation methods, Directory concept.

References/ Suggested Readings:

1. Modern Operating Systems- A.S. Tanenbaum (PHI)
2. Operating Systems, Galvin, John Wiley
3. Operating Systems, Prasad, Scitech

Course Name: Mathematics - II

Course Code: BCAC303

Course Type: **Core (Theoretical)**	Course Details: **CC-13**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Differential Calculus: Limit of a function and continuity. Fundamental properties of continuous functions (proofs not required); Derivative and Differential-Geometric meaning, Rules of Differentiation. Successive dirrerentiation.Rolle's theorem, Mean-Value theorems, Taylor's and Maclaurin's theorems with Cauchy's and Lagrange's forms of remainder; Taylor's series. Functions of several variables.Partial Derivatives.Total Differential. Euler's theorem on homogeneous functions of two variables. Application to plane curves.

UNIT II. Integral Calculus: Rules of Integration of Indefinite Integrals, Solution of Definite Integrals and their elementary properties. Idea of improper integrals.

UNIT III. Differential Equations: order, degree, solution and formation of a differential equation. Standard techniques of solving a linear differential equation with constant coefficients. Cauchy's and Ligendre's Liner Differential Equations with variable coefficients.

UNIT IV. Sequence and Series: Bounded and unbounded sequences, Convergence or divergence of a sequence, Behavior of monotone sequences, Algebra of convergent sequences, Cauchy sequence, Cauchy's general principle of convergence, Infinite series, it's convergence and sum, series with positive terms and standard tests of convergence (without proofs), Alternating Series, Leibniz Test, Absolute convergence, Rearrangement of absolutely convergent series, Test of convergence of Abel and Dirichlet (without proofs)

References/ Suggested Readings:

1. Differential Equations - Sheplay I, John Wiley & Sons, Inc.
2. Linear Algebra - Kenneth Hoffman & Ray Kunze, PHI.
3. Mathematical Analysis - S. C. Malic, Wiley Eastern Limited.
4. Differential Calculus – Das and Mukherjee, N. Dhur & Sons Pvt. Ltd.
5. Integral Calculus – Das and Mukherjee, N. Dhur & Sons Pvt. Ltd.

Course Name: Software Lab - IV: Object Oriented Programming with C ++

Course Code: BCAC304

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</table>

Course Content:

Practical

Program should be developed in C++ to implement the problems related to Object oriented programming.

References/ Suggested Readings:

1. Object Oriented Programming through C++ E.Balagurusamy, TMH
2. Object Oriented Programming in Turbo C++ Lafore Robert, Galgotia Publications

Course Name: Software Lab - V: Unix and Shell Programming

Course Code: BCAC305

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</table>

Course Content:

Practical

UNIT I. External and internal commands of UNIX.

UNIT II. What is shell and various type of shell, Various editors present in unix/linux

Different modes of operation in vi editor

UNIT III. What is shell script, Writing and executing the shell script. Shell variable (user defined and system variables)

UNIT IV. System calls, Using system calls. Pipes and Filters.

UNIT V. Decision making in Shell Scripts (If else, switch), Loops in shell

UNIT VI. Functions . Utility programs (cut, paste, join, tr, uniq utilities)

UNIT VII. Pattern matching utility (grep).

References/ Suggested Readings:

1. Sumitabha, Das, Unix Concepts and Applications, Tata McGraw-Hill Education.

Course Name: Business System & Application

Course Code: BCAGE301

Course Type: **GE (Theoretical)**	Course Details: **GEC-1**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Use of computers for managerial applications, Technology issues and data processing in organizations, Introduction to Information Systems, shift in Information system thinking, latest trends in Information Technology.

UNIT II. Management Information System and Management Processes – Definition of MIS; Role of MIS in an Organization; Processes of Management; Role of MIS in Planning, Organizing activity, Staffing, Directing and Controlling.

UNIT III. Major Information Systems of an Organization – Office automation systems, TPS (Transaction processing System), MIS (Management Information System), DSS (Decision Support System), ESS (Executive Support System) – definition, functions, Characteristics and benefits; Distinction between MIS and DSS.

UNIT IV. Enterprise Information System – Evolution of EIS; Enterprise Resource Planning (ERP) System – concept, architecture; Modules of ERP; How ERP improve company's business performance; Benefits of ERP.

References/ Suggested Readings:

1. Business Information Systems, Munish Kumar, VIKAS.
2. Management Information System, O'Brien, TMH.
3. Business Application of Computers, M.M. Oka, EPH.
4. Management Information System – Dharminder Kumar & Sangeeta Gupta; EXCEL Book.

Course Name: Multimedia System Design

Course Code: BCAGE302

Course Type: **GE (Theoretical)**	Course Details: **GEC-1**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Multimedia: Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality. Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext.

UNIT II. Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light & colors, computerized colors, color palettes, image file formats. Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.

UNIT III. Video: How video works, analog video, digital video, video file formats, video shooting and editing.

UNIT IV. Animation: Principle of animations, animation techniques, animation file formats.

UNIT V. Internet and Multimedia: www and HTML, multimedia on the web – web servers, web browsers.

UNIT VI. Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia software and Authoring tools.

References/ Suggested Readings:

1. Tay Vaughan, .Multimedia: Making it work., TMH, Eighth edition.
2. Ralf Steinmetz and KlaraNaharstedt, .Multimedia: Computing, Communications Applications., Pearson.
3. Keyes, .Multimedia Handbook., TMH.
4. K. Andleigh and K. Thakkar, .Multimedia System Design., PHI.

Course Name: Reasoning & Aptitude

Course Code: BCASE301

<table>
<tr><td>Course Type: SE
(Theoretical)</td><td colspan="2">Course Details: SEC-1</td><td colspan="2">L-T-P: 4-0-0</td></tr>
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</table>

Course Content:

Theory

UNIT I. Reasoning: Number and letter series, Venn diagram, seating arrangement, Syllogism, Blood relations

UNIT II. Aptitude: Simplification, Number Series, Speed, Time & Distance, Mixture and allegation, Data Interpretation.

End Semester Evaluation: There are 50 MCQs of 1 mark each. Examinees have to answer 40 questions out of 50 questions.

References/ Suggested Readings:

1. A Modern Approach to Logical Reasoning, R. S. Agarwal, S. Chand Publications.
2. A New Approach to REASONING Verbal & Non-Verbal, B.S. Sijwalii, InduSijwali, Arihant Publication.
3. Quicker Maths,M.Tyra, BSC Publication.
4. Quantitative Aptitude, R. S. Agarwal, S. Chand Publication.

Semester- IV

Course Name: Data Base Management System

Course Code: BCAC401

<table>
<tr><td>Course Type: Core (Theoretical)</td><td colspan="2">Course Details: CC-16</td><td colspan="2">L-T-P: 3-1-0</td></tr>
<tr><td rowspan="3">Credit: 4</td><td rowspan="3">Full Marks: 100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
</table>

Course Content:

Theory

UNIT I. Introduction: Basic Concept, Drawbacks of File Management; Advantages of DBMS; Layered Architecture of Database, Data Independence; Data Models; Schemas and Instances; Database Languages; Database Users, DBA; Data Dictionary; Functional Components of a DBMS.

UNIT II. ER Model: Entity, Attributes and Relationship; Structural Constraints; Keys(candidate,super,foreign,primary); Weak & strong Entity Set;ER Diagram; Specialization and Generalization; Constraints of Specialization and Generalization; Aggregation.

UNIT III. Relational Model: Basic Concepts of Relational Model; Relational Algebra.

UNIT IV. SQL: DDL, DCL, DML commands, aggregate functions, create a database table, create relationships between database tables, modify and manage tables, queries, create view.

UNIT V. Integrity Constraints: Domain Constraints, Referential Integrity.

UNIT VI. Relational Database Design: Problems of Un-Normalized Database; Functional Dependencies, Derivation Rules, Closure of FD Set, Membership of a Dependency, Canonical Cover; Decomposition to 1NF, 2NF, 3NF or BCNF Using FDs; Lossless Join Decomposition & Dependency Preservation.

UNIT VII. Transaction Processing: ACID properties, Introduction to concurrency control.

References/ Suggested Readings:

1. An Introduction to Database Systems, Vol. I& II – C.J. Date, Addison Wesley.
2. Database System Concepts, 3rdedn. – Korth&Siberschatz, T.M.H.
3. Principles of Database System, 2ndedn. – J.D. Ullman,Galgotia.

Course Name: Computer Networks

Course Code: BCAC402

Course Type: **Core (Theoretical)**	Course Details: **CC-17**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Introduction: Communication system, Analogue data, digital data, Communication channels, Synchronous data, Asynchronous data.

UNIT II. Transmission media: Twin wire, Coaxial cable, Radio, VHF and microwaves, satellite links, Optical fibre.

UNIT III. Data Modems: Concepts of modulation, ASK, FSK, PSK, Quadrature PSK, Differential PSK.

UNIT IV. Network operating systems, private, public and value added networks. Difference between computer networks and distributed networks. Structure of computer network, point-to-point multidrop circuits, Data flow and physical circuits, network topologies, topologies and design goals. Hierarchical topology, horizontal topology, star topology, ring topology, mess topology. Telephone network, switched and non-switched options, fundamentals of communication theory, channel speed and bit rate. Voice communication and analogue waveforms, bandwidth and frequency spectrum, connecting the analogue and digital world, digital signals, the modem, digital to digital conversion,Analog to analog conversion,Transmission impairments, Data rate limits, asynchronous and synchronous transmission.

UNIT V. Local area networks and wide area networks, connection oriented and connectionless network, classifications of communication protocols, time division multiple access (TDMA), time division multiplexing (TDM), frequency division multiplexing (FDM), statistical time division multiplexing (STDM), carrier sense system (collision), and token passing, peer-to-peer priority system, priority slot, carrier sense systems (collision free). Token passing (priority) system.

UNIT VI. Network Software: OSI and TCP/IP Models, Functions of each layer.

UNIT VII. Polling/Selection Protocols: Character and bit protocols, binary synchronous control (BSC), HDLC, HDLC options,HDLC frame format, code transparency and synchronization, HDLC transmission process, HDLC subsets, SDLC, protocol conversion.

UNIT VIII. Local Area Networks: Primary attributes of LAN, Broadband and baseband and base LANs, IEEE LAN standards, relationship of the 802 standards to the ISI/CCITT model,

connection options with LANs, LLC and MAC protocol data units, LAN topologies and protocols, CSMA/CD and IEEE 802.3, token ring (IEEE 802.5), token bus and IEEE 802.4, Metropolitan Area Networks (802.6), ANSI fiber distributed data interface.

UNIT IX. Switching and Routing in Networks:Message switching, packet switching, when and when not to use packet switching, packet routing, and packet switching support to circuit switching networks.

UNIT X. The X.25 and supporting protocols: Features of X.25, Layers of X.25 and the physical layer, X.25 and the data link layer, X.25 standards, X.25 channel options, flow control principles.

References/ Suggested Readings:

1. Black, U, Computer Networks- protocols, standards and Interfaces, P.H.I.
2. Stallings, W, Computer Communication Networks, P.H.I.
3. Tannembaum, A.S., Computer Networks, P.H.I.

Course Name: Computer Organization and Architecture

Course Code: BCAC403

Course Type: **Core (Theoretical)**	Course Details: **CC-18**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Basic Computer Organization: Various functional units – CPU, memory, I/O, Buses, Accumulator based CPU disadvantages and improvements,CPU registers (IR, PC, SP, MAR, MDR, AC), IAS computer, Von Neumann computer.

UNIT II. Functions of CPU, memory and memory types, System buses, Data buses, Address buses, control buses.

UNIT III. Instruction: Machine instruction, Assembly language instruction, Micro instruction,Instruction Cycle, Instruction Format, 0, 1,2, 3-address instruction, Instruction types,Instruction set completeness, Addressing modes, Numerical problems on Instructionformat.
Stack organization: Implementation of Stack using Shift register, Application of stack in Organization.

UNIT IV. Memory: Types of Memory (RAM, ROM, DRAM, SRAM, SAM), characteristic ofmemory, Memory organization: Linear, 2D, Memory expansion (Horizontal, vertical andmixed).
Associative memory: Design and application'

UNIT V. Virtual memory: Concept, Mapping - Direct, Associative and Direct – associativemapping, Replacement algorithm- FIFO, LRU, LFU.
UNIT VI. Cache memory: Concept of locality of reference, cache memory organization, Hit &miss, Write back & Write through Cache, Mapping (Direct, Associative and Setassociative mapping), Numerical problems on cache mapping.

UNIT VI I. Bus Organization:Bus structure, I/O interfacing, tri-state logic, Address decoding(Absolute & Partial), Memory mapped I/O& I/O mapped ,Datatransfer(Programmed I/O, interrupt initiated I/O, DMA, cycle stealing DMA,Burst transfer DMA), Bus contention and bus arbitration.

UNIT VIII. ALU Design: Functions of ALU, Bit sliced ALU, Implementation of Arithmeticoperations: Fixed point data - Addition, subtraction, multiplication and division algorithmfor signed number represented in signed magnitude and 2's complement, Floating pointdata - Addition, subtraction, multiplication and division algorithm for signed number,BCD arithmetic, Implementation of Logical operation.

References/ Suggested Readings:

1. M. Morris Mano, Computer System Architecture, Pearson.
2. John Hayes, Computer Architecture and Organization, McGrawHill.
3. William Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall.
4. Hamacher, Computer Organization, McGrawHill Higher Education.

Course Name: Software Lab - IV: Software Lab - VI : SQL & PLSQL

Course Code: BCAC404

Course Type: **Core (Practical)**	Course Details: **CC-19**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**…**	**40**	**….**

Course Content:

Practical

Program should be developed to implement the problems related to Data Base Management System using SQL & PLSQL.

References/ Suggested Readings:

1. Steven Feuerstein, Bill Pribyl, Oracle PL/SQL Programming, 6th Edition, O'Reilly Media, Inc.

Course Name: Software Lab - VII : Visual Basic

Course Code: BCAC405

Course Type: **Core (Practical)**	Course Details: **CC-20**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**…**	**40**	**….**

Course Content:

Practical

UNIT I. Simple applications development in Visual Basic environment.
Example: Simple input/output using Textbox, labels, inputbox, msgbox, command button.

UNIT II. Control logic using if then else, select case. Looping using do while, do until, for.

UNIT III. Library functions, user-defined functions and subroutines, Problems on Strings.

UNIT IV. Arrays- data array and control array. Problems using list box, combo box, check box, option button, timer.

UNIT V. Design and implement Pocket Calculator.

UNIT VI. Database connectivity using adodc and adodb.

References/ Suggested Readings:

1. Mastering VB 6.0, Evangelos Petroutsos, BPB Publication.

Course Name: Information System Analysis & Design

Course Code: BCAGE401

Course Type: **GE (Theoretical)**	Course Details: **GEC-2**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

Unit I: Data and Information, Introduction to Information System.

Unit II: System, System component, System Analysis, Business system concepts, System Development Life Cycle, Waterfall, Prototype, Spiral models (various phases),

Unit III: Planning: data gathering techniques, feasibility studies (technical, economical, operational), feasibility study of a project, cost benefit analysis, cost estimation, payback and buyback method.

Unit IV: Design and Modeling: logical and physical design, flow charts, structured charts, Flow chart, DFD (logical & physical) and ERD, form design, user interface design Modularity: module specification concepts, coupling and cohesion , System testing, Maintenance: evaluation, type of maintenance , validation, maintenance issues.

Unit V: UML – overview, conceptual model, things, relationships, diagrams, roles, mechanisms.

References/ Suggested Readings:

1. Kenneth E. Kendall, Julie E Kendall, Systems Analysis and Design, 10th Edition, Pearson
2. Elias M Awad, Systems Analysis and Design, Galgotia Publications Pvt Ltd
3. Igor Hawryszkiewycz, Introduction to Systems Analysis and Design, PHI.

Course Name: Microprocessor and its Applications

Course Code: BCAGE402

<table>
<tr><td>Course Type: GE
(Theoretical)</td><td colspan="2">Course Details: GEC-2</td><td colspan="2">L-T-P: 3-1-0</td></tr>
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<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
</table>

Course Content:

Theory

UNIT I. Microprocessor: the Brain of the computer. Functional units of Microprocessor.
General & Special purpose register:AC,PC,SP,DR,DAR,MAR, Flags,B-C,D-E,H-L pairs,PSW.
8 bit microprocessor architecture; 8085 pin description.

UNIT II. Programmers model of 8085, addressing modes of 8085; Instruction set of 8085; Assembly language program for 8085.

UNIT III. Memory interfacing; I/O interfacing; Peripheral ICs; I/O memory Interfacing Chips, Bus structure of microprocessor based systems, bus arbitration; Interrupt handling and DMA operation. Basic idea about microprogramming.

UNIT IV. Case Study: Intel 8085 microprocessor.

UNIT V. Advanced Microprocessors: Functional description of 8086 microprocessor, software model of 8068/8088; Data addressing modes of 8086; 80x86 family of microprocessor.Comparison of different microprocessors; microprocessors of other families.

References/ Suggested Readings:

1. Ramesh Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, PIP (India)
2. Barry B. Brey : The Intel Microprocessors : Architecture, Programming and Interfacing. Pearson Education, Sixth Edition, 2009.
3. Walter A Triebel, Avtar Singh; The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware, and Applications. PHI, Fourth Edition 2005.

Course Name: Communicative English

Course Code: BCASE401

<table>
<tr><td>Course Type: SE
(Theoretical)</td><td colspan="2">Course Details: SEC-2</td><td colspan="2">L-T-P: 4-0-0</td></tr>
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<tr><td>….</td><td>10</td><td>….</td><td>40</td></tr>
</table>

Course Content:

Theory

UNIT I. Objectives

i) To develop the learner's language skills in English- Listening, Speaking, Reading and Writing (LSRW)

ii) To develop the learners' specific skills for communication in the fields of Science, Technology and Computer Applications

UNIT II. Course Content:

Communication and communicative activities the notions of encoder and decoder and the message and the medium.

UNIT III. Communicative competence

- Concise grammatical structures and key vocabulary for general as well as specific purposes accuracy and appropriateness in the use of English
- English speech sounds and sound combinations
- Elements of spoken English

UNIT IV. Topic of discourse, mode of discourse and style of discourse with special reference to scientific discourse

- Writing notes, reports, proceedings, etc.
- Expanding and Summarising.
- Narrating and describing.

Evaluation of Internal Assessment: Practicum on all these language activities and communicative tasks – group discussion-seminar

References/ Suggested Readings:

1. Business Correspondence & Report Writing, Sharma, TMH.
2. English for Technical communication, Laxminarayanan, Scitech.
3. Business Communication, Kaul, PHI.

Semester- V

Course Name: Software Engineering

Course Code: BCAC501

Course Type: **Core (Theoretical)**	Course Details: **CC-21**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Software Engineering Fundamentals: Definition of software product, Software Engineering Paradigms; Software engineering, Knowledge engineering, and End user development approaches.

UNIT II. Software life cycle: Usefulness, Life cycle Model -Classical water fall model, Iterative waterfall model, prototype model, spiral model,Agile development method, comparative study of different models.

UNIT III. System Analysis: An abstraction, Partitioning and projection, System specification, Software Requirements Specification (SRS) standards, good SRS,Formal Specification methods. Specification tools, Flow based, Data based and Object – Oriented Analysis.

UNIT IV. Software Matrices: Halstead matrix, volume, size, difficulty, Effort estimation.
System Documentation: Principals of System documentation, types of documentation and their importance.

UNIT V. System Planning: Data and fact gathering techniques-Interviewing, communications, presentations and site visit. Feasibility study, feasibility reports, prototyping, Cost-benefit analysis-Tools and techniques.

UNIT VI. System Design: Idealized and constrained design, Process oriented design (Gane&Sarson and Yourdon notations), Data oriented design (Warnier – Orr, E-R modeling), Object oriented design (Booch approach), Cohesion and Coupling, Design matrices, Design documentation standard.

UNIT VII. Role of CASE Tools: Relevance of CASE Tools, High- end and Low- end CASE Tools, Automated support for data dictionaries, DFDs, ERDs.

UNIT VIII. Coding and Programming: Choice of programming languages, Mixed language programming and cell semantics, Re- engineering legacy system, Coding standard.

UNIT IX. Software Quality and testing: Software quality assurance, Types of Software Testing (White Box and Black Box Testing, Unit Testing, Integration Testing, Verification and Validation of Software), Debugging and Software Reliability analysis, Software quality and matrices, Software maturity model and extensions.

UNIT X. Software Cost and Time estimation: Function points, Issues in software cost estimation: Introduction to the Rayleigh curve, Algorithmic cost models (COCOMO, Putnam- SLIM, Watson and Felix), other approaches to software cost and Size estimation (software complexity, Wideband Delphi, costing by analogy).

UNIT XI. Software Project Management: Planning software, project, Work breakdown structures, Integrating software design and project planning, Software project teams, Projecting monitoring and control.

References/ Suggested Readings:

1. Software Engineering, A practioner's Approach- R.S. Pressman (Mc- Graw Hill Inc.)
2. An Integrated Approach to Software Engineering – P.Jalote (Narosa Publishing House)
3. Fundamentals of Software Engineering- Rajib Mall, PHI.

Course Name: E-commerce and Internet

Course Code: BCAC502

Course Type: **Core (Theoretical)**	Course Details: **CC-22**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. E-commerce: Introduction to E-commerce, Payment Methodology, Security aspects, Standard in electronic payment. E-commerce and Banking, E-commerce and Retailing.

UNIT II. Introduction to Internet: Evolution of Internet, Concept of Internet and internet, Applications of Internet, Types of Connectivity such as dial- up, leased, VAST etc, Internet Server and Clients module in various Operating Systems, TCP/IP, Introduction to RFC, Addressing in Internet- IP and Domains, major features of IP, IP datagram, major IP services, IP source routing, value of the transport layer, TCP, major features of TCP, passive and active operation, Internet Service Providers.

UNIT III. E-mail and List-servers: E-mail Networks, E-mail protocols (X.400, SMTP, UUCP), Format of an E-mail message, Description of E-mail Headers, E-mail contents and encoding, E-mail routing, List servers, E-mail clients, POP-3, IMAP-4.

UNIT IV. File Transfer Protocol: Introduction to FTP, public domain Software, Types of FTP Servers, FTP clients, Common Commands.

UNIT V. Telnet: Telnet protocol, Server daemon, Telnet clients, Terminal emulation. Usenet and Internet Relay Chat.

UNIT VI. Search Engines: Technology overview, Popular Search Engines, How to register a Web site on search engines.

UNIT VII. Internet Security: Overview of Internet Security threats, Firewalls, Introduction to AAA.

UNIT VIII. Tools: Design of web pages using PHP any MYSQL

References/ Suggested Readings:

1. Internetworking with TCP/IP – D.E. Comer, PHI
2. E-commerce - Paul A. Murphy, THM.

Course Name: Mathematics - III

Course Code: BCAC503

Course Type: **Core (Theoretical)**	Course Details: **CC-23**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Probability and Statistics:

Random experiments. Simple and compound events. Event space. Classical and frequency definitions of probability and their drawbacks. Axioms of Probability. Statistical regularity. Multiplication rule of probabilities. Bayes' theorem. Independent events. Independent random experiments. Independent trials. Bernouli trials and binomial law. Poisson trials. Random variables. Probability distribution. distribution function. Discrete and continuous distributions. Binomial, Poisson, and Normal distribution.

Collection and presentation of data. Frequency distribution. Measures of central tendency. Measures of dispersion.

Bivariate Frequency Distributions (scatter Diagram, Correlation coefficient and its properties, regression lines, correlation index and correlation ratio, rank correlation).

Random sampling, expectations and standard error of sampling mean. Expectation and standard error of sampling proportions.

UNIT II. Numerical Methods and Algorithms

Error: Introduction, types of error relative, absolute, percentage, round-off.

Solution of non-linear equations: Bisection, Newton-Raphson, Regular-Falsi and Secant method.

Interpolation and approximation-Lagrange Interpolation, Newton's Forward Interpolation and Newton's backward Interpolation methods.
Integration: Trapezoidal and Simpson's 1/3 rules.
Solution of linear equations: Gaussian elimination, Gauss Sheidal method
Solution of different equations; Eular's, Taylor's series, Runge-kutta (order-2)

References/ Suggested Readings:

1. C Language and Numerical Methods C Xaviers, New Age International
2. Fundamentals of Statistics – Goon, Gupta, Das Gupta

Course Name: Core Java

Course Code: BCAC504

Course Type: **Core (Theoretical)**	Course Details: **CC-24**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Introduction: Java as a Internet language, a first simple program, entering the program, compiling the program, control statements, using blocks of code, lexical issues – white space, identifiers, literals, comments, separators, the Java keywords – the Java class libraries, data types, variables and arrays, a simple types, integers – byte, sort, long, floating point types – float, double, characters, Booleans. A closer look at literals – Integer, Floating point, Boolean, Character, String literals; variables – declaring a variable, dynamic initialization, the scope and life time of variable, type conversion and casting – Java's automatic convergence, casting incompatible types, automatic type promotion in expression, the type promotion rules, arrays – one, multi-dimensional, alternative array declaration syntax. Operators – arithmetic – the basic arithmetic operators, the modulus operation, arithmetic assignment operators, increment and decrement, the bit wise operators, relational operators, Boolean logical operators, assignment operator the ? : operator, operator precedence, using parenthesis, control statements – Java's selection statements, if, switch, interactions statement – while, do while, for, some for loop variations, nested loops, jump statement using break, continue, return.

UNIT II. Introduction to classes: class fundamentals, the general form of a class a simple class, declaring objects, a closer look at new, assigning object reference variables, introducing methods, adding a method to a class, method returning a value, constructors, parameterized constructor, this keyword, instance variable hiding, garbage collection, the

finalize method, stack class, overloading method, overloading constructors, using object as parameter, argument passing, returning objects, introducing access control, understanding static, Introducing final, arrays revised, exploring the string class, using command line arguments, Inheritance, Inheritance basics, A more practical examples, a super class variable can reference a sub class object, using super, using super to call super class constructors, a second use for super, creating a multilevel hierarchy, when constrictor are called, method overriding, dynamic method dispatch, overridden methods, using final to prevent overriding, using final to prevent inheritance, the object class.

UNIT III. Packages and Interfaces: Defining a package, understanding class path, a sort package example, access protection, an access example, importing packages – Interface – defining a interface, implementing interfaces, variable in interfaces, interface can be extended.

UNIT IV. Exception handling: Exception fundamentals, Exception types, Uncaught exceptions, Using try and catch, Displaying a description of an exception, multiple catch clauses, Nested try statements, Throw, Throws, Finally, Java's built-in exceptions – Creating your own exception subclasses, Using exceptions

UNIT V. Threads: The Java's thread model, Thread priorities, Synchronization, Messaging, The thread class and the runnable interface, The main thread, Creating a thread, Implementing runnable, Extending Thread, Closing an approach, Creating multiple thread, Thread priorities, Synchronization, Using Synchronized methods, The synchronized statement, Inter thread communication, Using multithreading.

UNIT VI. Applets: Concept and use of applet, I/O Basics, Streams, Applet fundamentals, writing simple applet program.

UNIT VII. Stream class: The predefined streams, Reading console input, Writing console output, Reading and writing files. The transient and volatile modifiers, Using instance of native methods, Problem with native methods.

UNIT VIII. String handling: The string constructor, String length, Special string operations-String literals, String concatenation, String concatenation with other data types, String conversion, Character extraction, String comparison, Searching Strings, Modifying a string – Data conversion using String buffer constructors.

UNIT IX. Wrappers: Number, Double and float, Integer and long, Character, Boolean, Process, Runtime, Memory management, Executing other programs, system-Using current timemilias() to time, Program execution, Using array copy(), Environment properties, Object, Using clone() and the clone able interface, Class, Class loader, Math-Transcendental functions, Exponential functions, Rounding functions, Miscellaneous math methods, classes, Input stream, Output stream, File input stream, File output stream.

UNIT X. Java database connectivity (JDBC): Implementation of simple system using JDBC.

References/ Suggested Readings:

1. Programming with JAVA, E. Balagurusamy, TMH.
2. Java – The Complete Reference, Herbert Schildt, McGraw-Hill.

Course Name: Software Lab - VIII : E-commerce using HTML and PHP

Course Code: BCAC505

Course Type: **Core (Practical)**	Course Details: **CC-25**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**…**	**40**	**….**

Course Content:

Practical

E-commerce applications and Web pages should be developed to implement the problems related to E-commerce and Internet using HTML and PHP.

References/ Suggested Readings:

1. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5 3ed: A Step-by-Step Guide to Creating Dynamic Websites, ORELLY.

Course Name: Software Lab - IX : Core Java

Course Code: BCAC506

Course Type: **Core (Practical)**	Course Details: **CC-26**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**…**	**40**	**….**

Course Content:

Practical

Program should be developed to implement the problems related to Core Java using Java.

References/ Suggested Readings:

1. Programming with JAVA, E. Balagurusamy, TMH.

Course Name: Introduction to Cyber Security

Course Code: BCAGE501

Course Type: **GE (Theoretical)**	Course Details: **GEC-3**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Introduction to Cyber Security: Cybersecurity objectives, Cybersecurity roles, Differences between Information Security & Cybersecurity

UNIT II. Cyber Security Principles: Confidentiality, integrity, & availability, Authentication & nonrepudiation

UNIT III. Information Security (IS) within Lifecycle Management: Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts

UNIT IV. Risks & Vulnerabilities: Basics of risk management, Operational threat environments, Classes of attacks

UNIT V. Future Implications & Evolving Technologies: New & emerging IT & IS technologies, Mobile security issues, risks, & vulnerabilities, Cloud concepts around data & collaboration.

References/ Suggested Readings:

1. Wu Chwan-Hwa (John) et.al., Introduction To Computer Networks And Cybersecurity, BSP Books.
2. P. W. SINGER AND ALLAN FRIEDMAN, CYBERSECURITY AND CYBERWAR, Oxford University Press.

Course Name: Image Processing

Course Code: BCAGE502

<table>
<tr><td>Course Type: GE
(Theoretical)</td><td colspan="2">Course Details: GEC-3</td><td colspan="2">L-T-P: 3-1-0</td></tr>
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<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
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Course Content:

Theory

UNIT I. Introduction: Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

UNIT II. Digital Image Formation: A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

UNIT III. Mathematical Preliminaries: Neighbor of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

UNIT IV. Image Enhancement: Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain -Low pass filtering, High pass filtering.

UNIT V. Image Restoration: Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained, Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation – Spatial Transformation, Gray Level Interpolation.

UNIT VI. Image Segmentation: Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding, Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

References/ Suggested Readings:

1. Gonzalves, Digital Image Processing, Pearson.
2. B. Chanda and D.D. Majumder, Digital Image Processing and Analysis, PHI.
3. Jain, Fundamentals of Digital Image Processing, PHI.
4. Jahne, Digital Image Processing, Springer In.

Course Name: Intelligent Systems

Course Code: BCAGE503

<table>
<tr><td>Course Type: GE
(Theoretical)</td><td colspan="2">Course Details: GEC-3</td><td colspan="2">L-T-P: 3-1-0</td></tr>
<tr><td rowspan="3">Credit: 4</td><td rowspan="3">Full Marks: 100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
</table>

Course Content:

Theory

UNIT I. Introduction: What is AI- Importance of AI-Objectives.Applications of AI in Natural Language Processing, Speech Understanding, Computer Vision, Planning, etc. Introduction to LISP: Study of features and its application.

UNIT II. Knowledge and AI Problem solving concepts: Its representation, Organisation – Manipulation and Acquisition.

UNIT III. Predicate Calculus in AI – First Order Predicate Logic & its use in Knowledge Representation – Resolution Principal.Use of Resolution in reasoning and Question answering.Production Systems and Search Strategies – Production System and its variants – Heuristic Search Methods.

UNIT IV. Uncertainty Management: Fuzzy Logic, Bayesian inferencing, certainty factor Structured Representation of Knowledge – Semantic networks, Frames, Conceptual Dependancy& Scripts.

UNIT V. Learning: Learning automation, learning by induction, Neural Networks, Genetic Algorithms.

UNIT VI. Expert Systems: Rule Based System Architecture – Non-production System Architecture – Knowledge Acquisition Methods – Explanation Methods – Expert System Shells.

References/ Suggested Readings:

1. Intro. To A.I. & E.S. by D.W.Patterson, PHI
2. Principle of A.I. by N.J.Nilson, Narosa.

Semester- VI

Course Name: Programming in Python

Course Code: BCAC601

<table>
<tr><td>Course Type: Core (Theoretical)</td><td colspan="2">Course Details: CC-27</td><td colspan="2">L-T-P: 3-1-0</td></tr>
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<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
</table>

Course Content:

Theory

UNIT I. Introduction: The Python Language, the Python Standard Library and Extension Modules, Python Implementation, Python Development and Versions, Installation from Source Code and Binaries, the Python Interpreter.

UNIT II. Core Python Language and Built: Data Type, Variable, Expression and Operators, Numeric Operations, Sequence Operations, Dictionary Operations, The print statement, Conditional Statements, Looping, Control flow Statements.

UNIT III. Functions: Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions. Lists and Tuple: Introduction to List and Tuple, Accessing List and Tuple, Operations, working with List and Tuple, Function and Methods.

UNIT IV. Dictionaries: Working with dictionaries, properties and functions. Module: Importing Module, Math Module, Random Module, Package, Composition and the Distribution Utility.

UNIT V. Object Oriented Programming Concept: Class and Object, Attribute, Inheritance, Overloading and Overriding, Data Hiding, Meta classes.

UNIT VI. Exception handling: What is an exception?, various keywords to handle exceptions such try, catch, except, else, finally, raise.

UNIT VII. Regular Expressions: Concept of regular expression, various types of regular expressions, using match function.

UNIT VIII. Graphical User Interface Programming in Python (using Tkinter/ wxPython/Qt): GUI concept, Advantages of GUI, and Introduction to GUI library, Layout management, events and bindings, fonts, colours, drawing on canvas (line, oval, rectangle, etc.) Widgets such as: frame, label, button, check button, entry, list box, message, radio button, text, spin box etc.

References/ Suggested Readings:

1. Python in a Nutshell, Alex Martelli, Oreilly Publication.
2. Think Python, Allen Downey, Green Tea Press.
3. Core Python Programming, Wesley J. Chun, Pearson Education.

Course Name: C#.NET

Course Code: BCAC602

Course Type: **Core (Theoretical)**	Course Details: **CC-28**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Introduction to C#, Understanding .NET, Overview of C#, Literals, Variables and Data types, Operators and Expressions, Decision making and Branching, Decision making and looping, Methods in C#.

UNIT II. Handling Arrays, Manipulating Strings, Structures and Enumerations,

UNIT III. Classes and Objects, Inheritance and Polymorphism, Interface: Multiple inheritance, Operator overloading, Delegates and Events,

UNIT IV Managing console I/O operations, Managing Errors and Exceptions, Multithreading in C#

UNIT V. WindowForms and Wed-based application development on .NET.

References/ Suggested Readings:

1. Programming in C#, E. Balagurusamy, TMH.

Course Name: Software Software Lab - X : Python Programming

Course Code: BCAC603

Course Type: **Core (Practical)**	Course Details: **CC-29**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**…**	**40**	**….**

Course Content:

Practical

UNIT I. Installing and setting up the Python IDLE interpreter. Executing simple statements like expression statement (numeric and Boolean types), assert, assignment, delete statements; the print function for output.

UNIT II Script and interactive modes; defining a function in the two modes; executing a script; interactively executing a statement list (semicolon-separated sequence of simple statements); the input function.

UNIT III. Programs based on lists, conditional constructs, break, continue statements, the loop statement and the range function; interactively using the built-in functions len, sum, max, min, etc.

UNIT IV . Programs related to string manipulation.

UNIT V . Programs based on importing and executing built-in functions from the time, math and random modules.

UNIT VI Programs related to dictionaries.

UNIT VII Programs using list comprehensions and anonymous functions.

UNIT VIII . Programs using the built-in methods of the string, list and dictionary classes.

UNIT IX. Programs related to Object Oriented Programming.

UNIT X . Programs related to Graphical User Interface.

References/ Suggested Readings:

1. Python in a Nutshell, Alex Martelli, Oreilly Publication.

Course Name: Software Lab - XI : C#.NET

Course Code: BCAC604

<table>
<tr><td>Course Type: Core (Practical)</td><td colspan="2">Course Details: CC-30</td><td colspan="2">L-T-P: 0-0-8</td></tr>
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<tr><td>60</td><td>…</td><td>40</td><td>….</td></tr>
</table>

Course Content:

Practical

Program should be developed to implement the problems related to C#.NET using C#

References/ Suggested Readings:

1. Programming inC#, E. Balagurusamy, TMH.

Course Name: Project Work and Viva

Course Code: BCAC605

Course Type: **Core (Practical)**	Course Details: **CC-31**			L-T-P: **0-0-8**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	**…**	**40**	**….**

Course Content:

Practical

It is desirable that project report should be done in an Industry/Organization only using the tools learn in the BCA curriculum.

Internal Evaluation: Project Report (30 marks), Demonstration (20 marks) and Viva voce (10 marks).

End Semester Evaluation: Presentation (30 marks) and Viva voce (10 marks).

Course Name: Computer Graphics

Course Code: BCAGE601

Course Type: **GE (Theoretical)**	Course Details: **GEC-4**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Computer Graphics Basics:Basic elements of Computer graphics, Cathode Ray Tube, Raster Scan, Application of Computer Graphics.Architecture of Raster and Random scan display devices, input/output devices.

UNIT II. Output Primitives: Points and Lines, Line Generation Algorithm(DDA Algorithm, Bresenham's Line Generation, Mid-Point Algorithm), Line Function, Circle-Generating Algorithms(Bresenham's Algorithm and Midpoint Circle Algorithm), Properties of Circles,Ellipse-Generating Algorithms, Midpoint Ellipse Algorithm, Properties of Ellipses. Filled-Area Primitives, Scan-Line Polygon Fill Algorithm Inside-Outside Tests, Scan-Line Fill of Curved Boundary, Areas Boundary-Fill Algorithm, Flood-Fill Algorithm, Fill-Area Functions.

UNIT III. Two-Dimensional Geometric Transformations: Basic Transformations Translation Rotation Scaling , Matrix Representations and Homogeneous Coordinates , Composite Transformations, General Pivot-Point Rotation ,General Fixed-Point Scaling, General Scaling Directions, Concatenation Properties, General Composite Transformations and Computational Efficiency ,Other Transformations – Reflection, Shear, Transformations Between Coordinate Systems.

UNIT IV. Two-Dimensional Viewing: Viewing Coordinate Reference Frame, Window-to-viewport Coordinate Transformation, Clipping Operations, Point Clipping, Line Clipping(Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm), Polygon Clipping (Sutherland Hodgman Algorithm),Text Clipping,Curve Clipping, Exterior Clipping.

UNIT V. Three-Dimensional Geometric and Modeling Transformations: Translation, Rotation, Coordinate-Axes Rotations , General Three-Dimensional Rotations, Scaling, Reflections, Shears, Composite Transformations, Three-Dimensional Transformation Functions, Modeling and Coordinate Transformations.

References/ Suggested Readings:

1. Computer Graphics –Hearn and Baker, PHI.
2. Computer Graphics and Multimedia, D.P. Mukherjee, PHI.

Course Name: Theory of Computation

Course Code: BCAGE602

<table>
<tr><td>Course Type: GE
(Theoretical)</td><td colspan="2">Course Details: GEC-4</td><td colspan="2">L-T-P: 3-1-0</td></tr>
<tr><td rowspan="3">Credit: 4</td><td rowspan="3">Full Marks: 100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
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<tr><td>….</td><td>20</td><td>….</td><td>80</td></tr>
</table>

Course Content:

Theory

UNIT I. Introduction: Synchronous & Asynchronous Sequential Circuit, Storage Element, Melayand Moore Machines, Design Technique of State Machine.

UNIT II. Finite State Model: Synchronous Sequential Machine; State Successor in SequentialMachine; Capabilities and Limitations of FSM; State Equivalence and MachineMinimization.

UNIT III. Theory Of Automata: Definition of Automation; Description of Finite Automation;Transition System; Properties of Transition Function; NDFA, DFA, Conversion fromNDFA to DFA, Minimization Of States (Equivalence Partition);Conversion From Mooreto Mealy machine and Vice Versa.

UNIT IV. Formal Languages: Basic Definition of Grammar and Languages; Examples; ChomskyClassification of Languages; Languages and their Relations; Operation on Languages;Language and Automata.

UNIT V. Regular Set And Regular Grammar: Regular Expression; Finite Automata and RegularExpression; Regular Grammars and Regular Languages; Pumping Lemma for RegularSets, Application of Pumping Lemma, Closure Properties of Regular Languages.

UNIT VI. Context-Free Languages: Basics of CFL; Sentential Forms; Derivation Trees;Ambiguity in CFG; Simplification of CFG; CNF And GNF;

UNIT VII. Pushdown Automata: Basic Definition; Language Acceptance by PDA; DeterministicPDA.

UNIT VIII. Turing Machine: Turing Machine Model; Representation of Turing Machine; LanguageAcceptability by TM; Design of TM; Nondeterministic TM.

References/ Suggested Readings:

1. Mishra, Chandrasekaran - Theory of Computer Science, PHI
2. J.E. Hopcroft and J.D. Ullman: Introduction to Automata Theory, Languages and Computation.
3. H.R. Lewis and C.H. Papadimitriou: Elements of the Theory of Computation

Course Name: Cloud Computing

Course Code: BCAGE603

Course Type: **GE (Theoretical)**	Course Details: **GEC-4**			L-T-P: **3-1-0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**20**	**….**	**80**

Course Content:

Theory

UNIT I. Enabling Technologies and System Models for Cloud Computing, Introduction to Cloud Computing including benefits, challenges, and risks

UNIT II. Cloud Computing Models including Infrastructure/Platform/Software – as-a-service

UNIT III. Public cloud, private cloud and hybrid clouds, Cloud OS

UNIT IV. Cloud Architectures including Federated Clouds, Scalability, Performance, QoS, Data centers for Cloud Computing, Principles of Virtualization platforms

UNIT V. Security and Privacy issues in the Cloud, VMWare ESX Memory Management, Capacity Planning and Disaster Recovery in Cloud Computing

References/ Suggested Readings:

1. Distributed and Cloud Computing, 1st edition, Morgan Kaufmann, 2011.
2. Cloud Computing: Concepts, Technology & Architecture**,** Thomas Erl, Prentice Hall