2. BCA Semester - III Syllabus

BCA Semester – III (Second Year)

Subject Title : **Data Structures and Algorithms**
Subject Code : **CAM205-2C**
Subject Type : **Major**

Rationale:

To understand the concepts of Primitive and Non-Primitive Data Structures, Linked List, Stack Queue, Sorting-Searching using C and applications of Data Structure in System Development.

Learning Outcomes:

The Students will be able to:
- Understand the concepts of Data Structure.
- Use of various types of Data Structures.
- Develop efficient programs and managing different types of real and abstract data types.
- Understand the use of Data Structure in Operating systems as well as other relevant application area.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
4	30	60	50	50	100

Course Content:

Unit I: [Weightage=25% approx., Lectures=7, Practicals= 14]

Introduction of Data Structure: The concept of data structure, Primitive data structure, Non Primitive data structure, Linear and Non-Linear Data structure, Static and Dynamic Memory Allocation.

Array: Array terminologies, addressing system of an array, Advantages and Disadvantages of an array, Array applications, Array Operations (Insert, Delete, Search).

Unit II: [Weightage=25% approx., Lectures=8, Practicals= 16]

Stack: Introduction to Stack, Operations on Stack: PUSH, POP, PEEP and CHANGE, Evaluation of Arithmetic Expression, Infix-Prefix-Postfix notations, Conversion from Infix to Prefix, Conversion from Infix to Postfix, Evaluation of postfix expression, Application of Stack.

Queue: Introduction of Queue, Types of Queue: Simple Queue (Enqueue, Dequeue), Circular Queue (EnCqueue, DeCqueue), Overview of Double Ended and Priority Queue, Applications of Queue.

Unit III: [Weightage=25% approx., Lectures=8, Practicals= 16]

Linked List: Introduction of Linked List, Types of Linked List: Singly Linked List, Circular Linked List, Doubly Linked List. Operations of Linked List: Creation, Traversal, Insertion, Deletion, Searching, Applications of Linked List.

Unit IV: [Weightage=25% approx., Lectures=7, Practicals= 14]

Tree: Tree terminologies, Binary Tree, Binary Search Tree (Creation, Insert, Delete and Search operation), Tree Traversal (In-Order, Pre-Order, Post-Order), and Application of Tree.
Sorting: Insertion Sort, Selection Sort, Bubble Sort, and Quick Sort.
Searching: Linear Search, Binary Search.

Text Book:

- Classical Data Structure – D. Samanta – PHI Publication

Reference Books:

- Data Structure – Tanenbaum – Pearson Education
- Data Structures through C – Yashavant Kanetkar- BPB Publications
- An Introduction to Data Structures with Applications – Jean Paul Tremblay and Paul G. Sorenson- McGraw Hill Education

Practical List:

- Write a program of 1D array with Insert, Delete, Traverse and Search operations.
- Write a program of Stack with PUSH, POP, PEEP and CHANGE operations.
- Write a program of Simple Queue with Enqueue and Dequeue operations.
- Write a program of Circular Queue with EnCqueue and DeCqueue operations.
- Write a program of Singular Linked List to Insert (at begin, at middle and at End), Traverse and Delete operations.
- Write a program of Singular Circular Linked List to Insert (at begin, at middle and at End), Traverse and Delete operations.
- Write a program of Doubly Linked List to Insert (at begin, at middle and at End), Traverse and Delete operations.
- Write a program to demonstrate Bubble Sort algorithm.
- Write a program to demonstrate Selection Sort algorithm.
- Write a program to demonstrate Insertion Sort algorithm.
- Write a program to demonstrate Quick Sort algorithm.
- Write a program to demonstrate Linear Search operation on 1D array.
- Write a program to demonstrate Binary Search operation on 1D array.

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BCA Semester – III (Second Year)

Subject Title : **Object Oriented Programming with C++**
Subject Code : **CAM206-2C**
Subject Type : **Major**

Rationale:

To build the enhancement of the C language as C++ is Object Oriented Paradigm language and also a part of compiled and imperative general-purpose computer language.

Learning Outcomes:

The Students will be able to:
- Have a working knowledge of programming and be able to create flow charts and build algorithms.
- Create a program to address the provided programming challenge.
- Understand the significance of object-oriented ideas in both technical problem solving and real-world examples.
- Enhance their knowledge by employing various class, constructor, virtual, inheritance, and polymorphism functions along with library functions.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
4	30	60	50	50	100

Course Content:

Unit I [Weightage=25% approx., Lectures=7, Practicals= 14]

OOP Concepts: Introduction of OOP, Procedural Vs. Object Oriented Programming, Basic Concept of OOP, Applications of OOP.

Basics of C++: A simple C++ Program, Structure of C++ Program, Input Output Operator in C++, Variable, Reference Variable, Data types, Keyword, Manipulator, Control Structure.

Unit II [Weightage=25% approx., Lectures=7, Practicals= 14]

Functions: Introduction to Function, Function Prototyping, Inline Function, Default Arguments, Function Overloading.

Classes and Objects : Basics of Object and Class in C++, Access Specifiers - private and public members, defining Class Members, accessing Class Members, defining Member Function, Nesting of Member Function, Array of Object.

Unit III   **[Weightage=25% approx., Lectures=8, Practicals= 16]**

Constructor & Destructor: Concept of Constructor, Types of Constructor, Multiple Constructor in a Class, Destructor.

Inheritance: Concept of Inheritance, types of Inheritance: Single, Multiple, Multilevel, Hierarchical, Hybrid, Protected members, Virtual Base class, Abstract class, Constructor in Derived class, Function Overriding.

Unit IV   **[Weightage=25% approx., Lectures=8, Practicals= 16]**

Operator Overloading: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators.

Virtual Function: The Need for Virtual Function, Virtual Functions, Pure Virtual Functions.

Exception Handling: Basics of Exception Handling, Types of Exception, Exception Handling Mechanism, try, throw and catch block mechanism.

Text Book:

- Object Oriented Programming With C++, E Balagurusamy, TMH

Reference Books:

- Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
- The Complete Reference C++, Herbert Schlitz, TMH
- C++ Programming, Black Book, Steven Holzner, dreamtech

Reference Links:

- https://www.w3schools.com/cpp/
- https://www.tutorialspoint.com/cplusplus/cpp_web_programming.htm
- https://cplusplus.com/doc/tutorial/

Practical List:

- Program with the use of Function.
- Program with the use of Function Overloading.
- Program with the use of Inline Function.
- Program with the use of Class and Object.
- Program with the use of Constructor and their types.
- Program with the use of Destructor.
- Program with the use of Inheritance and their types.
- Program with the use of Operator Overloading.
- Program with the use of Virtual Function.
- Program with the use of Exception Handling.

BCA Semester – III (Second Year)

Subject Title : **Advanced Database Management System**
Subject Code : **CAM207-2C**
Subject Type : **Major**

Rationale:
Understanding functional dependencies and normalization ensures efficient database design and data integrity, while procedural SQL, cursor management, exception handling, triggers, and indexes enhance data manipulation and consistency.

Learning Outputs:
Students will be able to:
- Get proficiency in SQL commands.
- Understand normalization principles.
- Achieve mastery of procedural SQL.
- Acquire Competence in cursor management, exception handling, triggers, and index.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
4	30	60	50	50	100

Course Content:

Unit I   [Weightage=25% approx., Lectures=8, Practicals= 14]

SQL Commands: DDL, DML, DCL and TCL in RDBMS.
Database tables and Normalization concept overview, Data Anomalies (Update anomalies, Insertion anomalies, Deletion anomalies), Functional dependencies, Normalization and Database Design with example, 1NF, 2NF, 3NF, BCNF, 4NF, Concept of De-normalization, Identification of functional dependencies in sample datasets.

Unit II   [Weightage=25% approx., Lectures=7, Practicals= 16]

PL/SQL: PL/SQL architecture, The Generic PL/SQL Block, PL/SQL Execution Environment, Data Types, Control Structures - IF, CASE, LOOP, FOR, WHILE, Arithmetic operators, Relational operators, Comparison operators, Logical operators, String operators.
Overview of Function and Procedure: Function and Procedure Usage, Creation of Stored Procedure, Calling Stored Procedures, Creation of Function, Calling Function.

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Unit III   **[Weightage=25% approx., Lectures=8, Practicals= 14]**

Exception handling: Defining exceptions, Built-in exceptions (ZERO_DIVIDE, NO_DATA_FOUND, VALUE_ERROR, TOO_MANY_ROWS), Using the when others clause.

Working with Cursor: Overview of Cursor, Types of Cursor, Cursor Declaration, OPEN, FETCH, CLOSE.

Unit IV   **[Weightage=25% approx., Lectures=7, Practicals= 16]**

Triggers: Types of Triggers, Trigger Events, Trigger Creation, Implementation of Trigger, Restriction on Trigger.

Index: Introduction of Index, Create Index Statement, Create Unique Index, Drop Index Statement.

Text Books:

- Elmasri & Navathe, "Fundamentals of Database Systems", 5th edition, Pearson Education.
- Ivan Bayross, "SQL, PL/SQL-The Programming Language of ORACLE", BPB Publications 3rd edition.

Reference Books:

- C. J. Date, "An Introduction to Database Systems", 8th edition, Addison Wesley N. Delhi.
- Oracle 8 –PL/SQL programming –Scott Urman.
- A Guide to the SQL Standard, Data,C. and Darwen, H.3rd Edition, Reading, MA:1994, Addison-Wesley Publications, New Delhi.

Practical List:

- Practical based on DDL SQL statements.
- Practical based on DML SQL statements.
- Practical based on DCL SQL statements.
- Practical based on TCL SQL statements.
- Write PL/SQL code for creating simple block.
- Write PL/SQL blocks using Arithmetic operators, Relational operators Comparison operators, Logical operators, String operators.
- Write PL/SQL blocks using Control Structures IF, CASE, LOOP, FOR, WHILE.
- Write PL/SQL code for creating Store Procedures.
- Write PL/SQL code for creating Functions.
- Exception Handling: PL/SQL Procedure for application using exception handling.
- Write PL/SQL code for using cursors.
- Write PL/SQL code for creating triggers.
- Practical based on creating index, dropping index.

BCA Semester – III (Second Year)

Subject Title   :   **Probability Theory and Probability Distributions**
Subject Code   :   **MDC203-2C**
Subject Type   :   **MDC**

Rationale:

Provide the understanding of various concepts of statistical methods like Probability, Probability Distribution methods, Sampling Theory and Critical thinking and problem solving.

Learning Outcomes:

The Students will be able to:
- Acquire a deep understanding of Probability Theory and its applications.
- Understand the importance of Mathematical Expectation.
- Apply probability concepts to real-world situations and decision-making.
- Develop skills in analyzing and interpreting data using appropriate statistical methods.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
4	60	-	50	50	100

Course Content:

Unit I   [Weightage=25% approx., Lectures=15]

Probability Theory: Introduction, Probability of an event, Sample Space, Events (Simple, Equally Likely, Compound, Mutually Exclusive), Combination, Permutation, Probability Rules (Additive Rule, Multiplication Rule, Total Probability Rule, Bayes' Rule).

Unit II   [Weightage=25% approx., Lectures=15]

Mathematical Expectation: Random Variable, Types of Random Variable (Discrete, Continuous), Mathematical Expectation, Properties of Mathematical Expectation, Variance of a Random Variable, Properties of Variance.

Unit III   [Weightage=25% approx., Lectures=15]

Probability Distribution: Introduction of Probability Distribution, Discrete Probability Distributions, Binomial Distribution, Mean and variance of Binomial Distribution, Properties of Binomial Distribution, Applications of Binomial Distribution, Poisson Distribution, Mean and variance of Poisson Distribution, Properties of Poisson Distribution, Applications of Poisson Distribution.

Unit IV   **[Weightage=25% approx., Lectures=15]**

Normal Distribution: Introduction of Normal Distribution, Relation between Binomial, Poisson and Normal Distributions, Importance of Normal Distribution, Properties of Normal Distribution, Constants of the Normal Distribution, Area under the Normal Curve.

Text Book:
- Fundamental of Mathematical Statistics, 2000 Edition, Author(s): Gupta. S.C & Kapoor, V.K. Kapoor, Sultan Chand & Sons, New Delhi.

Reference Book:
- Scientific and Statistical Computing, Author(s): Heena Timani, Books India Publication.

Reference Links:
- https://www.cuemath.com/data/probability/
- https://www.geeksforgeeks.org/probability-distribution/

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BCA Semester – III (Second Year)

Subject Title : **Personality Development**
Subject Code : **AEC212-2C**
Subject Type : **AEC**

Rationale:

- To help develop an awareness of the concept of personality and its aspects.
- To enable the learners to gain clarity of their own skills and abilities as professionals.
- To instil an understanding of how one can develop certain traits of personality as per the requirement of one's professional field.

Learning Outcomes:

The Students will be able:

- To help students gain an idea of Personality and various aspects.
- To help analyze the personality so as to gain clarity about their future careers.
- To generate a neutral understanding of human relations especially in terms of profession.
- To enable to use the clarity for the real-life situations.
- To help gain some personal attributes that enhance the professional competence.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
2	30	-	25	25	50

Course Content:

Unit I [Weightage=30% approx., Lectures=09]

Basics of Personality Development:

Concept of personality: Introduction, Definitions and general meaning.

Personality Analysis Method: Types, self-assessment and implications for working on limitations.

SWOT Analysis: Introduction, Meaning, Benefits of SWOT analysis, Grid (Framework) of SWOT.

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Unit II [Weightage=30% approx., Lectures=09]

Interpersonal Skills:

Forms of Communication.

Interpersonal communication: Definition and three unique attributes, Personality traits to develop for good interpersonal skills (7 traits)

Teamwork: Importance of team work, collaboration VS silo building, five points of importance of team work, diverse and dispersed teams.

Features of a Good Team Worker/Leader.

Adaptability: Culture and communication: defining culture and understanding cultural communication. Some related terms- globalization, culture, intercultural communication, co-culture, cultural shock, cultural context, high-context and low context culture.

Five categories of cultural values.

Barriers to bridging differences and adapting to others, and strategies to deal with them.

Unit III   **[Weightage=40% approx., Lectures=12]**

Personal Attributes:

Change management: a case study and test.

Physical-emotional reactions to change, attitudes that hinder change, the change implementation model.

Motivation, Goal Setting and Self-Esteem: case study, questionnaire, Impact of values and attitudes, how one gets motivated step by step, characteristics of attainable goals, worksheets, ten ways to increase self-motivation, case study discussion.

Time Management: Case study, definition, symptoms of problem in time management. Steps-planning prioritizing, estimating, documenting, tracking.

Barriers in time management.

Creative Thinking: what it is, components, strategies and case study.

Reference Books:

- Personality Development and soft skills, By: Barun Mitra, Oxford university press.
- Cornerstone book of Developing Soft Skills, Pearson Publication By: Robert Sherfield, Rhonda Montgomery, and Patricia Moody.
- Soft Skills: Know yourself and Know the World By: Dr. K. Alex, S. Chand and CompanyPublications.
- Personality Traits By: Gerald Matthews, Ian J. Deary, Martha C. Whiteman, CambridgeUniversity Press.
- Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press publication.
- Communication: Principles for a Lifetime, By: Steven Beebe, Susan Beebe and Diana Ivy,Pearson Publication
- Technical Communication: Process and product, By: Gearson and Gearson, Pearson Publication.
- The Ace of Soft Skills: Attitude, Communication and Etiquettes for Success By: G. RameshPearson Publication.

BCA Semester – III (Second Year)

Subject Title : **Project Work-III**
Subject Code : **SEC203-2C**
Subject Type : **SEC**

Rationale:

The core objective of the subject is to provide Project and Practical based deep learning, concept understanding, its analysis, deriving inferences and documenting it towards productive outcome of the subjects Data Structures and Algorithms, Object Oriented Programming with C++ and Advanced Database Management System that is an integral part of the BCA curriculum.

Learning Outcomes:

In reference to the subjects Data Structures and Algorithms, Object Oriented Programming with C++ and Advanced Database Management System the Students will be able to:
- Gain knowledge of Project based Practical aspect in the respective subject.
- Understand Fundamentals and Importance of the selected concept.
- Implement the learning during the specific course.
- Get real-life application experience during project execution.
- Perform teamwork and get acquainted with Project Based Learning.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
2	-	60	25	25	50

Course Content:

Project Work – III   [Weightage=100% approx., Practicals=60]

Project Work – III based on the areas pertaining to Data Structures and Algorithms, Object Oriented Programming with C++ and Advanced Database Management System shall be executed based on choice based domain and Project titles will be selected in groups with specific count of members. The entire project work will be studied, analyzed, implemented inference learning will be derived and documented as well as presented in the three phases given below.

Phase I: Preliminary Learning

    1.1 Group Details

    1.2 Project Title

    1.3 Project Domain

    1.4 Project Definition

Phase II: Core Learning

    2.1 Project Overview

    2.2 Detail Explanation

    2.3 Advantages

    2.4 Challenges

Phase III: Inference Learning

    3.1 Real Life Applications

    3.2 Conclusion

    3.3 Future Enhancement

    3.4 Reference

Please Note: The Project Work shall be submitted as a Project Work – III Presentation / Report / Project Demonstration.

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BCA Semester – III (Second Year)

Subject Title : **Indian Ethos and Ethics**
Subject Code : **IKS206 -2C**
Subject Type : **IKS**

Rationale:

The course 'Indian Ethos and Ethics' intends to provide the students Emotional stability as manager with deep grounding of Indian Ethics and Values.

Learning Outcomes:

The Students will be able to enhance their emotional stability to work in challenging corporate environment.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
2	30	-	25	25	50

Course Content:

Unit I   [Weightage=50% approx., Lectures=15]

Indian Ethos and Ethics: Meaning, features, need, history, requisites and elements of Indian ethos; Role of Indian ethos in managerial practices; meaning and concept of ethics, types of ethics, difference between ethos and ethics.

Lessons from Scriptures: Lessons from Vedas, Mahabharata, Bible, Quran, Kautilya's Arthashastra; difference between general management and Indian ethos in management.

Unit II   [Weightage=50% approx., Lectures=15]

Work Ethos : Meaning and levels of work ethos, Types of task/mission, types of actions, types of Karta – Satvik, Rajsik and Tamsik, Attributes of a Karma Yogi or an Ideal Performer, Factors responsible for poor work ethos.

Values: Meaning and Features of values, Classification of Values, Value Based Management – meaning, Factors promoting VBM, Importance of VBM, Importance of Value System in work culture.

Reference Books:

- Indian Ethos in Management, Tushar Agarwal & Nidhi Chandorkar, Himalaya Publishing House.
- Indian Ethos and Values for Managers (Text and Cases from the Mahabharata), N. M. Khandelwal, Himalaya Publishing House.

BCA Semester – III (Second Year)

Subject Title : **Indian Astronomy-II**
Subject Code : **IKS207-2C**
Subject Type : **IKS**

Rationale:

The course Indian Astronomy-II unveils the cosmos through the lens of ancient scholars like Aryabhatta and Brahmagupta, bridging the gap to modern uses. The time concepts (Yugas, solar/lunar years) and the Panchang calendar will be comprehended. By exploring diverse calendars (Gregorian, Hindu, Islamic) the student will gain a global perspective, uniting science and tradition to understand astronomy's impact in daily life.

Learning Outcomes:

The Students will be able to:

- Understanding the universe explained in the Upanishads by ancient scholars like Aryabhatta and Brahmagupta.
- Be acquainted with the Indian knowledge system about the Yuga System, Solar Year and Lunar Year.
- Inspiring to know and understand Gregorian Calendar, Hindu Calendar, Islamic Calendar, Indian Calendar and Panchang as well as Direction/Place/Time, Eclipses of Sun/Moon/Star planets of the Indian Astronomy systems for the potential applications in our daily lives.

Teaching and Evaluation Scheme:

Credits	Duration in Hours		Maximum Marks		Total
	Theory	Practical	CCE (Formative)	SEE (Summative)	
2	30	-	25	25	50

Course Content:

Unit I [Weightage=50% approx., Lectures=15]

Calendars and Panchang: Introduction, Gregorian Calendar, Hindu Calendar, Islamic Calendar, Indian Calendar and Panchang.
True Positions of Sun, Moon and Star-Planets: Introduction Epicyclic theory, equation of Centre for the Sun and the Moon, True daily motions of the Sun, the Moon and Star-Planets.

Unit II [Weightage=50% approx., Lectures=15]

Triprasna-Direction, Place and Time: Introduction, determination of North-South Line, Finding Latitude & co-latitude of a place, Rising and Setting Points of the Sun, Times of Sunrise and Sunset, Rising of Signs of the Zodiac, Determination of Lagna at a given Time and Place.

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Eclipse: Lunar Eclipse, Solar Eclipse.

. **Reference Books:**
- Indian Astronomy: An introduction by S. Balachandra Rao, Universities Press (India) Ltd, Hyderabad.
- The Aryabhati of Aryabhata: An Ancient Indian Work on Mathematics and Astronomy, Walter Eugene Clark, The University of Chicago Press, Illinois.
- Indian Astronomy- A source book (Based primarily on Sanskrit Texts), Compiled by B V Subbarayappa & K V Sharma, Nehru Center, Bombay.