# Second Year BCA

## B.C.A.(Honors/Research) Program

As per NEP 2020,
for Affiliated Colleges
w.e.f - June 2025.

## Abbreviations:

- **T:** Theory Course
- **P:** Practical Course
- **DSC:** Discipline Specific Core Course
- **DSE:** Discipline Specific Elective Course
- **MIN:** Minor subject
- **VSEC:** Vocational skill and Skill enhancement courses
- **VSC:** Vocational Skill Courses
- **SEC:** Skill Enhancement Courses
- **GE/OE:** Generic / open elective
- **CI:** Constitution of India
- **IKS:** Indian Knowledge System
- **CEP:** Community engagement and service
- **OJT**: On Job Training: Internship/Apprenticeship
- **RP:** Research Project
- **RM:** Research methodology
- **ES:** Environment studies
- **ENG:** English
- **MIL:** Modern Indian language

- **CC:** Co-curricular Course
- **VEC:** Value Education Courses
- **AEC:** Ability Enhancement Courses

| Subject Short Name: | | |
|---|---|---|
| **Sr** | **Name of Subject** | **Short Name** |
| 1 | Physics | PH |
| 2 | Mathematics | MT |
| 3 | Chemistry | CH |
| 4 | Botany | BO |
| 5 | Zoology | ZO |
| 6 | Electronics | EL |
| 7 | Computer Science | CS |
| 8 | Statistics | ST |
| 9 | Microbiology | MB |
| 10 | Biotechnology | BT |
| 11 | Information Technology | IT |
| 12 | Biochemistry | BC |
| 13 | Environmental Science | EV |
| 14 | Geography | GG |
| 15 | Geology | GE |

# Semester-wise Code structure for B.C.A.(Honors/Research) Program as per NEP 2020, for Affiliated Colleges w.e.f – June 2025.

## BCA(Honors/Research)–Second Year, SEMESTER–III, Level–5.0

| Course | Course Type | Course Code | Course Title | Credits | Teaching Hours/Week | | | Marks (Total 100) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | T | P | Total | Internal (CA) | | External (UA) | |
| | | | | | | | | T | P | T | P |
| DSC-7 | DSC | CA-211 | Data Structures | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| DSC-8 | DSC | CA-212 | Python Programming | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| DSC-9 | DSC | CA-213 | Practical based on Data Structures | 2 | -- | 4 | 4 | -- | 20 | -- | 30 |
| DSC-10 | DSC | CA-214 | Practical based on Python Programming | 2 | -- | 4 | 4 | -- | 20 | -- | 30 |
| MIN-2 | MIN | CA-215(A) | Fundamentals of Accounting | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| | | CA-215(B) | Graph Theory | | | | | | | | |
| MIN-3 | MIN | CA-216(A) | Practical on Tally | 2 | -- | 4 | 4 | -- | 20 | -- | 30 |
| | | CA-216(B) | Practical on Graph Theory | | | | | | | | |
| OE-5 | OE | - | BCA students shall opt OE from basket | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| VSC-3 | VSC | CA-217 | Ethical Hacking | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| CC-3 | CC | - | Select any one from Basket of CC | 2 | 2 | -- | 2 | 50 | -- | | -- |
| FP-1 | FP | CA-218 | Field Project | 2 | | 8 | 8 | | 20 | | 30 |
| AEC-3 | AEC | MR-201 | Marathi-1 | 2 | 2 | | 2 | 20 | | 30 | |
| | | HN-201 | Hindi-1 | | | | | | | | |

| | | | BCA (Honors / Research) – Second Year, **SEMESTER–IV**, Level–5.0 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DSC-11 | DSC | CA-221 | Database Management System | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| DSC-12 | DSC | CA-222 | Artificial Intelligence | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| DSC-13 | DSC | CA-223 | Practical based on Database Management System | 2 | -- | 4 | 4 | -- | 20 | -- | 30 |
| DSC-14 | DSC | CA-224 | Practical based on Artificial Intelligence using Python | 2 | -- | 4 | 4 | -- | 20 | -- | 30 |
| MIN-4 | MIN | CA-225(A) | Enterprise Resource Planning | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| | | CA-225(B) | Basics of Statistics and Probability for Computer Science | | | | | | | | |
| MIN-5 | MIN | CA-226(A) | Practical based on ERP using case studies | 2 | -- | 4 | 4 | -- | 20 | -- | 30 |
| | | CA-226(B) | Practical on Basics of Statistics and Probability for Computer Science | | | | | | | | |
| OE-6 | OE | - | BCA students shall opt OE from basket | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| SEC-3 | SEC | CA-227 | Advanced Graphics Design | 2 | 2 | | 2 | 20 | -- | 30 | -- |
| CEP | CEP | CA-228 | Community Engagement and Service | 2 | | 4 | | | 20 | | 30 |
| CC-4 | CC | - | Select any one from Basket of CC | 2 | 2 | -- | 2 | 50 | -- | | |
| AEC-4 | AEC | MR-202 | Marathi-2 | 2 | 2 | -- | 2 | 20 | -- | 30 | -- |
| | | HN-202 | Hindi-2 | | | | | | | | |
| **Cumulative Credits for First Year–44** | | | | | | | | | | | |

| Course Code: CA-211 | Course Category: (DSC-7) |
|---|---|
| Course Title: Data Structure | Type: Theory |
| Total Contact Hours: 30 (2/week) | Course Credits: 02 |
| College Assessment (CA) Marks: 20 Marks | University Assessment (UA): 30 Marks |

**Course Objectives**:
- To understand the concepts of data structures and their importance in programming.
- To implement fundamental of data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
- To analyze the time and space complexity of algorithms related to data structures.
- To apply data structures to efficiently solve real-world problems.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Acquire basic concepts of data structures, including arrays, linked lists, stacks, queues, trees, graphs, and hash tables. | 1 |
| • Develop problem solving skill through algorithms. | 4 |
| • Implements Searching, Sorting and Data manipulation techniques by applying suitable data structure . | 3 |
| • Understand the basics data structure for programming | 2 |

## Course Content:

**Unit 1: Introduction to Data Structure**                                 (07 L, 10M)
- Meaning of Data, Data item, Elementary and Group Data items, Meaning of Data Structure, Linear and Non- Linear Data Structure, Meaning of Algorithm, algorithmic notations, Algorithm analysis (Time and space complexity using Bio O notations).

**Unit 2: Introduction to Array**                                 (08 L, 15M)
- Introduction to Arrays, Definition, One Dimensional Array and Multidimensional Arrays, Representation of linear array in memory, traversing linear array, Inserting and Deleting, Sorting (Bubble Sort, Selection Sort, Insertion Sort, Merge Sort), Searching (Linear Search, Binary Search)

**Unit 3: Introduction to Stack and Queue**                                 (07 L, 10M)
- Introduction to Stack, Definition, Stack Implementation, Operations on Stack (PUSH, POP, CHANGE, PEEP), Applications of Stack, Arithmetic expression, Polish notation, Recursion.

- Introduction to Queue, Definition, Queue Implementation, Operations on Queue (Insert, Delete), Circular Queue, Introduction to De-queue and Priority Queue, Queue Applications.

**Unit 4: Linked List, Tree and Graph**                                 (08 L, 15M)
- Introduction, Representation and Operations on Singly Linked List and Doubly Linked List (Traversing, Searching, Insert and Delete), Introduction to Circular Linked List and Circular Doubly Linked List.
- Introduction to Tree, Binary tree, representing binary trees in memory, traversing binary trees, Threaded Binary Tree, self-balancing tree (AVL and Red Black Tree).

- Introduction to Graph- Types, representation in memory.

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**Reference Books:**

1. Horowitz, Sahani, Data Structures: Galgotia publication
2. Aho, Hopcroft, Ulman, Data Structures and Algorithms
3. Schaum's Outline of Data Structures with C++ ISBN-10: 0071353453
4. Data Structure and Algorithms: Concept, Techniques and Application, G.A.V.Pai ISBN 10: 0070667268
5. Data Structure: Balucha ISBN: 978-93-833-0383-0
6. An Introduction to Data Structures with Application, Jean-Paul Tremblay, Paul Sorenson.

## Course Code: CA - 212
## Course Title: Python Programming

| | |
|---|---|
| **Course Code: CA-212** | **Course Category: (DSC-8)** |
| **Course Title: Python Programming** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:
- To provides an overview of core python programming.
- To develop programs in Python using lists, tuples, strings and dictionary.
- To acquire knowledge of implementing Object-Oriented programming concepts in Python.
- To explore libraries and modules in Python.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Acquire the knowledge of core python programming. | 1 |
| • Understanding utilization of fundamental data structures like tuples, lists, and dictionaries. | 2 |
| • Demonstrate the ability to define and invoke functions, work with modules, and implement object-oriented principle. | 3 |
| • Understand the basics of libraries in Python programming. | 2 |

**Course Content:**

### Unit 1: Introduction to Python                                    (07 L, 10 M)

- Introduction to Python: History of Python, Need, features of Python, Applications of Python.
- Standard Data Types – Basic, None, Boolean, Numbers, Type conversion Function, Operators in Python, Operator Precedence.
- Fundamentals of Python Programming: Python Identifiers, Variables and keywords, Putting Comments, Expressions and Statements. Accepting Input and Displaying Output.
- Flow Control Statements: Conditional Statements, Looping Statements, break, continue, pass Statements
.

### Unit 2: Basic of Python Programming                               (08 L, 15M)

- Introduction to String: String Literals, Assign String to a Variable, Multiline Strings, Operations on Strings (Index Operator, Slice Operator): Working with the Characters of a String, String Methods (lower, upper, count, index, find, replace).
- Concepts of Python Lists: Creating, Initializing and Accessing elements in lists, Traversing, Updating and deleting elements from Lists. List Operations: Concatenation, List Indexing, Slices, Built- in List functions and methods.
- Introduction to Tuples: Creating Tuples, Deleting Tuples, Accessing elements in a Tuple, Tuples Operations: Concatenation, Repetition, Membership, and Iteration. Built- in Tuples functions and methods
- Introduction to Dictionary: Concept of key-value pair. Creating, Initializing and Accessing elements in a Dictionary. Traversing, Updating and Deleting elements in a Dictionary, Built- in Dictionary functions and methods.

**Unit 3: Python Functions and Modules**                    **(08 L, 15 M)**

- Introduction to Functions: Defining a Function (def.), Calling a Function, Function Arguments-Required arguments, Default arguments, Variable-length arguments, Scope of Variables, Void functions and Function returning values
- Advance Function Topics: Anonymous Function Lambda, Mapping Functions.
- Introduction to Modules: Creating Modules, Importing Modules, built in modules.

**Unit 4: Object Oriented Concepts & libraries**                **(07 L, 10 M)**

- Overview of OOP Terminology Creating Classes, Creating Objects, Accessing Attributes, Built In Class Attributes
- Garbage Collection: Constructor, Overloading Methods, Overriding Methods
- Libraries – NumPy, Pandas, Matplotlib, Scikit-learn, pyTorch, Seaborn, pyBrain, Flask.

**Reference Books:**

1. 1.John V Guttag (2013), Introduction to Computation and Programming Using Python, Prentice Hallof India, 2013, ISBN: 9780262525008
2. Peter C. Norton, Alex Samuel and others, ―Beginning Python‖, Wrox Publication,2005 ISBN 10:0764596543 ISBN 13: 9780764596544
3. R. Nageswara Rao (2016), Core Python Programming, Dreamtech Press, 2016, ISBN-13: 9789351199427
4. Wesley J. Chun (2006), Core Python Programming - Second Edition, Prentice Hall, ISBN- 13: 978-0132269933, ISBN-10: 0132269937
5. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser (2013), Data Structures and Algorithms in Pyhon", Wiley, 2013, ISBN: 978-1-118-54958-2, ISBN: 978-1-118- 29027-9 (HardCover)
6. Kenneth A. Lambert (2011), Fundamentals of Python – First Programs, CENGAGE Publication, 2011, ISBN 1111822700, ISBN 9781111822705
7. Luke Sneeringer (2015), Professional Python, Wiley Inc.,2015, ISBN: 1119070856

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<tr><td colspan="2" align="center"><b>Course Code: CA-213</b><br><b>Course Title: Practical based on Data Structure.</b></td></tr>
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|---|---|
| **Course Code: CA-213** | **Course Category: (DSC-9)** |
| **Course Title: Practical based on Data Structure.** | **Type: Practical** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives:**
- To understand single-dimensional and multi-dimensional arrays for data storage and processing.
- To implement fundamental sorting algorithms such as Bubble Sort, Quick Sort, Selection Sort, and Insertion Sort to organize data.
- To develop searching techniques like Linear Search and Binary Search to efficiently locate data in arrays.
- To gain proficiency in data structure operations, including Stack, Linear Queue, and Linked Lists (singly and doubly), to manage dynamic data efficiently.

| Course Outcomes – At the end of the course, student will be able to: | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Identify the appropriate data structure for given problem. | 2 |
| • Analyze the various sorting and searching algorithms. | 4 |
| • Apply the different linear data structures like stack, queue and link list to various computing problems. | 3 |

**Assignments -**
**NOTE: - All practical' s are performed with OOPS using C++**

1. Write a program to demonstrate single dimensional array.

2. Write a program to demonstrate multidimensional array.

3. Write a program to implement Bubble sort.

4. Write a program to implement Quick sort

5. Write a program to implement Selection sort.

6. Write a program to implement Insertion sort.

7. Write a program to implement Linear search.

8. Write a program to implement Binary search.

9. Write a program to implement Stack operations: push, pop, display.

10. Write a program to implement Linear Queue operations: Insert, Delete, Display.

11. Write a program to implement singly linked list with operations. i)create ii) insert iii) delete

12. Write a program to implement doubly linked list.

## Course Code: CA - 214
## Course Title: Practical based on Python Programming

| | |
|---|---|
| **Course Code: CA-214** | **Course Category: (DSC-10)** |
| **Course Title: Practical based on Python Programming** | **Type: Practical** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives:**
- To explore fundamental programming concepts such as loops, conditionals, and functions.
- To demonstrate proficiency in Python data structures, including Lists, Dictionaries, and Tuples, along with their associated functions.
- To develop object-oriented programming skills through Classes, Objects, Method Overloading, and utilizing external libraries effectively.

| Course Outcomes – At the end of the course, student will be able to: | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Understand basics of python programming. | 2 |
| • Implement different applications using python | 3 |
| • Gain knowledge of Object-Oriented implementation in Python programming. | 2 |

### Assignments

**Instruction**: At the time of practical you can have used any Python IDEs and Code Editors (IDLE, PyCharm, Spyder, Thonny, etc.).

1. Installing python and setting up environment. Simple statements like printing the names

("Hello World"), numbers, mathematical calculations, etc.

2. Write a program to find all prime numbers within a given range.

3. Write a program to print "n" terms of Fibonacci Series using Iteration

4. Write a program to demonstrate the use of slicing in string.

5. Write a Program related to Functions & Modules.

6. Write a program to demonstrate the use of list & related functions.

7. Write a program to demonstrate the use of Dictionary & related functions.

8. Write a program to demonstrate the use of Tuple.

9. Write a program to demonstrate the working of Class and Objects.

10. Write a program to demonstrate the working of Overloading Methods

11. Write a program to demonstrate the working of libraries.

## CourseCode:CA-215 (A)
## Course Title: Fundamentals of Accounting

| | |
|---|---|
| **Course Code: CA-215 (A)** | **Course Category: (MIN-2)** |
| **Course Title: Fundamentals of Accounting** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:
- To familiarize students with basics of accounting and significance of accounting.
- To equip students with the essential skills to analyze, record, classify, and summarize financial transactions through journals, ledgers, trial balance.
- To estimate annual financial statements of sole proprietorship form of business.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Understand basics of accounting and its significance. | 2 |
| • Analyze and record financial transactions through appropriate journals, ledgers. | 4 |
| • Apply practical skills in the preparation of final accounts for sole proprietorships and recognize their importance for stakeholders. | 3 |

**Course Content:**

**Unit 1: Introduction to Accounting (Theory Only)**                    **(7 L, 10 M)**
- Concept of Bookkeeping and Accounting.
- Distinguish between Bookkeeping and Accounting, Scope of Accounting.
- Advantages and Limitations of Accounting.
- Users of accounting information.

**Unit 2: Conceptual Framework (Theory Only)**                    **(7L, 10M)**
- Accounting Concepts and Conventions
- Accounting Standards: Concept, Objectives and Benefits
- Terms used in accounting: - Debtors, Creditors, Bill Receivable, Bills Payable, Petty cash, Contra Entry, Trade Discount, Cash Discount, Capital and Revenue expenditure, Suspense A/c.

**Unit 3: Recording transactions (Theory and Problems)**                    **(8 L, 15M)**
- Types of Accounts, Golden Rules of Accounts
- Accounting Cycle
- Journal: Meaning, Specimen of Journal, Writing Journal Entries
- Ledger: - Meaning, Specimen of Ledger, Ledger Posting
- Trial Balance: - Meaning, Specimen of Trial Balance, Utility of Trial Balance

**Unit 4: - Final Accounts for Sole Proprietors (Theory and Problems)**                    **(8 L, 15M)**
- Concept of Final Accounts
- Objectives and Importance of Final Accounts
- Preparation of Trading Account, Profit and Loss Account & Balance Sheet

**Reference Books:**

1. Fundamentals of Accounting by Dr. S.N. Maheshwari, Dr. S.K. Maheshwari- Vikas Publishing House(ISBN-139788180544491).
2. Fundamentals of Accounting: S.K Paul
3. Financial Accounting: By Jane Reimers (Pearson Education)
4. Financial Accounting – Jawaharlal & Shrivastava – S. Chand & Sons
5. Dr. Sehgal Ashok & Dr. Sehgal Deepak: Fundamentals of Accounting. Taxman Allied Services P. Ltd., New-Delhi

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<tr><td colspan="2" align="center">**CourseCode:CA-215(B)**<br>**Course Title: Graph Theory**</td></tr>
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| Course Code: CA 215 (B) | Course Category: (MIN-2) |
|---|---|
| Course Title: Graph Theory | Type: Theory |
| Total Contact Hours: 30 (2/week) | Course Credits: 02 |
| College Assessment (CA) Marks: 20 Marks | University Assessment (UA): 30 Marks |

**Course Objectives:**
- To learn the fundamental concepts and types of graphs.
- To study graph connectivity, paths, cycles, and special types of graphs.
- To introduce tree and various types of tree.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Understand the basic concepts of graph theory. | 2 |
| • Illustrate the fundamental applications of Graph Theory in different walks of life | 2 |
| • Implement the graph theory in real life problems | 3 |

## Course Content:

**Unit 1: Introduction to Graph Theory**      (7L, 10M)
- Definition of a graph and Basic terminology: edge, vertex, graph, degree of vertex, path, cycle
- Types of graphs: Directed, undirected, weighted, mixed graph.
- Operation on graph: Union, Intersection, Join, Cartesian Product, Complement
- Representation of Graphs: Adjacency Matrix, Adjacency List, Incidence Matrix.
- Application of graph.

**Unit 2: Graph Connectivity and Travers ability**      (8L, 15M)
- Connectivity:
  - Connected components
  - Cut vertices and cut edges
  - Blocks
- Traversability:
  - Eulerian paths and circuits
  - Hamiltonian paths and circuits

**Unit 3: Graph Algorithm**      (7L, 10M)
- Shortest Path Algorithms:
  - Dijkstra's Algorithm
  - Bellman-Ford Algorithm
- Graph Traversal Techniques:
  - Breadth-First Search (BFS)
  - Depth-First Search (DFS)
  - Floyd-Warshall Algorithm
- Applications in Networking and Database Systems

**Unit 4: Trees**      (8L, 15M)
- Definition and properties of trees
- Types of trees: Rooted trees, binary trees, spanning trees
- Applications of trees:

- Minimum spanning trees (Prim's and Kruskal's algorithms)
- Binary search trees
- Decision trees
- Applications:  Applications in computer networks, social networks, and data structures.

**References:**

1  Introduction to Graph Theory by Douglas B. West
2  Graph Theory with Applications by J.A. Bondy and U.S.R. Murty.
3  Discrete Mathematics and Its Applications by Kenneth H. Rosen.
4  Discrete structure and graph theory", G.S.S.Bhisma Rao.
5  Graph Theory "Udit Agrawal Umesh Pal Sing.

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|---|---|
| **Course Code: CA-216 (A)** | **Course Category: (MIN-3)** |
| **Course Title: Practical on Tally** | **Type: Practical** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:
- To get familiar with Tally software, dashboard, menus and basic navigation to operate tally.
- To gain insight about how to create, alter, delete company in the Tally software.
- To understand voucher entry of purchases, sales, payments, receipts and contra vouchers

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Understand Tally Software, its gateway and various menus in Tally | 2 |
| • Apply theoretical knowledge of company creation, alteration and deletion of Company | 3 |
| • Create various reports using various vouchers in Tally. | 3 |

**Course Content:**

**Assignment 1: Introduction to Tally**

- Introduction to Tally Software
- Versions of Tally
- Features of Tally
- Gateway of Tally
- Vouchers in Tally

**Assignment 2: Creation, Alteration and Deletion of Company**

Create a company BCA Students Limited with the hypothetical details such as Address, Contact Number, State. Use current accounting year as financial year. Select Account with inventory option. Enter imaginary PAN number. Alter and delete the company.

**Assignment 3: Creation of Ledger Accounts**

Create following ledger accounts with balances given below and place under appropriate groups.

- State Bank of India          Rs.    5,00,000
- Plant and Machinery          Rs.   17,50,000
- Advertisements expenses       Rs.     47,500
- Salary                        Rs.     20,000
- Wages                      Rs.      7,500
- Commission Received         Rs.      3,100

**Assignment 4: Recording basic transactions and report generation:**

Record transactions related to purchase, sales, receipts, payments using imaginary values and generate report such as Trading account, Profit and loss Account and Balance-Sheet.

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**Reference Books:**

1. Financial Accounting on Computer using Tally- Namrata Agrawal
2. Tally Manual
3. Tally Essential, (Tally Prime), Prom Tally. Tally Solution Pvt. Ltd

# Course Code: CA-216 (B)
## Course Title: Practical on Graph Theory

| | |
|---|---|
| **Course Code: CA-216(B)** | **Course Category: (MIN - 3)** |
| **Course Title: Practical on Graph Theory** | **Type: Practical** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives:**
- To understand definitions and properties of graphs, representations, and operations.
- To apply graph theory concept to solve real-world problems using algorithms and techniques.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Define and identify fundamental graph theory concepts such as vertices, edges, degrees, paths, and cycles. | 1 |
| • Implement algorithms to find shortest paths and use BFS and DFS for graph traversal. | 3 |

## Assignments:

1) Graph: A simple undirected graph with 6 vertices A,B,C,D,E, F, and edges: AB,AC,BD,CD,DE,EF.
   - i) Identify the degree of each vertex. ii) List all possible paths between vertices A and E.

2) Graph: A directed graph with 5 vertices P,Q,R,S,T and directed edges: PQ,QR,RS,ST,TP.
   - ii) Add weights to the edges (e.g., PQ=5, QR=3, RS=4 etc.) and describe how this makes the graph weighted.
   - iii) Convert this graph into an undirected graph and discuss the changes.

3) Graph G1: Vertices A, B,C and edges AB,BC. Graph G2: Vertices X,Y,Z and edges XY,YZ.
   - i) Find the union of G1 and G2.
   - ii) Compute the Cartesian product of G1 and G2.
   - iii) Draw the complement of G1.

4) Graph: A weighted undirected graph with vertices V1,V2,V3,V4 and edges V1V2=2,V2V3=3,V3V4=4,V1V4=5. Represent this graph using an adjacency matrix.
   - i) Convert the adjacency matrix into an adjacency list.
   - ii) Write the incidence matrix for the graph.

5) Graph: An undirected graph with 8 vertices and edges connecting some vertices to form two disjoint sub-graphs.
   - i) Highlight any cut vertices or cut edges.
   - ii) Divide the graph into blocks.

6) Graph: A graph forming a square ABCD with diagonals AC and BD.
   - i) Determine whether the graph has an Eulerian path or circuit.
   - ii) Check for Hamiltonian paths or circuits.

7) Graph: A directed weighted graph with vertices A, B, C, D, E and edges with weights:
   A→B=4, A→C=2, B→C=5, B→D=10, C→E=3, E→D=4
   - i) Use Dijkstra's algorithm to find the shortest path from AAA to DDD.

8) Graph: A tree with vertices A, B, C, D, E, F, where A is the root, A→B, A→C, B→D, B→E, C→F
   - ii) Verify that the graph is a tree.
   - iii) Find the height and depth of the tree.

## Course Code: CA-217
## Course Title: Ethical Hacking

| | |
|---|---|
| **Course Code: CA-217** | **Course Category: (VSC-3)** |
| **Course Title: Ethical Hacking** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:
- To understand and explain ethical hacking techniques and tools, including reconnaissance, scanning, gaining access, maintaining access, and covering tracks.
- To apply ethical hacking knowledge to simulate real-world attacks and perform penetration testing in controlled environments.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Understand the different ethical hacking techniques. | 2 |
| • Discover the vulnerabilities, loophole on web server and system. | 4 |
| • Use ethical hacking knowledge to implement strategies for preventing attacks. | 3 |

**Course Content:**

**Unit 1: Introduction to Ethical Hacking** (08 L, 13M)
- Introduction Ethical Hacking – History, Advantages, Hacker-Cracker
- Types of Hackers (White Hat, Black Hat, Grey Hat)
- Ethical Hacking vs. Penetration Testing
- Roles and Responsibilities Phases of Ethical Hacking (Reconnaissance, Scanning, Gaining Access, Maintaining Access, Covering Tracks)
- Common Hacking Tools

**Unit 2: Information Gathering and Scanning Techniques** (07 L, 12M)
- Foot printing Information Gathering
- Google Dorking
- Identifying Live Hosts
- Port Scanning Techniques
- Banner Grabbing and Fingerprinting
- Password Cracking (Brute Force, Dictionary Attacks)
- Privilege Escalation Techniques

**Unit 3: Malware, Evasion Techniques, and Attack Prevention** (07 L, 12M)
- Covering Tracks
- Malware Threats
- Viruses, Worms, Trojans, and Ransomware
- Spyware and Adware
- Antivirus Evasion Techniques
- Social Engineering Defense Strategies
- Understanding DoS and DDoS Attacks
- Preventing DoS Attacks

**Unit 4: Web Application Security, Mobile Hacking, and Cryptography**        **(08 L, 13M)**

- Web Application Hacking
- SQL Injection
- Cross-Site Scripting (XSS)
- Cross-Site Request Forgery (CSRF)
- Web Server Security
- Mobile Platform Hacking
- Mobile Malware & Exploits
- Securing Mobile Devices
- Encryption Standards and Techniques

**Reference Books:**

1. "Ethical Hacking and Penetration Testing Guide", Rafay Baloch, Packt Publishing, 2017, ISBN: 978-1788625339.
2. "The Web Application Hacker's Handbook", Dafydd Stuttard, Marcus Pinto, Wiley, 2011, ISBN: 978-1118026476
3. "The Basics of Hacking and Penetration Testing", Patrick Engebretson, Syngress, 2011, ISBN: 978-1597496577
4. "Hacking: The Next Generation", Nitesh Dhanjani, O'Reilly Media, 2009, ISBN: 978-0596527757
5. Website: https://owasp.org/www-community/attacks/Google_Hacking
6. **Website**: https://www.owasp.org/index.php/OWASP_Mobile_Security_Project

# Course Code: CA-218 Field Project

| Course Code: CA-218 | Course Category: ( FP1) |
|---|---|
| Course Title: Field Project | Type: Practical |
| Total Contact Hours: 30 (8/week) | Course Credits: 02 |
| College Assessment (CA) Marks: 20 Marks | University Assessment (UA): 30 Marks |

**Course Objectives:**
- To provide students with hands-on experience in studying real-time software or system applications.
- To enhance problem-solving skills through innovative and usability-focused projects.
- To develop innovative prototypes based on field projects findings.
- To synthesize data and prepare comprehensive field projects reports.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Analyse real-time software or system applications to gain practical understanding and insights. | 4 |
| • Apply problem-solving skills to develop innovative and usability-focused solutions. | 3 |
| • Design a prototype based on findings from the field project. | 5 |

## GUIDELINES FOR FIELD PROJECT FORMULATION

- Each student shall have to undergo a Field Project during 3rd Semester.

- In the 3rd semester examination student are required to carry out a **Field Project individually or by group of two students.**

- Students should focus on studying either a **single real-time application or multiple applications** within the same platform to gain in-depth understanding and practical experience.

- It should be compulsorily based on **Software, Applications, and Computer System**, **Packages** etc. **implemented in real time domain** such as – **Schools, Colleges, Shops, Medical Shops, Various Government Offices, Hospitals, Banks, Small and Medium Industries etc.**

- The topic should be decided with guidance of internal teacher of the Institute / College.

- Student should study the project considering various components like usability, research orientation & innovation.

- The student has to write a report based on the **actual Field Project**, get it certified by the concerned Guide/teacher that the Field Project has been satisfactorily completed and submit TWO typed copies of the same to the Head / Director of the institute /Principal of the college.

- **Students are required to develop a Prototype / Design of Software / Applications, which they studied during the Field Project**. The prototype should be built consider the functionality of the product; identify strengths, weaknesses, and areas for improvement before final submission.

- **The prototype shall include Design of system, front end and back end of system, database of system, functionality of system etc.**

- Students are required to submit an official certificate from the organization where they have completed their Field Project. This certificate should verify the duration, nature of work, and successful completion of the assigned tasks during the Field Project.
- The Field Project will carry maximum 50 marks, of which **internal teacher** shall award marks out of maximum **20 marks** based on work done by the student.
- Remaining marks shall be awarded out of maximum **30 marks** by examining the student during Viva-voce, by the **External examiner**.

## PROJECT PROPOSAL / REPORT:

The project report should be prepared in consultation with your guide. The Field project work should compulsorily include the study of real time application/software/system as per guidelines. The Format of project report shall be as follows.

1. **Title Page:**
   Title of the Project.
   Organization Name and Location of Project.
   Student Name and PRN Number.
   Guide Name.
   Program Name.
   Logo and Name of Institution.
   Logo and Name of University
   Academic Year
2. **Acknowledgment**
3. **Declaration**
4. **Introduction:**
   a. Background of the Field Project.
   b. Purpose and scope of the Field Project.
   c. Overview of the organization.
   d. Objectives of the Field Project.
   e. Limitations of study.
5. **Methodology:[ if field project is based on some tools and techniques]**
   a. Tools, Techniques, and processes used during the Field Project.
   b. Data collection methods (if applicable)
   c. Analysis and interpretation of Data collection. (if applicable)
   d. Results achieved (use charts, graphs, or tables-if applicable)
6. **Design Prototype**:
   a. Tools and technologies.
   b. Validations.
   c. User module, Admin module.
   d. Input forms, Output forms.
7. **Findings:**
   a. Key observations and insights gained during the Field Project.
   b. Findings of the study.
8. **Conclusion and Recommendations:**
   a. Summary of the work completed.
   b. Future Work (if applicable).
   c. Outcomes.
9. **References**

## GUIDELINES FOR ORGANIZATION WHERE FIELD PROJECT WILL BE CARRIED OUT:

In the 3$^{rd}$semester SYBCA student are required to carry out a **Field Project on real-time application or multiple applications** within the same platform to gain in-depth understanding and practical experience. The field project carried out at various type of organization such as– **Schools, Colleges, Shops, Medical Shops, Various Government Offices, Hospitals, Banks, Small and Medium Industries etc.**

1. **Permission:** The organization grants permission for the field project as a part of the curriculum
2. **System Demonstration:** The organization offers assistance in the complete demonstration of the system and its real-time applications.
3. **Small Access:** Grant students limited access to the system for the purpose of designing the prototype
4. **Observation:** Monitor the student's knowledge, behavior, engagement, creativity, and other relevant attributes.
5. **Authorized Documents:** The organization should issue an authorized certificate.
6. **Feedback:** After completion of the field project, provide feedback of student field project work to the respective project guide via email.

# Second Year BCA
## Semester - IV

## Course Code: CA-221
## Course Title: Database Management System

| | |
|---|---|
| **Course Code: CA-221** | **Course Category: DSC-11** |
| **Course Title: Database Management System** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:
- To understand the basic concepts of database management systems.
- To design databases using ER modeling.
- To apply integrity constraints.
- To understand and demonstrate database schema.
- To demonstrate the use of SQL in DBMS.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| - Define and differentiate between data, information, and data management. | 2 |
| - Understand the concept of DBMS, its applications, and various types of database users. | 2 |
| - Apply normalization techniques to achieve different normal forms (1NF, 2NF, 3NF) and optimize database designs. | 3 |
| - Understand and implement joins to retrieve complex data from multiple tables. | 3 |

**Course Content:**

### Unit 1: Introduction to Basics of DBMS (05 L, 10 M)
- What is Data & Information?
- What is Data management?
- What is Optimization?
- Pre-processing of Data
- Importance of Data Quality
- List of DBMS software's

### Unit 2: Database Systems & Data Models (08 L, 10M)
- Introduction of File Processing System
- Introduction of DBMS
- Difference between File processing system & DBMS
- Applications of DBMS
- View of data
- Concept of DBA
- Relational Model
- Network Model
- Hierarchical Model
- Entity Relationship Model: Symbols, Entity, Attributes, Relationships, Examples.

### Unit 3: Integrity Constraints & Normalization (05 L, 15 M)
- Primary Key
- Foreign Key
- Candidate Key

- Super Key
- Null
- Default
- Not Null
- Check constraint
- Entity Integrity
- Referential Integrity
- Normalization
- Normal Form: 1 NF, 2 NF, 3 NF

## Unit 4: Structured Query Language (SQL)                    (12L, 15 M)

- Introduction to SQL
- Data types
- Operators
- Working with tables.
- Introduction to: DDL, DML, DCL, TCL.
- Clause: Where, Group by, having, order by.
- Functions: Numeric Function, Aggregate functions, Character Function, Date Function, Conversion Function.
- Sub Queries, view, Sequence, Set Operators.
- Joins: Inner joins, Equi, Non Equi, Self-join & Outer Joins.

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**Reference Books:**
- Database System Concepts: - Abraham Silberschatz, Henry F. Korth& S. Sudarshan, McGraw-Hill ISBN 978-0-07-352332-3
- Introduction to Database Management Systems, by – Atul Kahate (Pearson Education) ISBN 9788131700785
- Oracle PL/SQL by Example, Rosenweig, Pearson Education ISBN 10: 0133796787

| Course Code: CA-222 <br> Course Title: Artificial Intelligence | |
|---|---|
| **Course Code: CA-222** | **Course Category: DSC-12** |
| **Course Title: Artificial Intelligence** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To learn problems as state space searches and use production systems to solve them.
- To understand search methods with basic and heuristic approaches.
- To explore different ways to represent knowledge in AI systems.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level <br> [Bloom's Taxonomy] |
|---|---|
| • Remember the concepts of Artificial Intelligence. | 1 |
| • Understand applications of AI techniques in intelligent agents | 2 |
| • Learn the methods of solving problems using Artificial Intelligence. | 2 |

## Course Content:

**Unit 1: Introduction to AI** (07L, 10M)

- History of AI.
- The AI Problems.
- What is an AI Technique? Tic-tac-tow, Question answering, Turing-Test.
- Branches of Artificial Intelligence.
- Applications of Artificial Intelligence.
- Intelligent Agents - Structure, Types of Agents and Autonomous Agents.

**Unit 2: Problem, Problem Spaces and Search** (08L, 15M)

- Defining the Problem as a State Space Search
  - Monkey Banana Problem.
  - Tower of Hanoi.
- Production systems.
- Problem Characteristics.
- Production System Characteristics.
- Uninformed Search techniques - DFS and BFS.
- Issues in the Design of Search Programs.

**Unit 3: Heuristic Search Techniques:** (07L, 10M)

- Generate-and- Test, Traveling Sales Man Problem
- Hill Climbing
- Best-First Search: OR Graph, A*, Agendas.
- Problem Reduction: AND-OR Graph,AO*

**Unit 4: Knowledge Representation** (08L, 15M)

- Knowledge Representation Issues.
- Representations and Mappings.
- Approaches to knowledge.
- Representation.
- Issues in Knowledge Representation.

**Reference Books:**

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", 2nd Edition, 1991, ISBN: 9780071008945, Tata McGrawHill.
2. Stuart Jonathan Russell, Peter Norvig, "Artificial Intelligence – A modern approach", illustrated, 2010, ISBN: 9780136042594, Prentice Hall.
3. Deepak Khemani (2013). A First Course in Artificial Intelligence, McGraw Hill Education (India), ISBN 9781259029981

| Course Code: CA-223 | |
|---|---|
| **Course Title**: **Practical based on Database Management System** | |
| **Course Code: CA-223** | **Course Category: DSC-13** |
| **Course Title: Practical based on Database Management System** | **Type: Practical** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:
- To create, manage, and manipulate data in a database using DBMS software.
- To create databases, tables, and perform essential database CRUD operations.
- To use SQL operators, aggregate functions, and joins to perform complex data operations.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Demonstrate the ability to create a new database and design tables within it. | 3 |
| • Use SQL commands to insert, update, and delete records in database tables effectively. | 3 |
| • Understand the importance of enforcing data integrity in relational databases. | 2 |
| • Implement SQL operators, aggregate functions, and joins to perform complex data operations. | 3 |

**Course Content:**

**Assignments :( Note: All practical does perform on Oracle/open source)**

1. Demonstration of creating database.

2. Create table insert 10 records in it.

3. Demonstrate to INSERT, UPDATE, and DELETE, Records in Table.

4. Demonstrate to Alter Table (Add Column, Delete Column, Rename, Modify Column)

5. Demonstrate to SELECT with clauses (Simple and Parameterize).

6. Demonstrate: i. WHERE Clause ii. GROUP BY clause iii. HAVING Clause.

7. Demonstrate integrity constraints: PRIMARY KEY, FOREIGN KEY, CHECK, NOT NULL, and DEFAULT

8. Demonstrate use of operators.

9. Demonstrate joins (Inner joins, Equi, Non Equi, Self-join & Outer Joins)

10. Demonstrate the use of Sub-Queries.

11. Write down SQL by using i. Aggregate functions ii. Date functions iii. String functions.

| Course Code: CA-224 |
| Course Title: Practical based on Artificial Intelligence using Python |

| | |
|---|---|
| **Course Code: CA-224** | **Course Category:(DSC-14)** |
| **Course Title: Practical based on Artificial Intelligence using Python** | **Type: Practical** |
| **Total Contact Hours: 30 (2 /week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives:**

- To understand and implement basic Artificial Intelligence (AI) techniques
- To develop simple AI-based programs.
- To analyze and apply AI algorithms in practical scenarios

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Study the concepts of Artificial Intelligence practically. | 1 |
| • Understand applications of AI techniques and intelligent agents | 2 |
| • Learn the methods of solving problems using Artificial Intelligence. | 2 |

# Course Content:

1. Create a program where a simple AI plays Tic-Tac-Toe using basic rules.

2. Write programs to perform Depth-First Search (DFS) and Breadth-First Search (BFS) on a graph or tree.

3. Solve the "Tower of Hanoi" using a set of production rules.

4. Analyse a problem like a chess game and list its key characteristics.

5. Solve the "8 Puzzle Problem" using the generate-and-test method.

6. Solve the "Monkey Banana Problem" using a set of production rules.

7. Write a program to find the best solution for a numerical problem using hill climbing.

8. Create a program to perform Best-First Search on a graph and display the steps.

9. Solve a problem using AND-OR graphs and implement the AO* algorithm.

10. Write a program to check logical statements for truth.

11. Create a decision tree to classify or make decisions.

## Course Code: CA - 225 (A)
## Course Title: Enterprise Resource Planning

| | |
|---|---|
| **Course Code: CA-225 (A)** | **Course Category: (MIN-4)** |
| **Course Title: Enterprise Resource Planning** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To understand the concept of ERP and its importance in modern businesses.
- To study the steps and activities in the ERP Life Cycle.
- To study the architecture, components, and technologies used in ERP systems.
- To learn the concept of Business Process Reengineering (BPR) and its role in ERP implementations.

| **Course Outcomes: After completion of the course, the student will be able to** | **Cognitive Level [Bloom's Taxonomy]** |
|---|---|
| • Understand the steps and activities involved in the ERP life cycle. | 2 |
| • Identify and explain the functionalities of an ERP system. | 2 |
| • Understand reengineered business processes to ensure effective ERP implementation. | 2 |
| • Understand different ERP models and their applications.. | 2 |

## Course Content:

**Unit 1: Introduction to ERP**                           **(07 L, 10 M)**

- Introduction and Purpose to ERP
- Evolution of ERP
- Types of ERP System
- Benefits of ERP
- Factors affecting Success and failure of ERP

**Unit 2: ERP and Related Technologies**                    **(08 L, 10M)**

- Management Information System (MIS)
- Business Process Reengineering (BPR)
- Executive Information System (EIS)
- Decision Support System (DSS)
- Customer Relationship Management (CRM)
- Supply Chain Management (SCM)
- Introductions to Trends in ERP
  - Cloud ERP,
  - AI and Machine Learning in ERP,
  - Mobile ERP

**Unit 3: ERP Management**            **(07 L, 15 M)**

- ERP Modules (Finance, HR, Manufacturing, Inventory, Sales & Distribution)
- ERP Implementation Life Cycle
- Project Planning Phases
- Strategies in ERP implementation.
- People Organization in implementation - Consultants, Vendors and End Users.

**Unit 4: Data Management in ERP and SAP**       **(08 L, 15 M)**

- Importance of Data in ERP System
- ERP Security
- Data Cleaning in ERP
- Introduction to SAP
- SAP Architecture R/2, R/3 and HANA
- Features and Benefits of SAP

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## Reference Books:

- "Enterprise Resource Planning: Fundamentals of Design and Implementation" by Greg Gable and Jeffery H. McKeown
- Modern ERP: Select, Implement, and Use Today's Advanced Business Systems" by Marianne Bradford
- "ERP: Making It Happen - The Implementers' Guide to Success with Enterprise Resource Planning" by Thomas H. Davenport
- "ERP Demystified" by Alexis Leon
- "SAP ERP Financials: Configuration and Design" by Naeem Arif
- "Configuring SAP ERP Sales and Distribution" by Kapil Sharma and Ashutosh Mutsaddi
- "Cloud ERP: Implementation and Management" by Ranjit Singh

| Course Code: CA 225 (B) |
| Course Title: Basics of Statistics and Probability for Computer Science |

| | |
|---|---|
| **Course Code: CA-225 (B)** | **Course Category: (MIN-4)** |
| **Course Title: Basics of Statistics and Probability for Computer Science** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives:**
- To provide a basic understanding of statistical tools for data analysis.
- To learn measures of central tendency.
- To understanding of probability for data analysis.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Understand of basics concepts of Statistics. | 2 |
| • Learn the basics of probability theory and its applications | 2 |
| • Understand the applications of statistics and probability | 2 |

## Course Content:

**Unit 1:  Introduction to Statistics**                                                 **(07 L, 10 M)**
- Meaning of Statistics
- Importance and Limitations of statistics,
- Meaning of data, Raw data, Primary data, Secondary data, Variable and attribute,
- Types of variables: - districts and continuous, Meaning of Population and sample,
- Introduction to methods of sampling: - simple random sampling and stratified random sampling

**Unit-2 Measures of central tendency**                                       **(08 L, 15 M)**
- Meaning and central tendency,
- Statement of measures of central tendency: - arithmetic mean, geometric mean, harmonic mean, median and mode,
- Computation of these measures of central tendency for given raw data,
- Partition values: - quartiles, deciles and percentiles,
- Computation of partition values for given raw data

**Unit 3: Introduction to Probability**                                            **(07 L, 10 M)**
- Basic Concepts of Probability: Definitions: Experiment, Sample Space, Events
- Types of Events: Simple, Compound, Mutually Exclusive, and Exhaustive.
- Classical Probability
- Axioms of Probability: Non-negativity, Additivity.
- Applications and Examples

**Unit 4: Conditional Probability and Independence**                          **(08 L, 15 M)**
- Conditional Probability
- Independent Events
- The Law of Total Probability
- Bayes' Theorem

**References:**

1. Statistics for Business and Economics" by Paul Newbold, William L. Carlson, and Betty Thorne.
2. Elementary Statistics: A Step By Step Approach by Allan G. Bluman.
3. Probability and Statistics by Morris H. DeGroot and Mark J. Schervish.
4. Introduction to Probability Models by Sheldon Ross.

## Course Code: CA - 226 (A)
## Course Title : Practical based on ERP using Case Studies

| | |
|---|---|
| **Course Code: CA-226 (A)** | **Course Category: (MIN-5)** |
| **Course Title: Practical based on ERP using Case Studies** | **Type: Practical** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To study the steps and activities in the ERP Life Cycle.
- To develop a process driven thinking towards business processes.
- To understand the key implementation issues of ERP.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Identify and describe functionality in an ERP system. | 2 |
| • Apply the steps and activities in the ERP life cycle. | 3 |
| • Analyze issues of ERP architecture, design, development, implementation and project management. | 4 |
| • Evaluate business processes for successful ERP implementation. | 5 |

**The students are required to select, discuss and solve minimum of 8 (Eight) case studies related to the following subjects: CA 225-A - Enterprise Resource Planning.**

"Through this course, the subject teacher will guide students in solving case studies related to ERP implementation, helping them apply theoretical knowledge to real-world scenarios, ICT based and develop practical problem-solving skills."

**Note:** Students must maintain a journal file for all case studies, including their discussions and solutions.

**Basic Guidelines -**
- **Understand the Problem / Challenges:** Identify the company's challenges and objectives.
- **Understand Current System:** Review existing processes and limitations.
- **Define ERP Requirements:** List the needs for the new ERP system.
- **Select ERP Solution:** Choose the best-fit ERP based on requirements.

**Marking Scheme - University Assessment (UA): Total 30 Marks**

**Evaluation Pattern:**
**Solve Any One Case out of Two Cases.**
- Written Solution for the Case: 15 Marks
- Viva Voce of Case: 10 Marks
- Journal File of all Cases (During Practical Session): 5 Marks

## References

**1.**Enterprise Resource Planning (ERP) – A Managerial and Technical Perspective S. Parthasarathy, New Age International Limited (ISBN (13) : 978-81-224-2298-6)

**2.**Enterprise Resource Planning: Concepts and Practice, Vinod Kumar Garg, PHI Learning Pvt Ltd, New Delhi (ISBN : 978-81-203-2254-7)

**3.**Enterprise Resource Planning (Text and Case Studies), C.S.V Murty, Himalaya Publication, (ISBN – 9350970090)

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**Course Code: CA - 226(B)**
**Course Title: Practical on Basics of Statistics and Probability for Computer Science**

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| **Course Code: CA – 226 (B)** | **Course Category: (MIN - 5)** |
|---|---|
| **Course Title: Science Practical on Basics of Statistics and Probability for Computer Science** | **Type: Practical** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives:**
- To provide a basic understanding of statistical tools for data analysis.
- To learn measures of central tendency.
- To understanding of probability for data analysis.

| **Course Outcomes: After completion of the course, the student will be able to** | **Cognitive Level** [Bloom's Taxonomy] |
|---|---|
| • Understand of basics concepts of Statistics. | 2 |
| • Learn the basics of probability theory and its applications | 2 |
| • Understand the applications of statistics and probability | 2 |

**Course Content:**

1) **Use the dataset of the ages of 50 employees in a ABC pvt. Ltd. company**.

   i. Classify the data as primary (collected first hand) or secondary (obtained from existing sources).

   ii. Determine whether the age variable is discrete (countable values) or continuous (any value within a range).

2) **Consider a dataset containing information on students: age, gender, test scores, and participation in extracurricular activities**.

   i. Identify which variables are quantitative (e.g., age, test scores) and which are qualitative (e.g., gender, participation).

   ii. Determine which variables are discrete (e.g., number of activities) and which are continuous (e.g., test scores).

3) **Given the test scores of 10 students: 72, 85, 90, 75, 88, 95, 80, 78, 84, and 91.**

   i. Compute the arithmetic mean (average) of the scores.

   ii. Calculate the median (middle value) of the scores.

   iii. Determine the mode (most frequent score) if it exists.

4) **Using the same dataset of test scores: 72, 85, 90, 75, 88, 95, 80, 78, 84, 91.**

   i. Calculate the first quartile (Q1), median (Q2), and third quartile (Q3).

   ii. Determine the $20^{th}$ percentile ($P_{20}$) and $80^{th}$ percentile ($P_{80}$) of the scores.

5) **Consider the experiment of rolling a six-sided die.**

   i. Define the sample space (S) for the experiment.

   ii. Identify events such as rolling an even number (E) and rolling a number greater than 4 (G).

6) **In a standard deck of 52 cards, calculate the probability of drawing an Ace.**

    i.    Determine the number of favourable outcomes (drawing an Ace) and the total number of possible outcomes (52 cards).

    ii.    Compute the probability as the ratio of favourable outcomes to total outcomes.

7) **In a deck of 52 cards, what is the probability of drawing a King given that a face card has been drawn?**

    i.    Identify the number of face cards in the deck (Jack, Queen, and King of each suit: 12 cards).

    ii.    Determine the number of Kings among the face cards (4 Kings).

8) **Consider two events: A = drawing a red card from a deck, and B = drawing a King.**

    i.    Calculate the probability of event A (drawing a red card).

    ii.    Calculate the probability of event B (drawing a King).

    iii.    Determine if events A and B are independent by checking if $P(A \cap B) = P(A) * P(B)$.

9) **A factory produces 60% of its products from Machine A and 40% from Machine B. The defect rates are 3% for Machine A and 5% for Machine B. If a randomly selected product is found to be defective, what is the probability it was produced by Machine A?**

    i.    Define events: D = defective product, A = product from Machine A, B = product from Machine B.

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| | |
|---|---|
| **Course Code: CA-227** | **Course Category: SEC-3** |
| **Course Title: Advanced Graphics Design** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To understand basic tools and features of Adobe Animate.
- To explain how to create simple animations using the timeline and key-frames.
- To use Adobe, animate to create a basic motion tween or frame-by-frame animation.
- To design and produce a short-animated project incorporating various elements

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level [Bloom's Taxonomy] |
|---|---|
| • Understand basic animation workflow and timeline operations in Adobe Animate. | 2 |
| • Develop skill in producing simple animations using motion tweens and frame - by - frame techniques. | 3 |
| • Make simple animations using the timeline and key-frames. | 3 |

**Course Content:**

**Unit 1: Introduction to Adobe Animate CC**        **(07 L, 10 M)**

- Introduction Adobe Animate
- Features of Adobe Animate
- Benefits of Adobe Animate
- Uses of Animate in Industry
- Uses of Animate for Digital Marketing
- Supported Graphics Format to Animate
- Importing files into Animate

**Unit 2: Working with Panels**        **(08 L, 10M)**

- Understanding Interface of Animate
- Workspace, Stage
- Timeline
- Frames, Key Frames, Blank Key Frames
- Tools Panel
- Library Panel
- Introduction to Layers and Layer Panel
- Properties Panel

**Unit 3: Frame-by-Frame Animation**                                **(07 L, 15 M)**

- Frame-by-Frame Animation
- Creating and Editing Text
- Filter, Types of Filters
- Understanding Mask Layer

**Unit 4: Working with and Tween Animation and Publishing Files**     **(08 L, 15 M)**

- Introduction to Tween Animation
- Motion Tween
- Shape Tween
- Introduction to Symbol - Graphics Symbol, Movie Clip and Button
- Configuring Publishing Settings
- Animate Files (FLA, SWF, AS File, ASC File etc.)

## Assignments –

1. Create animated page / image for your college web site.
2. Create animated advertisements for your college event / Web Site.
3. Create animated invitation card for your college program.
4. Create animated page / image for social awareness programs.
5. Create animated image gallery of your college / cultural program.

## Reference Books:

- Adobe Animate CC Classroom in a Book (2020 release)" by Peter Lourekas and the Adobe Creative Team
- Adobe Animate CC: The Professional Portfolio" by Joseph Labrecque
- Adobe Animate CC For Dummies" by David M. Gehner
- Adobe Animate CC Digital Classroom" by Jeremy Osborn, Jennifer Smith, and the AGI Creative Team
- Mastering Adobe Animate CC: A Complete Guide for Beginners and Advanced Users" by Anthony Shia
- Create Your Own Animated Stories with Adobe Animate" by Chris Georgenes
- The Animator's Survival Kit" by Richard Williams.

## Course Code: CA-228
## Course Title: Community Engagement and Service

| | |
|---|---|
| **Course Code: CA-228** | **Course Category: CEP** |
| **Course Title: Community Engagement and Service** | **Type: Practical/Field Work** |
| **Total Contact Hours: 60 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:
- To sensitize students to the needs and challenges of the local community.
  To inculcate values of empathy, citizenship, and social responsibility among students.
- To engage students in meaningful service activities that benefit both learners and the community.
- To integrate classroom knowledge with practical field-based learning.
- To develop students' soft skills, problem-solving, and teamwork in real-world contexts.

| Course Outcomes: After completion of the course, the student will be able to | Cognitive Level |
|---|---|
| - **CO1**: Demonstrate awareness of social issues and local community needs. | 2 |
| - **CO2**: Apply problem-solving and communication skills to address community challenges. | 3 |
| - **CO3**: Exhibit values of civic responsibility and active citizenship. | 4 |
| - **CO4**: Work collaboratively in teams to plan and execute service projects. | 3 |
| - **CO5**: Reflect critically on their engagement experiences and learning | 5 |

**General Guidelines for Implementation:**

**Project Areas May Include:**

- Digital literacy training in villages or slums.
- Helping schools with basic computer education or library setup.
- Awareness campaigns (cybersecurity, health, e-governance).
- Assisting local self-governments in digital record-keeping.
- Environmental awareness (plantation, waste management, water conservation).
- Conducting surveys or data collection for NGOs or government departments.

**Project Implementation:**

- Each student must engage in minimum 30 hours of fieldwork or project-based service.
- Students may work individually or in small groups (max 5 per group).
- The activity must be documented through logs, photographs, videos, and community feedback.
- Faculty mentors will supervise, guide, and approve projects.
- Final submission should include a Project Report and Presentation/Viva.

**Evaluation Criteria (Total 50 Marks)**

**A. <u>College Assessment – 20 Marks</u>**

| Component | Marks | Description |
|---|---|---|
| Attendance & Participation | 5 | Consistency, active involvement |
| Faculty Observation | 5 | Engagement, attitude, initiative |
| Fieldwork Documentation | 5 | Logbook, photo/video evidence |
| Interim Report & Reflection | 5 | Insightful observations, learning |

**B. University Assessment – 30 Marks**

**Conducted through viva/presentation and final report review by an external/examiner.**

| Component | Marks | Description |
|---|---|---|
| Final Project Report | 10 | Structure, content, relevance |
| Oral Presentation / Viva | 10 | Clarity, articulation, reflection |
| Impact Assessment & Reflection | 10 | Social impact, learning outcomes, feedback from beneficiaries |

**<u>Documentation Requirements:</u>**

- Project Proposal (approved by mentor)
- Daily Log of Work
- Photographic/Videographic Evidence
- Final Report (approx. 5-10 pages)
- Beneficiary/Stakeholder Feedback (if applicable)
- Presentation Slides for Viva

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