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Programme:- BCA (AI&DA) **Semester - II** **wef: July 2025**

Name of Paper& Category	Paper Code	Theory					
		Credit			Marks		
Data Structures (Major)	BAI-201	L	T	J	EST	CAT	Total
		3	1	0	70	3 0	100

Course Objective	The objective of this course is to teach about how the data organizes and the techniques to organize the data. Develop good understanding of how operations are performed on data in various data structures including hierarchical representation.

Units	Contents (Theory)	Hours /week
I	**Introduction**: Definition, Types of Data structures, Data structure operations, Abstract data type, Algorithm, Complexity, Time and Space tradeoffs.	8
II	**Stack:** Operations on stack, Applications of stack, Conversion of Infix to Prefix and Postfix, Expressions and Expression evaluation. **Queues:** Operations on queues, Types of Queue, Circular queue, D-queue, Priority Queues, Applications of queue.	8
III	**Linked list:** Introduction to linked list, Operations on linked list, Types of linked list, Singly linked list, Doubly linked list, Circular linked list, Applications of linked list**.**	8
IV	**Trees:** Basic terminology, Binary trees, Algebraic expressions, Complete binary tree, Extended binary tree, Traversing binary trees, Binary search Tree. **Graphs:** Introduction, Types of graphs, Sequential representations of graphs, Adjacency Matrices, Traversal, Spanning trees, Minimum cost spanning trees.	8
V	**Sorting& Searching:** Insertion sort, Bubble sort, Selection sort, Quick sort, Merge sort, Sequential search, Binary search.	8

Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Seymour Lipschutz	Data Structures	Schaum‘s Outline Series	Tata Mc GrawHill.

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G. S. Baluja	Data Structures Through C++	4th Edition	Dhanpat Rai & Co
Ellis Horowitz& Sartaj Sahni	Fundamentals of Data Structures	1977	Pitman Publishing Limited
Yashwant Kanetkar	Data Structure Through 'C'	2nd Edition, 2017	BPB Publications

COURSE OUTCOMES: Students will be able to

CO1	Explore the basic knowledge of data structure used in computer systems and understand algorithms, Big O notation.
CO2	Impart knowledge about linear and non-linear data structures
CO3	Understand basic data structures such as arrays, linked lists, stacks and queues.
CO4	Understand graphs and trees
CO5	Apply Algorithm for solving problems like sorting and searching

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Operating System (Minor)	BAI-202	3	1	0	70	30	100

Course Objective	The objective of this course is to understand operating system and its components and their functionalities.

Units	Contents (*Theory*)	Hours /week
I	**Operating Systems:** Introduction of operating system, Evolution of Operating Systems, Operating system components, Operating-System Services, Types of operating systems: Batch, Multi-programmed, Multitasking, Multiprocessor, Real-time, Distributed, Parallel and Open source, Concept of System calls.	**8**
II	**Process management and Synchronization:** Processes, Process Scheduling algorithms, Inter process Communication, Threads, Thread issues, Critical-Section Problem and Semaphores.	**8**
III	**Deadlock:** Deadlock definition, Characterization, Deadlock prevention, Deadlock detection, Deadlock avoidance, Recovery from Deadlock, Banker's Algorithm.	**8**
IV	**Memory Management and Allocation Methods:** Address binding, Logical and Physical address space, Contiguous allocation methods – Static & Dynamic partitioned memory allocation, Concepts of fragmentation, Swapping, Non–contiguous memory allocation methods – Paging and its basic principle, Segmentation and its basic principle	**8**
V	**Virtual Memory:** Demand paging, Page fault, Page replacement algorithms – FIFO, LRU, OPT, Thrashing.	**8**

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
Galvin P., J. L. Abraham Silberschatz	Operating System Concepts	9th Edition, 1989	John, Wiley & Sons Company
Deitel, H.M.	An Introduction to Operating Systems	2004	Addison Wesley Publishing Co.
Tanenbaum, A. S.	Modern Operating System	4thEdition, 2016	Prentice Hall of India, Pvt. Ltd.,
D. M. Damdhere,	Operating Systems	4thEdition, 2003	Tata McGraw Hill

COURSE OUTCOMES: Students will be able to	
CO1	Understand the components and services of operating system.
CO2	Understand the importance of process and scheduling.
CO3	Understand the concept and importance of synchronization.
CO4	Identify deadlock and prevent it.
CO5	Understand memory management concept.

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Name of Paper& Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Environmental Studies (GEC)	BAI-203	3	1	0	70	30	100

Course Objective	To create awareness regarding Environmental issues and its effects on people, amongst students.

Units	Contents (Theory)	Hours /week
I	Environment and Ecology - Definition, Scope and importance. -Ecosystem- Concepts, components, structure & function, energy flow, food chain, ecological pyramids & types.	8
II	Environment and Population -Population growth, disparities between countries. -Population explosion, family welfare programme. -Environment and human health.	8
III	Natural Resources, Problems and Conservation: Role of mankind -Introduction, definition and significance. - Types of Natural Resources and Social Problems and management to them. (a) Food resources – World food problem. (b) Energy resources – increasing demand for energy. (c) Land resources – Land as resources.	8
IV	Social Issues and the Environment, From unsustainable to Sustainable development, Urban problem related to energy, Resettlement and rehabilitation of people, its problem and concerns. Climate change, global warming, Acid rain, Ozone layer depletion	8
V	Environmental movements , Ethics &Environment conservation laws : Role of Indian and other religions and cultures in Environmental conservation. - Chipko and Silent Valley. (a) Conservation laws for air and water pollution. (b) Wildlife conservation laws. (c) Role of information technology in protecting environment & health.	8

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Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
K.C. Agarwal	Environmental Biology	2001	Nidi Publ. Ltd. Bikaner
R.C. Brunner	Hazardous Waste Incineration	1989	McGraw Hill
Bharucha Erach	The Biodiversity of India	2006	Mapin Publishing Pvt. Ltd., Ahmedabad
H.P. Gleick	Water in crisis, Pacific Institute for Studies in Dev., Environment & Security	1993	Oxford Univ. Press

COURSE OUTCOMES: Students will be able to

CO 1	Develop Environmental concept, problems and solutions in them.
CO2	Understand the relation between the Environment, Population and Social Issues.
CO3	Understand Natural Resources and Social Problems, Management and Conservation laws.
CO4	Learn sustainable development and causes of global warming.
CO5	Understand laws of forest conversation

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Data Analysis using Python (Major)	BAI-204	3	1	0	70	30	100

Course Objective	To understand Python programming concepts including syntax, control flow, data structures, and file handling, while applying NumPy, pandas, and visualization libraries for effective data analysis.

Units	Contents (Theory)	Hours /week
I	**Python programming Basic:** Python interpreter, IPython Basics, Tab completion, Introspection, %run command, magic commands, matplotlib integration, python programming, language semantics, scalar types. Control flow.	8
II	**Data Structure, functions, files:** tuple, list, built-in sequence function, dict, set, functions, namescape, scope, local function, returning multiple values, functions are objects, lambda functions, error and exception handling, file and operation systems.	8
III	**NumPy: Array and vectorized computation:** Multidimensional array object. Creating ndarrays, arithmetic with numpy array, basic indexing and slicing, Boolean indexing, transposing array and swapping axes, universal functions, array-oriented programming with arrays, conditional logic as arrays operations, file input and output with array.	8
IV	**Pandas:** Pandas data structure, series, DataFrame, Index Object, Reindexing, dropping entities from an axis, indexing, selection and filtering, integer indexes, arithmetic and data alignment, function application and mapping, soring and ranking, correlation and covariance, unique values, values controls and membership, reading and writing data in text format.	8
V	**Visualization with Matplotlib:** Figures and subplots, colors, markers, line style, ticks, labels, legends, annotation and drawing on sublots, matplotlib configuration. Plotting with pandas and seaborn: line plots, bar plots, histogram, density plots, scatter and point plots, facet grids and categorical data.	8

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Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Wes McKinney	Python for Data Analysis	3rd	O'Reilly Media
Mark Lutz	Learning Python	5th	O'Reilly Media
Ivan Idris	NumPy Beginner's Guide	3rd	Packt Publishing
Luciano Ramalho	Fluent Python	2nd	O'Reilly Media
Allen B. Downey	Think Python	2nd	Green Tea Press

COURSE OUTCOMES: Students will be able to

CO1	Describe the Python interpreter, control flow, and basic syntax.
CO2	Use built-in data structures, functions, and manage file I/O and exceptions.
CO3	Implement data processing using NumPy arrays and functions.
CO4	Analyze and manipulate structured data using pandas.
CO5	Visualize data using matplotlib and seaborn plotting libraries.

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Basic Communication (AEC)	BAI-205	3	1	0	70	30	100

Course Objective	The objective of this course is to understand details of communication and various media of communication.

Units	Contents (*Theory*)	Hours /week
I	**Communication:** Meaning and process of communication, Importance of effective communication, Communication situation, Barriers to communication, Objectives of communication, Types of communication, Principles of communication, Essentials of effective communication.	8
II	**Media of Communication:** Written, Oral, Face-to-Face, Visual, Audio-Visual, Merits and demerits of written and oral communication.	8
III	**Communication Skills:** Developing communication skills, Listening, Speaking, Reading-Writing (oral & written), Body language, Utility of aids in Communication.	8
IV	**Spoken Skills:** Preparing for oral presentation, Conducting presentations, Debates, Seminar, Speeches, Lectures, Interviews, Telephonic Conversation, Negotiations, Group Discussions.	8
V	**Writing Skills:** Preparing of bio-data, Seminar, Paper, Bibliography, Official correspondence, Mechanics of writing, Formal & Informal writings, Letters, Paragraphing, Precise, Report writing, Technical reports, Length of written reports, Organizing reports, Writing technical reports, Creative writing, Common Errors in Language.	8

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Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Rajendra Pal and J. S. Korlahalli	Essentials of Business Communication	13th Edition	Sultan Chand & Sons Publishers, New Delhi
U. S. Rai & S. M. Rai	Business Communications	6thEdition	Himalaya Publishing House.
Menzal and D. H. Jones	Writing a technical Paper	1961	Mc Graw Hill
Scot Ober	Contemporary Business Communication	5thEdition	Wiley India

COURSE OUTCOMES: Students will be able to

CO1	Learn the basics of English language
CO2	Enhance their reading and writing skills.
CO3	Improve their vocabulary through comprehension.
CO4	Write different types of reports.
CO5	Give presentations

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Name of Paper & Category	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Programming Lab in Data Structures (Major)	BAI-206	2	-	70	30	100

Contents (Practical):

1. WAP to print the array elements in multiple dimensions.
2. WAP to sort array elements in ascending and descending order.
3. WAP to find maximum and minimum elements in array.
4. WAP to convert binary to decimal number in array.
5. WAP to convert decimal to binary number in array.
6. WAP to merge two sorted arrays into one sorted array.
7. WAP to perform basic operations (traversing, inserting, deleting, reversing and display) on array.
8. WAP to implement stacks of n elements using array and also perform push and pop operation.
9. WAP to implement simple queue of n element using array and also perform insertion and deletion operation.
10. WAP to implement circular queue of n element using array and also perform insertion and deletion operation.
11. WAP to implement singly linked and perform (traversing, inserting, deletion and Creating).
12. WAP to implement circular linked list and perform (traversing, inserting, deletion and Creating).
13. WAP to implement stack using linked list.
14. WAP to implement queue usinglinked list.

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Name of Paper & Category	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Lab in Data Analysis using Python (Minor)	BAI-207	2	-	70	30	100

Contents (Practical):

1. Write a Python program to find those numbers which are divisible by 7 and multiple of 5, between 1500 and 2700 (both included)?

2. Given the string 'Today is a sunny day.'
   - Write a code to get 'Today' and 'sunny'.
   - Obtain the last two letters.
   - Write the statement backwards.

3. Use list comprehension to obtain the square root of first 10 natural numbers.

4. How to filter words that contain at least 2 vowels from a series?
Ser = dearies([‘Apple’, ‘Orange’, ‘Plan’, ‘Python’, ‘Money’])

5. Write a code to find the first five rows and last five rows in dataset?

6. Using the list of tree names = ["Mango tree", "Coconut tree", "papaya tree", "Apple tree", "Banana tree", "Blackberry tree"] answer the below questions.
   - Step1: Using tree names remove items at indexes [2,3,4] by replacing with an empty list.
   - Step2: Add the items [Neem Tree, Peepal Tree] starting at index [3].
   - Step3: Write a function determine how many times a given letter "n" occurs in a string= (" Banana tree")

7. Write a program that asks the user to enter a string (consisting of any characters). Then create and print a dictionary from that string whose keys are the characters of the string and whose values are how many times those characters appear in the string.

Sample Input/Output:
Enter a string: AAABBCCCCC##**
Characters with its count: {'*': 2, 'C': 5, '#': 2, 'B': 2, 'A': 3}

8. Create a pandas series having values 4, 7, -5, 3, NAN.
   - Set their index as d, b, a, c, e.
   - The minimum of all values.
   - The maximum of all value.

- The values in ascending order.
- The values in descending order.

9. Create a 2D Numpy array from list of lists.

List1 = [[110, 102, 183],[140, 175, 106], [170, 195, 117], [192, 140, 195]]

- Find the minimum value along each of the rows.
- Replace all odd numbers in the array with -2.
- Swap row 1 and row 2 in the given array.

10. Write a code for the following:

- Check whether input is even number or odd number (take input from the user).
- Print whether a number is divisible by 9 and a multiple of 6 (take input from the user).
- Retrieve the third element in the given list.

num_list = [5, 3, 6, 1, 85, 23, 5, 13]

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Name of Paper& Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Disaster Management (AEC)	FC-111	-	-	-	-	-	-

Course Objective	The Programme has been framed with an intention to provide a general concept in the dimensions of disasters caused by nature beyond human control as well as the disasters and environmental hazards induced by human activities with emphasis on Natural disaster, Man-made disaster.

Units	Contents (*Theory*)	Hours /week
I	Introduction: Hazard, Risk, Vulnerability, Disaster; Disaster Management, Meaning, Nature Importance, Dimensions & Scope of Disaster Management, Disaster Management Cycle. National disaster management framework; financial arrangements for Disaster management, International Strategy for Disaster reduction	**2**
II	Natural Disasters: Meaning and nature of natural disasters, their types and effects , Hydrological Disasters - Flood, Flash flood , Drought, cloud burst, Geological Disasters- Earthquakes, Landslides, Avalanches, Volcanic eruptions, Mudflow Unit, Wind related- Cyclone, Storm, Storm surge, tidal waves, Heat and cold Waves, Climatic Change, Global warming, Sea Level rise, Ozone Depletion	**2**
III	Manmade Disaster: CBRN – Chemical disasters, biological disasters, radiological disasters, nuclear disasters Fire – building fire, coal fire, forest fire, Oil fire	**2**
IV	Types of Man – made Disasters: Accidents- road accidents, rail accidents, air accidents, sea accidents. Pollution and deforestation- air pollution, water pollution, deforestation, Industrial wastewater pollution, deforestation	**2**
V	Disaster Determinants: Factors affecting damage – types, scale population, social status, habitation pattern, physiology and climate. Factors affecting mitigation measures, prediction, preparation, communication, area and accessibility, population, physiology and climate	**2**

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
S. L. Goel	Disaster Administration and Management, Text & Case studies-	2nd edition	Deep and Deep Publications
G.K. Ghosh	Disaster Management	4thedition	A.P.H. Publishing Corporation
Vinod K Sharma-	Disaster Management	10th edition	IIPA
S.K.Singh, S.C. Kundu, Shobha Singh	Disaster Management	2nd edition	William Publications

COURSE OUTCOMES: Students will be able to	
CO1	Explain disaster management theory.
CO2	Prevent and control Public Health consequences of Disasters.
CO3	Know man-made disasters.
CO4	Classify man-made disasters.
CO5	Reveal unfounded myths about human behavior in disasters.