LNCT UNIVERSITY, BHOPAL

Programme:- BCA (CA) **Semester – V** **wef: July 2025**

Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Advance Data Structure (Major - core)	BCA-501	3	1	0	70	30	100

Course Objective	To develop proficiency in advanced data analysis techniques and tools for extracting meaningful insights from large and complex datasets.

Units	Contents (Theory)	Hours /week
I	Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problem types – Fundamentals of the Analysis Framework – Asymptotic Notations and Basic Efficiency Classes.	8
II	Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm – Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization.	8
III	Brute Force – Selection Sort and Bubble Sort – Sequential Search and Brute-force string matching – Divide and conquer – Merge sort – Quick Sort – Binary Search – Binary tree- Traversal and Related Properties – Decrease and Conquer – Insertion Sort.	8
IV	Transform and conquer – Presorting – Balanced Search trees – AVL Trees – Heaps and Heap sort –Dynamic Programming – Warshall's and Floyd's Algorithm.	8
V	Backtracking – n-Queen's Problem – Hamiltonian Circuit problem – Subset-Sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem.	8

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Text Books/ Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Anany Levitin	"Introduction to the Design and Analysis of Algorithm", Pearson Education Asia	2003	Pearson Education Asia
Sara Baase and Allen Van Gelder	"Computer Algorithms - Introduction to Design and Analysis"	2003	Pearson Education Asia
Aho A.V.,Hopcroft J.E. and Ullman J.D.	"The Design and Analysis Of Computer Algorithms"	2003	Pearson Education Asia

COURSE OUTCOMES: Students will be able to

CO 1	Argue the correctness of algorithms using inductive proofs and Analyze worst-case running times of algorithms using asymptotic analysis.
CO 2	Explain and apply the major algorithm design paradigms and major Computational Geometry algorithms and their analysis.
CO 3	Explain important algorithmic design paradigms and apply when an algorithmic design situation calls for it and analyze String matching algorithms.
CO 4	Explain the major graph algorithms and their analyses
CO 5	Solve problems on decrease and conquer Backtracking, Branch and Bound strategy.

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Artificial Intelligence and Expert System (Major-DSE)	BCA-502	3	1	0	70	30	100

Course Objective	Understanding the principles and applications of AI and developing expertise in designing and implementing expert systems.

Units	Contents (*Theory*)	Hours /week
I	**Introduction: AI Problems –** AI techniques – Criteria for success. Problems, Problem Spaces, State space search – Production System, Problem Characteristics – Issues in design of Search. **Heuristic Search techniques**: Generate and Test, Hill Climbing, Best-First, Constraint Satisfaction algorithm	**8**
II	**Knowledge representation issues:** Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.	**8**
III	**Using Predicate Logic:** Representing simple facts in logic – Representing Instance and Is a relationships, Computable functions and predicates, clauses, Resolution principle.	**8**
IV	**Game playing techniques** like minimax procedure, planning, Study of the block world problem in robotics, Introduction to natural language processing.	**8**
V	**Learning:** Rote Learning, explanation based learning, learning through advise, Expert systems, types of expert systems, applications of expert systems in society.	**8**

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Text Books/ Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
George F. Luger	Artificial Intelligence – Structures and Strategies for Complex Problem Solving	4th edition	Pearson Education,
Elaine Rich and Kevin Knight	"Artificial Intelligence"	2nd edition	Tata McGraw Hill.
Dan W. Patterson	"Introduction to Artificial Intelligence and Expert Systems"	4th edition	Prentice India
M.Sasikumar, S.Ramani	"Rule based Expert System"	2021	Narosa Publishing House

COURSE OUTCOMES: Students will be able to	
CO1	Developing a comprehensive understanding of AI problem-solving techniques.
CO2	Exploring various methods and approaches for representing knowledge in AI.
CO3	Mastering the principles and techniques of predicate logic for precise representation, reasoning, and inference in AI systems.
CO4	Developing a deep understanding of strategies and algorithms for effective game playing
CO5	Representing knowledge using rule-based systems to enable logical reasoning and decision-making in AI applications.

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Name of Paper & Category	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Computer Networks (SEC)	BCA-503	3	1	0	70	30	100

Course Objective	The course objective includes learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks.

Units	Contents (Theory)	Hours /week
I	Definition of a Computer Network, Networking, Advantages and disadvantages of Networks, Components of a computer network, Use of Computer networks, Networks for companies, Networks for people, Social Issues, Classification of networks, Based on transmission technology, Type of Networks: LAN, MAN, WAN, Wireless networks.	**8**
II	Networks Software, Protocol hierarchy, Design issues for the layers, Merits and De-merits of Layered Architecture, The OSI Reference Model, The TCP/IP Reference Model, Comparison of the OSI & the TCP/IP Reference Models, Transmission Medium, Guided & Unguided Transmission medium, Twisted pair, Coaxial cable, Optical fiber, Wireless transmission, Electromagnetic spectrum, Radio transmission,	**8**
III	Data Communications, Data transmission modes, Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous, Network topologies, Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison transmission, Standards – Ethernet, Token bus, Token ring, interfacing devices – bridge, hub, switch, router, gateway.	**8**
IV	Considerations when choosing a Topology, Switching, Circuit switching, Message switching, Packet switching, Implementation of packet switching, Multiplexing, FDM – Frequency division multiplexing, WDM – Wavelength division multiplexing, TDM – Time division multiplexing:	**8**
V	Modulations & demodulations, Comparison of channel access protocols, IEEE standards, Ethernets, Fast Ethernet, Gigabit Ethernet, IEEE 802.3 frame format, File transfer protocol (FTP), IP protocol (IPV4), UDP protocol.	**8**

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Text Books/ Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
Brijendra Singh	Data Communication and Computer Networks	2nd Edition	PHI
Behrouz A Forouzan	Data Communication and Computer networks	4th Edition	McGraw Hill
Achyut S Godbole	Data communications and networks,	2nd Edition	McGraw Hill

COURSE OUTCOMES: Students will be able to	
CO1	Characterize and understand computer networks from the view point of components and from the view point of services.
CO2	Display good understanding of the flow of protocols in general and a network protocol in particular.
CO3	Model a problem or situation in terms of layering concept and map it to the TCI/IP stack.
CO4	To understand how to send a huge number of signals at the same time
CO 5	Analysis and design of various modulation and demodulation techniques.

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Name of Paper & Category	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Programming Lab in Advance Data Structure (Major-core)	BCA-504	2	-	70	30	100

Contents (Practical):-

1. Sort any set of elements using Selection sort. Hence find the time and space complexities required to search an element.
2. Arrange ten students marks of ADA using Merge sort of Divide and conquer Technique.
3. Arrange age of n students by Implementing Quick sort using Divide and conquer Technique.
4. Arrange n students name using Insertion sort.
5. Implement fractional knapsack problem using greedy method.
6. Solve Dijkstra's single source shortest path algorithm.
7. Solve all pair shortest path using dynamic programming.
8. Implement 0/1 knapsack problem using dynamic method.
9. Solve longest common subsequence problem using dynamic method.
10. Solve Multiplication of two numbers using divide and conquer method.
11. Find minimum cost spanning tree of a any undirected graph using Prim's algorithm.
12. Find minimum cost spanning tree of a any undirected graph using Kruskal's algorithm.

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<table>
<tr><td rowspan="2">Name of Paper & Category</td><td rowspan="2">Paper Code</td><td colspan="5">Practical</td></tr>
<tr><td colspan="2">Credit</td><td colspan="3">Marks</td></tr>
<tr><td rowspan="2">Internship
(Field)</td><td rowspan="2">BCA-505</td><td>P</td><td>J</td><td>ESP</td><td>CAP</td><td>Total</td></tr>
<tr><td>-</td><td>10</td><td>200</td><td>100</td><td>300</td></tr>
<tr><td>Course Objective</td><td colspan="6">Internships are valuable learning experiences, so make the most of the opportunity to develop your skills, build professional connections, and explore the student’s career interests.</td></tr>
<tr><td colspan="7">Instructions for Internship:</td></tr>
<tr><td colspan="7">1. Set clear goals for your internship.
2. Research companies offering internships in your field of interest.
3. Prepare a well-written and tailored resume highlighting your relevant skills and experience.
4. Craft a compelling cover letter expressing your interest and explaining why you are a suitable candidate.
5. Submit your applications following the instructions provided by each company.
6. Prepare for interviews by researching common internship interview questions and practicing your responses.
7. Attend career fairs and networking events to connect with potential employers.
8. Follow up with a thank-you email after interviews or networking events.
9. Carefully review internship offers and consider if they align with your goals and learning objectives.
10. Accept the offer formally and clarify any remaining details.
11. Once the internship starts, maintain professionalism and a positive attitude.
12. Take initiative, ask questions, and seek feedback to maximize your learning experience.
13. Network with colleagues to build professional connections.
14. Make the most of the opportunity to gain practical experience in your field.</td></tr>
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