BANGALORE UNIVERSITY

SCHEME AND SYLLABUS

For the course

BACHELOR OF COMPUTER APPLICATIONS (BCA)

NEP2021 Scheme

Academic Year 2021-22 and onwards

Department of Computer Science and Applications
BANGALORE UNIVESITY, BANGALORE

BANGALORE UNIVERSITY

PROCEEDINGS OF THE MEETING OF THE BOARD OF STUDIES IN COMPUTER SCIENCE (UG AND PG), BANGALORE UNIVERSITY HELD ON 09-09-2022 THROUGH ONLINE MODE AT 6:30 PM

The following members were present :

1. Dr. Somashekara. M.T, Department of Computer Science, Bangalore University
2. Dr. Aziz Makandar, Department of Computer Science, Karnataka State Akkamahadevi Women's University, Vijayapura
3. Dr.. H.L. Shashi Rekha, Department of Computer Science, Mangalore University
4. Dr. Shivashankar S, Department of Computer Science, Karnatak University, Dharwad
5. Ms. L. Hamsaveni, Department of Computer Science, University of Mysore
6. Mr. Prakasha K Renukappa, Software Quality Principal Engineer, Dell Technologies, Bangalore
7. Mr. Dodde Gowda, Sales force, Torrey Pines, Bangalore
8. Ms. Suneetha V, MCA Department, Dayananda Sagar College of Arts, Science and Commerce, Bangalore
9. Dr.P.Felcy Judith, Computer Applications, T John College, Bangalore
10. Ms. B Nazia Hassan, Department of Computer Science, Government First Grade College, Vijayanagar ,Bengaluru
11. Mr. Chandrashekar, Department of Computer Science, Government First Grade College, Nelamangala
12. Mr. Sreenivasa H V, Department of Information Technology AIMS, Peenya , Bangalore
13. Dr. Rajesh B, Dr. B.R. Ambedkar School of Economics, Bangalore
14. Dr. Muralidhara B L, Department of Computer Science, Bangalore University

The chairperson presented the syllabus of the III and IV semester BCA (NEP), and B.Sc Computer Science (NEP) to the Committee. The Committee discussed the syllabus in detail, and approved the same.

The Chairperson thanked all members for their active participation.

10.09.2022

(MURALIDHARA B. L)
Chairperson, BoS in Computer Science
Coordinator / ಸಂಯೋಜಕರು
MCA Programme / ಎಂ.ಸಿ.ಎ. ಪ್ರೋಗ್ರಾಂ
Bangalore University / ಬೆಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾಲಯ
Jnanabharathi Campus / ಜ್ಞಾನಭಾರತಿ
Bengaluru / ಬೆಂಗಳೂರು - 560 056
India / ಭಾರತ

2

BCA SYLLABUS (NEP)

Semester	Course Code	Title of the Paper	Credits	Languages, Skill Enhancement (SEC), and Ability Enhancement Courses	Credits	Total Credits
I	CA-C1T	Discrete Structure	3	OE1: Open Elective	3	26
	CA-C2T	Problem solving Techniques	3	Language L1	3	
	CA-C3T	Data Structure	3	Language L2	3	
	CA-C4L	Problem solving Lab	2	SEC I : Office Management Tools	2	
	CA-C5L	Data Structure Lab	2	Physical Education	1	
				Health & Wellness	1	
II	CA-C6T	Computer Architecture	3	OE2: Open Elective	3	26
	CA-C7T	Object Oriented Programming using Java	3	Language L1	3	
	CA-C8T	Database Management System	3	Language L2	3	
	CA-C9L	Java Lab	2	Environmental studies	2	
	CA-C10L	Database Management System Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
III	CA-C11T	Operating Systems	3	OE3: Open Elective	3	26
	CA-C12T	Computer Networks	3	Language L1	3	
	CA-C13T	Python Programming	3	Language L2	3	
	CA-C14L	Computer Networks Lab	2	SEC II : Computer Assembly and Repair	2	
	CA-C15L	Python Programming Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
IV	CA-C16T	Software Engineering	3	OE4: Open Elective	3	26
	CA-C17T	Design and Analysis of Algorithm	3	Language L1	3	
	CA-C18T	Internet Technologies	3	Language L2	3	
	CA-C19L	Design and Analysis of Algorithm Lab	2	The Constitution of India	2	
	CA-C20L	Internet Technologies Lab	2	Physical Education	1	
				NCC/NSS/CL/R&R	1	
V	CA-C21T	Artificial Intelligence	3	CA-V1 Vocation Course I : Quantitative	3	23
	CA-C22T	Data Analytics	3	CA-E1 Elective I : a. Data Mining b. Computer Graphics	3	
	CA-C23T	Web Programming	3	SEC III : Cyber Crime, Cyber Law, and Intellectual Property Right	2	
	CA-C24L	Data Analytics Lab	2	Physical Education	1	

Semester	Course Code	Title of the Paper	Credits	Languages, Skill Enhancement (SEC), and Ability Enhancement Courses	Credits	Total Credits
	CA-C25L	Web Programming Lab	2	NCC/NSS/CL/R&R	1	
Semester	**Course Code**	**Title of the Paper**	**Credits**	**Languages, Skill Enhancement (SEC), and Ability Enhancement Courses**	**Credits**	**Total Credits**
VI	CA-C26T	Theory of Computation	3	CA-V2 Vocation Course II : Electronic Content Design	3	23
	CA-C27T	Machine Learning	3	CA-E2 Elective II : a. Operations Research b. Software Testing	3	
	CA-C28T	Mobile Application Development	3	Professional Communication	2	
	CA-C29L	Machine Learning Lab	2	Physical Education	1	
	CA-C30L	Mobile Application Development Lab	2	NCC/NSS/CL/R&R	1	
VII	CA-C31T	Cloud Computing	3	CA-V3 Vocation Course III : Technical Writing	3	21
	CA-C32T	Internet of Things	3	CA-E3 Elective III : a. Modeling and Simulation b. Compiler Design	3	
	CA-C33T	Internship	2	Research Methodology	3	
	CA-C34L	Cloud Computing Lab	2			
	CA-C35L	Internet of Things Lab	2			
VIII	CA-C36T	Block Chain Technologies	3	CA-V4 Vocation Course IV : Project Management	3	20
	CA-C37T	Cryptography and System Security	3	CA-E4 Elective IV : a. Human Computer Interface b. Parallel Algorithms	3	
	CA-C38T	Block Chain Technologies Lab	2	Research Project	6	

4

CA-C11T: OPERATING SYSTEMS

Total Teaching Hours: 48 No. of Hours / Week: 03

UNIT - I [12 Hours]

Introduction: Computer System Organization, Architecture, Structure, Operations, Process Management, Memory Management, Storage Management, Kernel Data Structures, Computing Environments. Operating System Structures: Services, System Calls, Types, Operating System Structure, System Boot. Processes: Process Concept, Scheduling, Operations, Interprocess Communication. Multithreaded Programming: Multicore Programming, Multithreading Models.

UNIT –II [12 Hours]

Process Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronisation Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples. Process Scheduling: Criteria, Scheduling Algorithms, Multi-Processor Scheduling, Real-time CPU Scheduling. Deadlocks: System model, Characterization, Methods for handling deadlocks, Deadlock Prevention, Avoidance, Detection and Recovery from deadlock.

UNIT – III [12 Hours]

Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory Management: Demand Paging; Copy-on-Write, Page Replacement; Allocation of Frames; Thrashing, Memory-Mapped Files, Allocating Kernel Memory. File System: File Concept, Access Methods, Directory and Disk Structure, Protection. File-System Implementation: Structure

UNIT - IV [12 Hours]

File-System and Directory Implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery. Mass-Storage Structure: Overview, Disk Scheduling, Disk Management. Distributed Systems: Advantages, Types of Network- based OS, Robustness, Design Issues, Distributed File Systems. Case Studies: The Linux System, Windows 10 (Process, Memory, storage management).

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Concepts, 9thEdition, 2016 India, Wiley.

Reference Books:

1. William Stallings, "Operating Systems-Internals and Design Principles", Pearson, IX Edition, 2018
2. D M Dhamdhere: Operating Systems – A Concept Based Approach, III Edition, Tata McGraw – Hill, 2015.
3. Harvey M Deitel, Paul J Deitel, Dr Choffnes,"Operating Systems", Pearson Education Limited (Publisher), 3rd Edition, 2013.
4. J. Archer Harris, John Cordani, " Operating Systems", Schaum's Outline, Indian Edition, Mc Graw Hill Education (India), First Edition
5. Gary Nutt, Nabendu Chaki, Sarmistha Neog, "Operating Systems" Pearson Education Limited, 3rd Edition, 2016.

CA-C12T: COMPUTER NETWORKS

Total Teaching Hours : 48 No. of Hours / Week: 03

UNIT - I [12 Hours]

Introduction: Data Communications, Networks, Network Types, Internet History, Network Models: Protocol Layering, The OSI Model, TCP/IP Protocol Suite, Introduction to Physical Layer: Transmission Impairments, Data Rate Limits, Performance, Introduction to Data-Link- Layer: Link-Layer Addressing, Error Detection and Correction: Block Coding, Cyclic Codes, Checksum

UNIT - II [12 Hours]

Data Link Control: Data-Link Layer Protocols, HDLC, Point-To-Point (PPP), Media Access Control (MAC): ALOHA, CSMA, CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, TDMA, CDMA

UNIT - III [12 Hours]

Introduction to Network Layer: Network-Layer Services, Packet Switching, Network-Layer Performance, IPV4 Addresses, Network Layer Protocols: Internet Protocol (IP), ICMPv4, Mobile IP, Unicast Routing: Routing Algorithms, Unicast Routing Protocols, Next Generation IP: IPv6 Addressing

UNIT - IV [12 Hours]

Introduction to Transport Layer: Introduction, Transport-Layer Protocols, Transport-Layer Protocols: User Datagram Protocol, Transmission Control Protocol: TCP Services, TCP Features, Segment, A TCP Connection, TCP Congestion Control, Flow Control, Error Control, Application Layer: WWW, E-MAIL, Domain Name System (DNS), Quality of Service: Flow Control To Improves QoS, Integrated Services

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw HillEducation, 2013.

Reference Books:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Prentice Hall,2011.
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks A System Approach", 5th Edition, MKP, 2012.
3. James F. Kurose , Keith W. Ross, " Computer Networking, A Top-Down Approach", 5thEdition, Pearson, 2012.

Web Resources:

1. https://www.geeksforgeeks.org/computer-network-tutorials/
2. https://codescracker.com/networking/
3. https://youtube.com/playlist?list=PLxCzCOWd7aiGFBD2-2joCpWOLUrDLvVV_

6

CA-C13T: PYTHON PROGRAMMING

Total Teaching Hours : 48 No. of Hours / week: 03

UNIT - I [12 Hours]

Parts Python Programming Language: Python Interpreter/Shell, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data types, Indentation, Comments, Reading Input, Print Output, Type Conversions, The type() function and Is operator, Dynamic and Strongly Typed Language.**Control Flow Statements:**The if Decision Control Flow Statement, The if…else DecisionControl FlowStatement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, TheforLoop, The continue and break Statements. **Functions**: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Life time of Variables, Default Parameters, Command Line Arguments. **Strings:** Creating and Storing Strings, Basic String operations,Accessing Characters in StringbyIndexNumber, String Slicing and Joining, String methods

UNIT - II [12 Hours]

Lists: Creating Lists, BasicListOperations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, ThedelStatement, **Dictionaries:** Creating Dictionary, Accessing and modifying key:value pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary methods, ThedelStatement**. Tuples and Sets:** Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples,Built-In Functions Used onTuples, Relations between Tuples and Lists, Relations between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Frozenset.

UNIT - III [12 Hours]

Files: Types of files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files,The Pickle module, Reading and writing CSV files, **Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data attributes, Encapsulation, Inheritance, The Polymorphism.

UNIT - IV [12 Hours]

D**ata Visualization:** Generating Data-Installing Matplotlib, Plotting a Simple Line Graph, Random Walks, Rolling Dice with Plotly. Downloading Data- The CSV File Format, Mapping Global Data Sets: JSON Format, **Working with APIs:** Using a Web API, Visualizing Repositories Using Plotly.

Text Books:

1. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372. [Unit I&II- 2,3,4,5,6,7,8,9 Unit III-11,12].
2. Eric Matthes, "Python Crash Course- A Hands-On, Project-Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.[Unit III-15, Unit IV-16]
3. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education, 2016. [Unit IV- 2,5].

Reference Books:

1. Kamthane, A. N., & Kamthane, A.A. , "Programming and Problem Solving with Python", McGraw Hill Education, 2017.
2. Mark Lutz, "Learning Python", 5th edition, Orelly Publication, 2013, ISBN 978- 1449355739.
3. Ljubomir Perkovic, "Introduction to Computing Using Python- An Application Development Focus",Wiley,2012.

7

CA-C14L: COMPUTER NETWORKS LAB

1. Execute the following commands:
   arp, ipconfig, hostname, netdiag, netstat, nslookup, pathping, ping route, tracert
2. Study of different types of network cables.
3. Practically implement the cross-wired cable and straight wired cable using crimping tool.
4. Study of network IP address configuration: (Classification of address, static and dynamic address)
5. Study of network IP address configuration: (IPv4 and IPv6 , Subnet, Supernet)
6. Study of network devices: (Switch, Router, Bridge)
7. Configure and Connect the computer in LAN.
8. Block th e website using "Windows Defender Firewall" in windows 10.
9. Share the folder in a system, and access the files of that folder from other system using IP address .
10. Share the printer in Network, and take print from other PC.
11. Configuration of wifi hotspot, and connect other devices (mobile / laptop).
12. Configuration of switches.
13. Configuration of I/O box fixing.
14. Making your own patch cord.
15. Configuration of VLAN using Packet Tracer/ GNS3
16. Configuration of VPN using Packet Tracer/ GNS3

References:

1. Paul Browning, "101 CompTIA Networs+ LABS", 2018, Reality Press Ltd.

Web References:

1. youtube.com/watch?v=rurs7cdT5cc
2. https://www.youtube.com/watch?v=_IOZ8_cPgu8
3. https://www.alphr.com/block-websites-windows/

CA-C15L: PYTHON PROGRAMMING LAB

1. Write a program to demonstrate basic data type in python
2. Create a list and perform the following methods
   1) insert() 2) remove() 3) append()
   4) len() 5) pop() 6) clear()
3. Create a tuple and perform the following methods
   1) Add items 2) len() 3) check for item in tuple 4)Access items
4. Create a dictionary and apply the following methods
   1) Print the dictionary items 2) access items 3) use get()
   4)change values 5) use len()
5. Write a program to create a menu with the following options
   1. TO PERFORM ADDITITON 2. TO PERFORM SUBTRACTION
   3. TO PERFORM MULTIPICATION 4. TO PERFORM DIVISION
   Accepts users input and perform the operation accordingly. Use functions with arguments.
6. Write a python program to print a number is positive/negative using if-else.
7. Write a program for filter() to filter only even numbers from a given list.
8. Write a python program to print date, time for today and now
9. Write a python program to add some days to your present date and print the date added.
10. Write a program to count the numbers of characters in the string and store them in a dictionary data structure
11. Write a program to count frequency of characters in a given file.
12. Using a numpy module create an array and check the following: 1. Type of array 2. Axes of array 3. Shape of array 4. Type of elements in array
13. Write a python program to concatenate the dataframes with two different objects
14. Write a python code to read a csv file using pandas module and print the first and last five lines of a file.
15. Write a python program which accepts the radius of a circle from user and computes the area (use math module)
16. Use the following data (load it as CSV file) for this exercise. Read this file using Pandas or NumPy or using in-built matplotlib function.

Months	Pen	Book	Marker	Chair	Table	Pen stand	Total units	Total profit
1	2500	1500	5200	9200	1200	1500	21100	211000
2	2630	1200	5100	6100	2100	1200	18330	183300
3	2140	1340	4550	9550	3550	1340	22470	224700
4	3400	1130	5870	8870	1870	1130	22270	222700
5	3600	1740	4560	7760	1560	1740	20960	209600
6	2760	1555	4890	7490	1890	1555	20140	201400
7	2980	1120	4780	8980	1780	1120	29550	295500
8	3700	1400	5860	9960	2860	1400	36140	361400
9	3540	1780	6100	8100	2100	1780	23400	234000
10	1990	1890	8300	10300	2300	1890	26670	266700
11	2340	2100	7300	13300	2400	2100	41280	412800
12	2900	1760	7400	14400	1800	1760	30020	300200

a. Get total profit of all months and show line plot with the following Style properties
Generated line plot must include following Style properties: –

9

- Line Style dotted and Line-color should be blue
- Show legend at the lower right location.
- X label name = Months
- Y label name = Sold units
- Line width should be 4

b. Display the number of units sold per month for each product using multiline plots. (i.e., Separate Plotline for each product.

c. Read chair and table product sales data and show it using the bar chart.
   - The bar chart should display the number of units sold per month for each product. Add a separate bar for each product in the same chart.

d. Read all product sales data and show it using the stack plot

10

SEC II: COMPUTER ASSEMBLY

1. Demonstration of Hardware peripherals: CPU, RAM, SMPS, Motherboard, NIC card, Processor, Processor cooling fan, PCI card, HDD.
2. Demonstration of various ports: CPU , VGA port, PS/2 (keyboard, mouse) ,USB, LAN, Speaker, Audio.
3. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/ 64 bit)
4. Identify and Troubleshoot the problems of RAM (beep sound with blue screen), SMPS and motherboard (CPU is not switched ON)
5. Configure BIOS settings- disable and enable USB and LAN.
6. Identify, how to recover the hidden files from corrupted pendrive using command.
7. Recover the contents from crashed Hard Disk using Disk Drill software.
8. Install Operating System – Windows family (Windows 7/ Windows 10) and also make partitions.
9. Install Operating System - Unix family (Linux/UBUNTU)
10. Install Application software – python 3.8, MS- Office 2010/2013, MySQL, TOAD, Openoffice, etc.,
11. Install any one of the antivirus software (Avast, Kaspersky, etc.,) and observe the variations before and after installation.
12. Add new Hardware device (keyboard, mouse, Speaker, Microphone)
13. Connect the LCD Projector with Laptop / CPU.
14. Adding additional RAM to the system.(expanding RAM size).
15. Graphic Card insertion.
16. Assemble and Disassemble Desktop System.

References:

1. Dan Gookin ,Troubleshooting & Maintaining Your PC ALL-IN-ONE, 3rd Edition,2017, John Wiley & Sons.
2. Mike Meyers, Scott Jernigan, Dan Lachance, "CompTIA Fundamentals + Exam Guide (All-in-One), 2nd Edition, 2019, Mc Graw Hill Education.

Web References:

1. https://www.youtube.com/watch?v=ItxwyMR0SnY&list=PLeH4ngtDM7eE-1_mdWuXWyZrI_FMHnyJ0&index=5
2. https://www.cleverfiles.com/howto/crashed-hard-drive-recovery.html

11

CA-C16T : SOFTWARE ENGINEERING

Total Teaching Hours: 48 **No. of Hours / Week: 03**

UNIT – I [12 Hours]

Introduction to Software Engineering: Evolution and impact of Software engineering, software life cycle models: Waterfall, prototyping, Evolutionary, and Spiral models. Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification.

Agile development: Agile, Agility and cost of change; Agile Process, Extreme programming; Other agile process models.

UNIT - II [12 Hours]

Formal Modeling and verification: The cleanroom strategy; Functional specification; Cleanroom design; Cleanroom testing; Formal methods: Concepts; Applying mathematical notation for formal specification; Formal specification languages. Software Project Management: The management spectrum; The management of people, product, process and project; The W5HH Principle; Critical practices. **Software testing strategies**: A Strategic Approach to Software Testing, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, System Testing, Software Testing Fundamentals, White-Box Testing, Black-Box Testing

UNIT - III [12 Hours]

Software Project Scheduling: Basic concepts and principles of project scheduling; Defining task set and task network; Scheduling; Earned value analysis. Risk Management: Reactive versus proactive strategies; Software risks; risk identification; Risk projection; Risk refinement; Risk mitigation, monitoring and management; The RMMM plan. Maintenance and Reengineering: Software maintenance; Software supportability; Reengineering; Business process reengineering; Software reengineering; Reverse engineering; Restructuring; Forward engineering; The economics of reengineering.

UNIT - IV [12 Hours]

Software Process Improvement (SPI): Approaches to SPI; Maturity models; The SPI process; The CMMI; The People CMM; Other SPI frameworks: SPICE, Bootstrap, PSP and TSP, ISO; SPI return on investment. Software Configuration Management (SCM): Basic concepts; SCM repository; The SCM process; Configuration management for web applications; SCM standards.

Text Books:

1. Fundamentals of Software Engineering by Rajib Mall, – PHI-3rd Edition, 2009.
2. Roger S. Pressman, "*Software Engineering*: A Practitioner's Approach", Alternate Edition, 7th Edition, McGraw Hill, 2010.

Reference Books:

1. Software Engineering, by Ian Sommerville, Pearson Education Inc., New Delhi, (2009).
2. Software Engineering: A Practitioner"s Approach", by Roger S. Pressman, McGraw-Hill. (2005).
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House Pvt Ltd, Darya Ganj, New Delhi 110002

12

CA-C17T : THE DESIGN AND ANALYSIS OF ALGORITHMS

Total Teaching Hours: 48 **No. of Hours / Week: 03**

UNIT - I [12 Hours]

Introduction: Algorithms, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures. Fundamentals of the Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms, Empirical Analysis of Algorithms

UNIT – II [12 Hours]

Brute Force Method: Selection Sort and Bubble Sort, Sequential Search, Brute-Force String Matching, Exhaustive Search, Depth-First Search and Breadth-First Search. Decrease and Conquer: Insertion Sort, Topological Sorting, Algorithms for Generating Combinatorial Objects, Decrease-by-a-Constant-Factor Algorithms. Divide and Conquer: Merge Sort, Quick Sort, Binary Tree Traversals and Related Properties, Strassen's Matrix Multiplication.

UNIT - III [12 Hours]

Space and Time Tradeoffs: Sorting by Counting, Input Enhancement in String Matching, Hashing. Dynamic programming: Binomial Coefficient, Principle of Optimality, Optimal Binary Search Trees, Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms. Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

UNIT – IV [12 Hours]

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP Complete Problems .Coping with the Limitations of Algorithm Power: Back Tracking: n Queens problem, Hamiltonian Circuit Problem, Subset-Sum Problem. Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesman Problem.

Textbooks:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson, 2012.
2. Horowitz, Sahni, Rajasekaran, "Fundamentals of Computer Algorithms", 2/e, Universities Press, 2007.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, The MIT Press, 2009.
2. A.V. Aho, J.E. Hopcroft, J.D. Ullmann, "The design and analysis of Computer Algorithms", Addison Wesley Boston, 1983.
3. Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Education, 2006.

13

CA-C18T : INTERNET TECHNOLOGIES

Total Teaching Hours : 48 No. of Hours / Week: 03

UNIT - I [12 Hours]

INTERconnected NETwork: Internet**:** The Giant Wide Area Network, Communicating over the Internet, Accessing the Internet, Internet Organisations, Cyber Ethics, **Internet Applications:** Internet services, Electronic Mail(E-Mail), File Transfer, Real-Time User Communication, Remote Login,
Usenet, **World Wide Web**: The Web, The Working Web, Web Terminology, Web Architecture, World Wide Web Challenges.

UNIT - II [12 Hours]

Hypertext Transfer Protocol (HTTP):HTTP, HTTP Version, HTTP connections, HTTP Communication, Hypertext Transfer Protocol Secure, Hypertext Transfer Protocol State Retention: Cookies, Hypertext Transfer Protocol Cache**, Evolution of Web:** The Generations of Web, Web 1.0, Web 2.0, Web 3.0, Big Data: A Special Discussion, **Web IR: Information Retrieval on the Web:** Web Information Retrieval, Web Information Retrieval Tools, Web Information Retrieval Architecture (Search Engine Architecture), Web Information Retrieval Performance Metrics, Web Information Retrieval Models, Google PageRank.

UNIT - III [12 Hours]

Web Development Basics: Elements of Web Development , Client-Side and Server-Side Scripting, Model-View-Controller Architecture for Web Application Development**, Client-Side Technologies:** HTML: Hypertext Markup Language, CSS: Cascading Style Sheets, JavaScript, Bootstrap Framework, AngularJS Framework, **Server-Side Technologies:** Server-Side Scripting, Personal Home Pages, Node.js: Server-Side JavaScript.

UNIT - IV [12 Hours]

Web Application Frameworks: Django ,Ruby on Rails**.Web Databases:** Web Database, Structured Query Language: Relational Databases, NoSQL Databases: Non-relational and Distributed Data, Understanding Popular Databases. **Research Trends on the Web:** Contextual Information Retrieval, Web Mining.

TEXT BOOKS:

1. Akshi Kumar, "Web Technology: Theory and Practice", CRC Press, 2019.

REFERENCE BOOKS :

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI, Learning, Delhi, 2013.
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011.

14

CA-C19L : Algorithms Lab

1. Write a program to implement linear search algorithm Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.

2. Write a program to implement binary search algorithm. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.

3. Write a program to solve towers of honai problem and execute it for different number of disks

4. Write a Program to Sort a given set of numbers using selection sort algorithm. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

5. Write a program to find the value of a^n (where a and n are integers) using both brute-force based algorithm and divide and conquer based algorithm

6. Write a Program to Sort a given set of elements using quick sort algorithm. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

7. Write a Program to find the binomial co-efficient C(n, k), [where n and k are integers and n > k] using brute force based algorithm and also dynamic programming based algorithm

8. Write a Program to implement Floyd's algorithm and find the lengths of the shortest paths from every pairs of vertices in a given weighted graph

9. Write a program to evaluate a polynomial using brute-force based algorithm and using Horner's rule and compare their performances

10. Write a Program to solve the string matching problem using Boyer-Moore approach.

11. Write a Program to solve the string matching problem using KMP algorithm

12. Write a program to implement BFS traversal algorithm

13. Write a program to find the minimum spanning tree of a given graph using Prim's algorithm

14. Write a Program to obtain the topological ordering of vertices in a given digraph. Compute the transitive closure of a given directed graph using Warshall's algorithm.

15. Write a Program to Find a subset of a given set S = {s1,s2, ,sn} of n positive integers whose ..... sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6} and {1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

15

CA-C20L :INTERNET TECHNOLOGIES LAB

1. Demonstrate E-Mail working (Sending ,Receiving, forward)
2. How to create, organize meeting in Zoom/ GoogleMeet
3. Create a form by using various attributes of the input tags (text box, multiline textbox, option button, check box)
4. Create a simple HTML page by using some of the basic tags (hyperlink, marquee, image)
5. Create a web page with multiple types of style sheet used in a single page
6. Write a CGI sample program to send output back to the user
7. Create Time-Table using table tag
8. Creation of Frames in browser window using HTML.
9. Write a java script program to create dialogue boxes using alert, confirm and prompt methods
10. Write a java script program on Form Validations.
11. Write a java script program to perform four arithmetic operations: Addition, Subtraction, Multiplication and Division on two numbers.
12. Create a web site of our College.

16