ಬೆಂಗಳೂರು ನಗರ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ

BENGALURU CITY UNIVERSITY

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Syllabus of Third and Fourth Semesters for

B. Voc. Information Technology

(CBCS Scheme)

Under
State Education Policy

Effective from the Academic Year
2025 – 2026

Board of Studies in Computer Science for UG

No : BCU/BoS/Comp.Sci. & Appln.(PG & UG)/389/2024-25 dated:19.02.2025

1	Prof. Ramesh B Kudenatti Department of Mathematics Bengaluru City University,Bengaluru-560056	Chairperson
2	Prof. Guru D S Department of Studies in Computer Science University of Mysore, Mysore-570006	Member
3	Prof. Aziz Makandar Department of Computer Science Karnataka State Akkamahadevi Women University, Jnanashakti Campus, Vijayapura-586109	Member
4	Prof. Suneetha Department of Computer Science, Karnataka State Open University, Muktha Gangothri, Mysuru-570006	Member
5	Prof. Veena R Department of MCA, Seshadripuram College, Seshadripuram, Bengaluru-560020	Member
6	Prof. Kiran Kumar M N Department of Computer Applications, BMS College of Commerce and Management, Bengaluru-560004	Member
7	Prof. Latha B Department of Computer Science Vijaya College, R V Road, Basavanagudi, Bengaluru-560004	Member
8	Prof. R Shanthi Krishna Department of Computer Applications, SSMRV College, Jayanagar, Bengaluru-560041	Member
9	Prof. Roopa H R Department of Computer Applications, Seshadripuram Institute of Commerce and Management, Seshadripuram, Bengaluru-560020	Member
10	Sri Seby Kallarakkal CEO-Nabler Web Solutions, Bengaluru-560052	Member

Name of the Degree Program : **B.Voc. Information Technology - B. Voc**
Discipline Course : **Computer Science**
Starting Year of Implementation : **2024-25 (I and II Semesters)**
2025-26 (III & IV Semesters)
2026-27 (V & VI Semesters)

Programme Outcomes (PO)

PO 1	Equip students with domain-specific skills integrated with foundational knowledge, enabling them to pursue careers in software development, system administration, and related IT fields.
PO 2	Provide seamless higher education opportunities for students from vocational or general streams, encouraging continued learning without age or background limitations.
PO 3	Train students to meet the technical and soft skill requirements of local, national, and global employers, thereby improving their job-readiness across various sectors.
PO 4	Ensure that students are equipped with sufficient knowledge and hands-on training to be industry-ready, supporting both employment and higher education pathways.
PO 5	Develop expertise in various programming languages essential for application development.
PO 6	Impart a thorough understanding of computer network models, network protocols and connectivity, enabling students to troubleshoot and build basic networks.
PO 7	Prepare students to independently build end-to-end software applications using modern tools and frameworks relevant to industry demands.
PO 8	Encourage entrepreneurial thinking through real-world project work, lab sessions, and internships, fostering the ability to conceptualize, design, and deploy technology solutions.
PO 9	Instill a sense of ethical responsibility in computing practices, emphasizing data security, privacy, environmental sustainability, and inclusiveness in software design.
PO 10	Build professional communication, interpersonal, and teamwork skills required for collaborative software development and workplace success.

ASSESSMENT

Weightage for the Assessments (in percentage)

Type of Course	Formative Assessment/ I.A.	Summative Assessment (S.A.)
Theory	20%	80 %
Practical	20%	80 %

Detailed Structure for B. Voc.- IT Course

Semester	Course Code	Paper Title	Teaching Hours/ Week	Marks		Duration of Exam in Hours	Credits
				Exam	IA		
I	24BVOC11	Discrete Structure	3	80	20	03	3
	24BVOC12	Problem Solving Technique	3	80	20	03	3
	24BVOC13	Computer Architecture	3	80	20	03	3
	24BVOC11P	Problem Solving Technique Lab	4	40	10	03	2
	24BVOC12P	Computer Architecture Lab	4	40	10	03	2
	24BVOC13P	Office Automation Tools	4	40	10	03	2
	24BVOCL11	Language L1	4	80	20	03	3
	24BVOCL12	Language L2	4	80	20	03	3
	24BVOCCV1	Constitutional Values-I	2	40	10	1.5	2
Total Credits							**23**
II	24BVOC21	Data Structures	3	80	20	03	3
	24BVOC22	Object Oriented Programming Using JAVA	3	80	20	03	3
	24BVOC23	Operating System	3	80	20	03	4
	24BVOC21P	Data Structures Lab	4	40	10	03	2
	24BVOC22P	Java Lab	4	40	10	03	2
	24BVOC23P	LINUX and Shell Programming Lab	4	40	10	03	2
	24BVOCL21	Language 1	4	80	20	03	3
	24BVOCL22	Language 2	4	80	20	03	3
	24BVOCCV2	Constitutional Values-II	2	40	10	1.5	2
	24BVOCES	Environmental Studies	2	40	10	1.5	2
Total Credits							**26**

Semester	Course Code	Paper Title	Teaching Hours/ Week	Marks		Duration of Exam in Hours	Credits
				Exam	IA		
III	24BVOC31	Database Management System	4	80	20	3	4
	24BVOC32	Fundamentals of Computer Networks	4	80	20	3	4
	24BVOC33	Introduction to Python	4	80	20	3	4
	24BVOC34	Cyber Security	2	40	10	1.5	2
	24BVOC31P	Database Management System Lab	3	40	10	3	2
	24BVOC32P	Computer Networks Lab	3	40	10	3	2
	24BVOC33P	Python Lab	3	40	10	3	2
	24BVOCL31	Language 1	4	80	20	3	3
	24BVOCL32	Language 2	4	80	20	3	3
Total Credits							**26**
IV	24BVOC41	Basics of Web Programming	4	80	20	3	3
	24BVOC42	Design and Analysis of Algorithms	4	80	20	3	4
	24BVOC43	Artificial Intelligence	4	80	20	3	3
	24BVOC44	Ethical Hacking	2	40	10	1.5	2
	24BVOC41P	Web Programming Lab	3	40	10	3	2
	24BVOC42P	Design and Analysis of Algorithms Lab	3	40	10	3	2
	24BVOC43P	Artificial Intelligence Lab	3	40	10	3	2
	24BVOCSE1	Probability and Statistics	2	40	10	1.5	2
	24BVOCL41	Language 1	4	80	20	3	3
	24BVOCL42	Language 2	4	80	20	3	3
Total Credits							**26**

Semester	Course Code	Paper Title	Teaching Hours/ Week	Marks		Duration of Exam in Hours	Credits
				Exam	IA		
V	24BVOC51	Advanced Web Programming	4	80	20	3	3
	24BVOC52	Software Engineering	4	80	20	3	3
	24BVOC53	Operation Research	4	80	20	3	3
	24BVOC54	Introduction to Machine Learning	4	80	20	3	3
	24BVOC51P	Advanced Web Programming Lab	3	40	10	3	2
	24BVOC52P	Machine Learning Lab	3	40	10	3	2
	24BVOCSE2	Soft Skills	2	40	10	1.5	2
	24BVOC5PJ	Project	8	120	30	3	6
Total Credits							**24**
VI	24BVOC61	Fundamentals of Data Analytics	4	80	20	3	3
	24BVOC62	Data Mining	4	80	20	3	3
	24BVOC63	Mobile Computing	4	80	20	3	3
	24BVOC64	Cloud Computing	4	80	20	3	3
	24BVOC61P	Data Analytics Lab	3	40	10	3	2
	24BVOC62P	Data Mining Lab	3	40	10	3	2
	24BVOC6IN	Internship		80	20	3	4
Total Credits							**20**
Overall Course Credits							**144**

Detailed Syllabus for B. Voc. Information Technology

SEMESTER – III

Theory	24BVOC31: Database Management System
Teaching Hours: 04 Hours/Week	Credits: 04
Duration of Exam: 03 Hours	Maximum Marks: 100 (Exam 80 + IA 20)

Course Outcomes

CO1.	Understand the fundamentals of database systems**,** including data models, DBMS architecture, and E-R modelling concepts such as entities, relationships, keys, and inheritance.
CO2.	Analyze and implement file organization and indexing techniques**,** including B-trees, B++ trees, and various hashing methods to improve data access and performance.
CO3.	Apply relational model principles, perform relational algebra operations, write SQL queries, and convert EER/ER models into normalized relational database schemas.
CO4.	Demonstrate knowledge of database normalization, transaction management, concurrency control**,** and implement basic database security and recovery mechanisms.

UNIT-I: Introduction **14 Hours**

Characteristics of database approach, data models, DBMS architecture and data independence. E-R Modeling: Entity types, Entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, Sub classes; Super classes, inheritance, specialization and generalization.

UNIT-II: File Organization **14 Hours**

Indexed sequential access files; implementation using B & B++ trees, hashing, hashing functions, collision resolution, extendible hashing, dynamic hashing approach implementation and performance.

UNIT-III: Relational Data Model **14 Hours**

Relational model concepts, relational constraints, relational algebra SQL: SQL queries, programming using SQL. EER and ER to relational mapping**:** Data base design using EER to relational language.

UNIT-IV: Data Normalization **14 Hours**

Functional Dependencies, Normal forms 1NF, 2NF 3NF and BCNF, Concurrency Control: Transaction processing, locking techniques and associated, database recovery, security and authorization. Recovery Techniques, Database Security.

Text Books:

1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 4th Edition, McGraw Hill, 1997.
2. A.K. Majumdar, P. Bhattacharya, "Database Management Systems", TMH, 1996.
3. Bipin Desai, "An Introduction to database systems", Galgotia Publications, 1991
4. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan

Theory	24BVOC32: Fundamentals of Computer Networks
Teaching Hours: 04 Hours/Week	Credits: 04
Duration of Exam: 03 Hours	Maximum Marks: 100 (Exam 80 + IA 20)

Course Outcomes

CO1. Understand and explain the layered architecture of computer networks, including the OSI model and the functionalities of each layer from physical to application level.
CO2. Describe and evaluate various data link layer protocols, including flow and error control mechanisms, synchronous/asynchronous communication, and ISDN services.
CO3. Identify and differentiate key networking devices and analyze network layer functionalities**,** including routing algorithms, congestion control, and internetworking principles.
CO4. Illustrate the purpose and functions of transport, session, presentation, and application layers**,** and demonstrate their role in end-to-end data communication.

UNIT-I: Basic concepts **14 Hours**

Introduction: Overview, Objectives, Networking Connectivity Network Extension, Network Topologies, Protocols, Programs and Processes, Protocol Layering Concepts, the OSI Reference Model.

UNIT-II: Data Link Control Protocols **14 Hours**

Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit-oriented protocols, Link access procedures. Point to point controls: Transmission states, PPP layers: LCP, Authentication, NCP. ISDN: Services, Historical outline, subscriber's access, ISDN Layers and broadcast ISDN.

UNIT-III: Network devices **14 Hours**

Repeaters, bridges, gateways, routers, the network layer: design issues, routing algorithms, congestion control algorithms, quality of service, internet working, network layer in the internet.

UNIT-IV: Transport and upper layers in OSI Model **14 Hours**

Transport and upper layers in OSI model: Transport layer functions, connection management, functions of session layers, presentation layer and application layer.

Text Books:

1. Andrew S. Tanenbaum, David J. Wetheral, "Computer Networks", 6th Edition, Pearson Education 2021. Education
2. Behrouz A. Forouzan, "Data Communication and Networking", 3rd Ed, Tata McGraw Hill, 2004.
3. A.S. Tanenbaum, "Computer Networks", Pearson Asia, 4th Ed., 2003.
4. William Stallings, "Data and computer communications", Pearson education Asia, 7th Ed., 2002.

Theory	24BVOC33: Introduction to Python
Teaching Hours: 04 Hours/Week	Credits: 04
Duration of Exam: 03 Hours	Maximum Marks: 100 (Exam 80 + IA 20)

Course Outcomes

CO1	Understand the basic syntax, data types, variables, operators, control structures, and functions in Python, and apply them to develop simple programs.
CO2	Demonstrate proficiency in handling Python's complex data structures such as lists, dictionaries, tuples, and sets, and apply file handling for text, binary, and CSV formats.
CO3	Apply object-oriented programming concepts in Python and use libraries like NumPy and Pandas for efficient data manipulation and analysis.
CO4	Utilize Python packages like Matplotlib, Plotly, and APIs for effective data visualization and apply them in real-time data analysis projects.

UNIT – I Foundations of Python Programming **14 Hours**

Introduction to Python: 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: Conditional blocks: if, else, elif, Nested if. Looping: while, for, range, loop manipulation using break, continue, else, pass. Functions: Function Definition and Calling, Built-In Functions, Return Statement, Default Parameters, Scope and Lifetime of Variables, Command Line Arguments. Strings: Creating and Storing Strings, String Operations, Slicing, Joining, String Methods.

UNIT – II Data Structures, Functions, and File Handling in Python **14 Hours**

Lists: Creating Lists, Basic List Operations, Indexing and Slicing, List Methods, Built-in Functions, The del Statement. Dictionaries: Creating Dictionaries, Accessing and Modifying Key-Value Pairs, Dictionary Methods, Built-in Functions, The del Statement. Tuples: Creating Tuples, Tuple Operations, Indexing, Slicing, Tuple Methods, Relationships between Tuples, Lists, and Dictionaries. Sets and Frozensets: Creating Sets, Set Operations, Set Methods. Iterators and Iterables. Organizing Code Using Functions. File Handling: Types of Files, Reading and Writing Text and Binary Files, CSV File Handling, Pickle Module.

UNIT – III Object-Oriented Programming and Data Handling Libraries **14 Hours**

Object-Oriented Programming: Classes and Objects in Python, Constructor Method, Multiple Objects, Class vs Data Attributes, Encapsulation, Inheritance, Polymorphism. Introduction to Python Libraries for Data Handling: NumPy – Arrays and Operations, Pandas – Series and DataFrames, Indexing and Querying, Handling Missing Values, Data Aggregation, Grouping, and Summarization.

UNIT – IV Data Analysis and Visualization with Python **14 Hours**

Data Analysis and Visualization in Python: Importing and Exporting Data (CSV, JSON), Understanding and Formatting Data, Using Matplotlib and Plotly for Visualization, Generating and Plotting Data (Line Graphs, Bar Charts).

TEXT BOOKS:

1. Wesley J. Chun, *Core Python Applications Programming*, 3rd Edition, Pearson Education, 2016.
2. Yashavant Kanetkar and Aditya Kanetkar, *Let Us Python*, 3rd Edition, BPB Publications.
3. Jeeva Jose & P. Sojan Lal, *Introduction to Computing and Problem Solving with Python*, Khanna Publishers, New Delhi, 2016.

4. Eric Matthes, *Python Crash Course – A Hands-On, Project-Based Introduction to Programming*, 2nd Edition, No Starch Press, 2019.
5. Gowrishankar S, Veena A, *Introduction to Python Programming*, 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN: 978-0815394372.

Theory	24BVOC34: Cyber Security
Teaching Hours: 02 Hours/Week	Credits: 02
Duration of Exam: 1.5 Hours	Maximum Marks: 50 (Exam 40 + IA 10)

Course Outcomes

COs	Description
CO1	Understand the fundamentals of cyber security, types of cyber threats and adopt safe internet practices and responsible digital behavior.
CO2	Understand the basic concepts of cryptography, encryption techniques, password security and secure communication protocols used for data protection.
CO3	Apply system and personal security measures to protect devices and data from threats, vulnerabilities and online attacks.

Unit I – Fundamentals of Cyber Security & Secure Communication 14 Hours

Introduction to Cyber Security: Importance of cyber safety in the digital world, Common types of cyber threats: viruses, worms, trojans, phishing, ransomware, fake websites, social engineering, Real-life examples of cyber attacks.

Goals of Cyber Security: Confidentiality, Integrity, Availability (CIA Triad), Difference between threats, vulnerabilities, and risks.

Security Concepts and Terminology: Firewall, antivirus, malware, hacking. Safe Internet Practices: Responsible digital behaviour, Secure browsing and identifying fake/unsafe websites, Email safety: detecting phishing and spam, Use of public Wi-Fi and avoiding data leaks.

Introduction to Cryptography and Secure Communication: Purpose of encryption and decryption, Difference between symmetric and asymmetric encryption, Role of HTTPS and SSL, Two-Factor Authentication (2FA), OTP-based logins, Importance of secure messaging and email

Unit II – System, Personal, and Device Security Practices 14 Hours

System and Device Security Basics: Operating System security basics, User authentication and access control, Password policies and best practices, Antivirus and anti-malware software.

Web and App Security: Common web security issues: SQL injection, XSS, CSRF (overview only), Mobile app security – permissions and safe usage, Safe use of mobile devices, laptops, and social media, Software updates and patch management.

Network and Online Protection: Introduction to firewalls and VPNs, Risks of pop-ups, cookies, and online tracking, Safe and responsible data sharing online

TEXT BOOK:

1. Chirag Shah (2018). A Hands-On Introduction to Cybersecurity. Wiley.

REFERENCE BOOKS:

1. Nina Godbole & Sunit Belapure (2011). Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives. Wiley India.
2. Rao, U. & Nayak, P. (2014). Cyber Security. Cengage Learning.
   Moeti J. (2021). Cybersecurity for Beginners. Amazon Digital Services (for simple reading-level coverage).

Lab	24BVOC31P: Database Management System Lab
Teaching Hours : 03 Hours/Week	**Credits : 02**
Duration of Exam : 3 Hours	**Maximum Marks : 50 (Exam 40 + IA 10)**

1. Perform the following:
   Viewing all databases, Creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback).
2. Perform the following:
   Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.
3. Draw E-R diagram and convert entities and relationships to relation table for a given scenario. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college) Consider the Company database with following Schema
   EMPLOYEE (FNAME, MINIT, LNAME, SSN, BDATE,ADDRESS,SEX,SALARY, SUPERSSN, DNO)
   DEPARTMENT (DNAME, DNUMBER,MGRSSN,MSRSTARTDATE) DEPT_LOCATIONS (DNUMBER, DLOCATION)
   PROJECT (PNAME, PNUMBER, PLOCATION, DNUM)
   WORKS_ON (ESSN, PNO, HOURS)
   DEPENDENT (ESSN, DEPENDENT_NAME, SEX, BDATE, RELATIONSHIP)
4. What is the resulting salaries if every employee working on the ‘Research’ Departments is given a 10% raise.
5. Find the sum of the salaries of all employees of the ‘Accounts’ department, as well as the maximum salary, the minimum salary, and the average salary in this department
6. For each Department that has more than five employees, retrieve the department number and number of employees who are making salary more than 40000.
7. For each project on which more than two employees work, retrieve the project number, project name and the number of employees who work on that project.
8. For each project, retrieve the project number, the project name, and the number of employee who work on that project.(use GROUP BY)
9. Retrieve the name of employees who born in the year 1990’s
10. For a given set of relation tables perform the following: Creating Views (with and without check option), Selecting from a view, dropping views.

Lab	24BVOC32P: Computer Networks Lab
Teaching Hours : 03 Hours/Week	**Credits : 02**
Duration of Exam : 3 Hours	**Maximum Marks : 50 (Exam 40 + IA 10)**

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 the 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

Lab	24BVOC33P: Python Lab
Teaching Hours : 03 Hours/Week	**Credits : 02**
Duration of Exam : 3 Hours	**Maximum Marks : 50 (Exam 40 + IA 10)**

1. Write a program to demonstrate basic datatype 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 python program to print date, time for today and now
8. Write a python program to concatenate the dataframes with two different objects
9. Write a python code to read a csv file using pandas module and print the first and last five lines of a file.
10. Matplotlib Basics: Plot a line graph and a bar chart using Matplotlib.

SEMESTER – IV

Theory	24BVOC41: Basics of Web Programming
Teaching Hours: 04 Hours/Week	**Credits: 03**
Duration of Exam: 03 Hours	**Maximum Marks: 100 (Exam 80 + IA 20)**

Course Outcomes

CO1	Understand the foundational components of the web
CO2	Design web pages using HTML, XHTML, and CSS
CO3	Develop interactive features using JavaScript
CO4	Integrate JavaScript with HTML using the Document Object Model (DOM)

UNIT-I Fundamentals of Web **14 Hours**

Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox. XHTML: Origins and evolution of HTML and XHTML, Basic syntax, Standard XHTML document structure, Basic text markup, Images, Hypertext Links, Lists, Tables.

UNIT – II HTML, XHTML and CSS **14 Hours**

Forms, Frames in HTML and XHTML, difference between HTML and XHTML. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The Box model, Background images, tags, Conflict resolution.

UNIT – III Basics of JavaScript **14 Hours**

Object orientation and JavaScript: General characteristics, Primitives, Operations and expressions, Screen output and keyboard input, Control statements, The JavaScript execution environment. Object creation and Modification, Arrays, Functions, Constructors, Pattern matching using expressions, Errors in scripts.

UNIT – IV Document Object Model [DOM] **14 Hours**

Document Object Model: Element access in JavaScript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model: The navigator object, DOM tree traversal and modification.

Text Books:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", 1st Edition, Wiley, Nov 8 2011.
2. Jon Duckett, "JavaScript and jQuery: Interactive Front-End Web Development" ,Wiley, 1st edition, Sept 29, 2014.
3. JavaScript: The Definitive Guide" by David Flanagan, Publisher: O'Reilly

Theory	24BVOC42: Design and Analysis of Algorithms
Teaching Hours: 04 Hours/Week	Credits: 04
Duration of Exam: 03 Hours	Maximum Marks: 100 (Exam 80 + IA 20)

Course Outcomes

CO1	Define, write, and analyse algorithms using structured programming principles and understand performance considerations through time and space complexity analysis
CO2	Apply divide and conquer strategies to solve algorithmic problems such as binary search, merge sort, quick sort, and optimization problems
CO3	Implement greedy algorithms for problems like the knapsack, job sequencing, minimum spanning tree, and shortest path to develop efficient real-world solutions
CO4	Solve complex problems using dynamic programming and backtracking techniques, including graph algorithms, traveling salesman, 0/1 knapsack, and constraint satisfaction problems like 8-Queens

UNIT – I Introduction **14 Hours**

Definition of algorithm, Characteristics of algorithm, Different Control Structures, Writing Structured Programs, Analysis of algorithm. Basic Data Structures used in Algorithms, Fundamentals and Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic Notations.

UNIT – II Divide and Conquer **14 Hours**

Introduction to the general method and its strategy, Binary Search, Merge Sort and Quick Sort, Finding Maximum and Minimum using divide-and-conquer approach, Analysis of time complexity for each algorithm.

UNIT – III Greedy Method **14 Hours**

Introduction to the general greedy strategy for problem-solving, Knapsack Problem, Job Sequencing with Deadlines, Finding Minimum-cost Spanning Trees using Prim's and Kruskal's algorithms, Solving Single-Source Shortest Path problems using Dijkstra's algorithm, Efficiency analysis and limitations of the greedy approach.

UNIT – IV Dynamic Programming **14 Hours**

Introduction to Graphs: Definition, types, Terms related to graph, Multistage Graphs, All pair Shortest Paths, The traveling salesperson problem. Basic traversal & Search techniques: Search & traversal techniques for trees and graphs. Backtracking: General method, The 4- Queens Problem, Sum of subsets.

Referential Books:

1. Sara Baase, Allen Van Gelder, Computer Algorithms, Introduction to design and Analysis, 3rd edn (9th reprint), Pearson, 2005.
2. Design & Analys of alogorithm- Horowitz & Sahni 4. Fundamentals of Computer algorithm – Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran.
3. Aho Ullman & Hopkraft "Design & analysis of Algorithms".

Theory	24BVOC43: Artificial Intelligence
Teaching Hours: 04 Hours/Week	Credits: 03
Duration of Exam: 03 Hours	Maximum Marks: 100 (Exam 80 + IA 20)

Course Outcome:

CO1	Understand the various characteristics of problem solving agents and apply problem solving through search for AI applications
CO2	Appreciate the concepts of knowledge representation using Propositional logic and Predicate calculus and apply them for inference/reasoning
CO3	Understand basics of computer vision and Natural Language Processing and understand their relevance in AI applications
CO4	Obtain insights about machine learning, neural networks, deep learning networks and their significance

UNIT I **14 Hours**

Introduction to Al: What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of the environment, the structure of agents; Problem-solving: Problem- solving agents; Uninformed search strategies: DFS, BFS; Informed Search: Best First Search, A* search, AO* search, Means End Analysis. Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning.

UNIT - II **14 Hours**

Knowledge-based Agents, The Wumpus world as an example world, Logic, Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting, Forward chaining, Backward chaining, Resolution, Truth maintenance systems. Knowledge in Learning, What is learning? Types of Learning,: Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, , Decision Trees.

UNIT - III **14 Hours**

Introduction to Planning: Blocks World problem, Strips; Handling Uncertainties: Non- monotonic reasoning, Probabilistic reasoning, Fuzzy logic; Robotics: Fundamentals of Robotics, Robot Kinematics; Computer Vision: Introduction to image processing and classification, object detection.

UNIT - IV **14 Hours**

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Expert Systems: Architecture and role of expert systems, two case studies of Expert Systems, Introduction to Machine learning: Supervised learning, unsupervised learning, reinforcement learning, Neural Networks: Introduction, basics of ANN, Deep Learning with basics of CNN, RNN, LSTM and their applications.

Text Book

1. Russell, S. and Norvig, P., "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall
2. Nilsson Nils J, "Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4.
3. Dan W Patterson, "Introduction to Artificial Intelligence & Expert Systems", PHI

Theory	24BVOC44: Ethical Hacking
Teaching Hours: 02 Hours/Week	Credits: 02
Duration of Exam: 1.5 Hours	Maximum Marks: 50 (Exam 40 + IA 10)

Course outcomes

COs	Description
CO1	Understand the scope, phases and legal aspects of ethical hacking and recognize various cyber attacks and the role of ethical hackers in cyber security.
CO2	Apply reconnaissance, scanning and enumeration techniques using tools to gather and analyze system and network information for vulnerability assessment.
CO3	Identify and explain common system hacking methods, malware types and social engineering attacks and suggest preventive strategies.
CO4	Understand web and network security threats, secure browsing practices and the use of firewalls, VPNs and IDS/IPS for ethical hacking and protection.

Unit-I Foundations of Ethical Hacking and Cyber Attacks 14 Hours

Definition and scope of ethical hacking, Difference between hacking and ethical hacking, Types of hackers – white hat, black hat, grey hat. Ethical hacking process and phases – planning, scanning, gaining access, maintaining access, clearing tracks. Common attack types – phishing, malware, password cracking, social engineering attacks such as phishing, baiting, and shoulder surfing. Introduction to attacks including Trojans, worms, viruses, and ransomware. Basics of keyloggers, spyware, backdoors, and rootkits. Introduction to sniffing and packet capturing. Role of ethical hacking in cyber security. Basic prevention strategies and the importance of user awareness.

Unit-II Footprinting, Scanning, Enumeration and System Exploitation 14 Hours

Introduction to reconnaissance and information gathering. Footprinting techniques – search engines, social networks, WHOIS, DNS, email tracking. Tools for passive and active footprinting. Scanning networks – IP scanning, port scanning, vulnerability scanning. Overview of common tools: Nmap, Angry IP Scanner. Enumeration basics: Windows and Linux enumeration, identifying users, shares, services and open ports, interpreting scan results and identifying risks. Basics of system hacking including password cracking, privilege escalation, keylogging, and techniques used to gain unauthorized access.

TEXT BOOK*:*

1. Bachaalani, P., & Mehta, N. (2020). *Fundamentals of Ethical Hacking*. BPB Publications.

REFERENCE BOOKS*:*

1. EC-Council (2019). *Ethical Hacking and Countermeasures: Attack Phases*. Cengage Learning.
2. Kimberly Graves (2010). *CEH: Official Certified Ethical Hacker Review Guide*. Wiley.
3. Jon Erickson (2008). *Hacking: The Art of Exploitation*. No Starch Press.

Lab	24BVOC41P: Web Programming Lab
Teaching Hours : 03 Hours/Week	Credits : 02
Duration of Exam : 3 Hours	Maximum Marks : 50 (Exam 40 + IA 10)

1. Create a form by using various attributes of the input tags (text box, multiline textbox, option button, check box)
2. Create a simple HTML page by using some of the basic tags (hyperlink, marquee, image).
3. Create a web page with multiple types of style sheet used in a single page.
4. Create Time-Table using table tag.
5. Write a java script program to create dialogue boxes using alert, confirm and prompt methods.
6. Write a java script program on Form Validations.
7. Write a java script program to perform four arithmetic operations: Addition, Subtraction, Multiplication and Division on two numbers.
8. Write a JavaScript code to find the sum of N natural Numbers. (Use user defined function).
9. Create a form for Student information. Write JavaScript code to find Total, Average, Result and Grade.
10. Develop an HTML Form, which accepts any Mathematical expression. Write JavaScript code to Evaluate the expression and Display the result.

Lab	24BVOC42P: Design and Analysis of Algorithms Lab
Teaching Hours : 03 Hours/Week	Credits : 02
Duration of Exam : 3 Hours	Maximum Marks : 50 (Exam 40 + IA 10)

1. Write a program to implement binary search and linear search using recursive function and determine the time required to search an element. Record the time taken for the best case and worst case.
2. Write a program to find the maximum and minimum numbers in an array using the divide and conquer technique. Record the time taken.
3. Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st 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.
4. Write a program to sort algorithm to sort a given set of elements using merge sort and determine the time required to sort the elements. 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 Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
6. Write a program to implement all pairs shortest path problem using Floyd's algorithm.
7. Write a program to compute the transitive closure of a given directed graph using Warshall's algorithm.
8. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
9. Given a Binary tree, implement recursive in-order, pre-order and post-order tree traversals.
10. Write a program to check whether a given graph is connected or not using DFS method.

Lab	24BVOC43P: Artificial Intelligence Lab
Teaching Hours : 03 Hours/Week	**Credits : 02**
Duration of Exam : 3 Hours	**Maximum Marks : 50 (Exam 40 + IA 10)**

1. Write a Prolog program to define facts and rules for a family tree. Query relationships such as parent, child, and grandparent.
2. Write a Prolog program to find the maximum of two numbers using rules.
3. Write a Prolog program to check if an element is a member of a given list.
4. Write a LISP program to calculate the factorial of a number using recursion.
5. Write a LISP program to determine whether a number is even or odd.
6. Write a LISP program to reverse the elements of a list.
7. Write a Python program to implement Breadth-First Search (BFS) on a graph using an adjacency list or matrix.
8. Write a Python program to implement Depth-First Search (DFS) on a graph using recursion or a stack.
9. Write a Python program to create a simple rule-based chatbot that responds to basic greetings.
10. Write a Python program to perform basic tokenization: split a sentence into individual words.

Theory: Skill Enhancement Course-I	24BVOCSE1: Probability and Statistics
Teaching Hours: 02 Hours/Week	Credits: 02
Duration of Exam: 1.5 Hours	Maximum Marks: 80 (Exam 40 + IA 10)

Course Outcomes

COs	Description
CO1	Knowledge to conceptualize the probabilities of events including frequent and axiomatic approach. Simultaneously, they will learn the notion of conditional probability.
CO2	Knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments
CO3	Knowledge related to concept of random variable, Probability mass function and probability density function.

UNIT - I Fundamentals of Probability and Theorems **14 Hours**

Introduction to Probability: Basic concepts of Probability, random experiment, trial, outcome, sample space, event, mutually exclusive event, equally likely events. Conditional probability, Independent events, Addition and multiplication theorems of probability for 2 events (Statement without proof) and problems, Addition and multiplication theorems of probability for n events (Statement without proof) and problems, Bayes' theorem Statement and its applications.

UNIT - II Random Variables and Probability Distributions **14 Hours**

Random variable: Definition of Random variable, discrete and continuous random variables, functions of random variable, probability mass function, probability density function, distribution function and its properties. For a given probability mass function calculation of mean and variance. For a given probability density function calculation of mean and variance. Mathematical Expectation of random variable and function of random variable.

TEXT BOOKS:

1. S.P. Gupta, "Statistical Methods" Sultan Chand and Sons Publishers, 2020
2. S.C. Gupta & V.K. Kapoor " Fundamentals of Mathematical statistics", Sultan Chand and Sons Publishers, 2020.

REFERENCE BOOKS:

1. Sambavyatha – "Fundamentals of statistics" , Goon, Gupta and Das Gupta, 2010

BLUEPRINT FOR QUESTION PAPER						
FOR 03/04 CREDITS						
Marks	**Unit I**	**Unit II**	**Unit III**	**Unit IV**	**Number of questions to be answered**	**Total**
2	**3**	**3**	**3**	**3**	**10**	**20**
6	**2**	**2**	**2**	**2**	**5**	**30**
10	**1**	**1**	**1**	**1**	**3**	**30**
					Total	**80**
FOR 02 CREDITS						
Marks	**Unit I**	**Unit II**	**Number of questions to be answered**			**Total**
2	**3**	**3**	**5**			**10**
5	**3**	**3**	**4**			**20**
10	**1**	**1**	**1**			**10**
					Total	**40**

Formative Assessment – 03/04 Credits

Category	Marks Allotted
Tests	10
Assignments	10
Total Marks	**20**

Formative Assessment - 02 Credits

Category	Marks Allotted
Tests	5
Assignments	5
Total Marks	**10**