DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS SCHEME AND SYLLABUSOF EXAMINATION FOR

Bachelor (Honours/Honours with Research) of Computer Application

Duration4 Years (8 Semesters) w.e.f. Academic Session2023-24

Semester–V Scheme C									
Course Code	**Course Title**	**Credit**	**L:T:P:CH**	**Internal Marks**		**External Marks**		**Total Marks**	
				Th	**Pr**	**Th**	**Pr**	**Min**	**Max**
Major/Core Courses									
B23-CSE-501	Artificial Intelligence	4	3:0:1:5	20	10	50	20	40	100
B23-CSE-502	Data Structures	4	3:0:1:5	20	10	50	20	40	100
DSE-A2	**Student need to opt any one of two**								
B23-DSE-503	Back End Development	4	3:0:1:5	20	10	50	20	40	100
B23-DSE-504	Cloud Computing	4	3:0:1:5	20	10	50	20	40	100
DSE-A3	**Student need to opt any one of two**								
B23-DSE-505	Programming with Python	4	3:0:1:5	20	10	50	20	40	100
B23-DSE-506	Block Chain Technology	4	3:0:1:5	20	10	50	20	40	100
Minor/Vocational Courses									
B23-CSE-507	Data Communication and Networking	4	3:0:1:5	20	10	50	20	40	100
Multidisciplinary Courses									
Ability Enhancement Courses									
Skill Enhancement Courses									
Value Added Courses									
	Total	**20**		**20**					**400**

B23- CSE – 501 Artificial Intelligence

Maximum marks: 70 External: 50
Time: 3 hours Internal: 20
Credit: 4

Course Objectives:

1. *To understand the Domain of Artificial intelligence and basics techniques used for searching*
2. *To understand different methods of knowledge representation*
3. *To understand nature and goals of Neural computing*
4. *To understand the Fuzzy Logic and Arithmetic*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Basics of AI: Definition of AI, History, Domains AI, AI problems & State space, Some examples problems representations like Travelling Salespersons, Syntax analysis Problem, Basic issues to solve AI problems, Underlying assumptions, AI techniques, Level of model, Criteria for success, Control strategies.
Searching Techniques: DFS, BFS, Heuristic Search Techniques: Generate & Test: Hill Climbing (simple & steepest), Best first search/A*, Problem Reduction/AO*, Constraint satisfaction, Alpha-Beta pruning.

UNIT-II

Reasoning in logic : Brief revision of propositional and predicate logic. Different characterizations of reasoning. Generalized modus ponens. Resolution.
Forward and backward chaining. Knowledge Representation, Diversity of knowledge.
Inheritance hierarchies. Semantic networks. Knowledgebase ontologies. Handling uncertainty,

UNIT-III

Nature and Goals of Neural Computing: Comparison with rule-based AI. Overview of network
architectures and learning paradigms. Binary Decision Neurons, The McCullough-Pitts model.
Single-layer perceptrons and their limitations. The Multilayer Perceptron, The sigmoid output function.Hidden units and feature detectors. Training by error backpropagation. The error surface
and local minima. Generalisation, how to avoid overtraining.

UNIT-IV

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function,Fuzzy rule generation.

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, AggregationOperations.

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals; Numbers,Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, LinguisticHedges.

Suggested Readings:

1. R. Beale, T. Jackson, " *Neural Computing-an introduction*", CRC Press, 1990.
2. Stuart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach*", Prentice-Hall, 4th edition, 2020.
3. George J. Klir and Bo Yuan, "*Fuzzy Sets and Fuzzy Logic: Theory and Applications*" Prentice Hall, 1996.
4. M. Ganesh , "*Introduction To Fuzzy Sets And Fuzzy Logic*", PHI Learning, 2006.
5. Narayanan, A., & Kapoor, S, "*AI Snake Oil: What Artificial Intelligence Can Do, What It Can't, and How to Tell the Difference*", Princeton University Press, 2024.

B23- CSE – 502 Data and File Structures

Maximum marks: 70 External: 50
Time: 3 hours Internal: 20
Credit: 4

Course Objectives:

1. *To Understand the concepts of data types, data structure like arrays, records, linked list, stacks, queues, trees and graphs and their memory representation and Applications*
2. *To learn various searching and sorting algorithms*
3. *Apply fundamental algorithmic problems including Tree traversal, graph traversal and their applications.*
4. *To understand the file system.*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Fundamentals of algorithm analysis: Big 'O' notations, Time and space complexity of algorithms, Elementary data structures and their applications
Arrays: ordered lists, representation of arrays, sparse matrices, linked lists: singly and doubly linked lists, stacks, queues, multiples stacks and queues, Applications: polynomial arithmetic, infix, postfix and prefix arithmetic expression conversion and evaluations.

UNIT-II

Lists, Stacks & Queues: Abstract Data Types, Representation & implementation of linked list, Doubly linked list, Circular linked lists, Stacks, array representation of stack. Applications of stacks. Queues, array representation of Queues, Circular queues, Deques, priority queues, Applications of Queues.

UNIT-III

Trees: Introduction to trees, binary trees, representation and traversal of trees, operations on binary trees, types of binary trees, threaded binary trees, B Trees, AVL Trees, Application of trees.
Graphs: Representation, traversal, connected components, shortest path and transitive closure, topological sort, activity network, critical path, path enumeration. Dijkstra's Algorithm, Floyd Warshall's Algorithm, Minimum Spanning Tree Definitions.

UNIT-IV

Searching & Sorting: searching techniques, Hash function, Hash table, Internal sort: Radixsort, Insertion sort, Exchange sort, Selection sort, Quicksort, Mergesort, Heaport, External sort: K-way mergesort, balanced mergesort.
Files: Files, Queries and sequential organization; Cylinder surface indexing, Hashed Indexed, Tree Indexing, Sequential file organizational, random file organization, Hashed file organization, Inverted files, cellular partitions.

Suggested Readings:

1. Gupta S., "*Data Structures and Algorithms*", Toronto Academic Press, 2024
2. Agate J., "*Data Structures and Algorithms*", Brilliance Publications, 2024
3. E. Horowitz and S. Sahani, "*Fundamentals of Data Structures*", Galgotia Books Pvt. Ltd, 1999.
4. Mark Allen Weiss , "*Data Structures & Algorithm Analysis in C++",* Second edition, Pearson Edition. Asia,1996.
5. A.V. Aho, J.E. Hopcroft and T.D. Ullman , "*Data Structures and Algorithms*", Original edition, Addison-Wesley, 1999, Low Priced Edition.
6. John Hubbard, "*Schaum's Outline of Data Structures with C++"*, McGraw-Hill Education , 2000.

B23-DSE-503 Back End Development

Maximum marks: 70 **External:** 50
Time: 3 hours **Internal:** 20
Credit: 4

Course Objectives:

1. *To understand Client side scripting using Java Script.*
2. *To provide an overview of Data Types and operators in Java Script.*
3. *To understand Function, flow control and dialog boxes.*
4. *To know how to deal with Regular expressions.*
5. *To provide the concept of Form handling and State management using JavaScript.*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Introduction and overview of Java Script: Common uses of JavaScript, Overview of JavaScript Core Language Features, input and output in JavaScript.
Data Types and variables: Numbers, Strings, Booleans, Null, Objects, Arrays, type conversion, identifiers, variable declaration, implicit variable declaration, variable scope, constants.
JavaScript Operators: assignment, arithmetic, bitwise, increment/decrement, comparison, logical, ? and comma operator, typeof, Object operators, operator precedence and associativity.

UNIT–II

JavaScript Flow Control statements: if statements, switch, for loops, while loops, do-while loops, break, continue, label, return.
JavaScript Functions: Parameter passing basics, return statements, parameter passing: In and Out, Global and Local variable scope, recursive functions.
Dialog boxes: Alert dialog box, prompt dialog box, confirm dialog box

UNIT-III

Objects in JavaScript: Object creation, object destruction and garbage collection, common properties and methods, Array object, Date object, Math object, Number object, Boolean object and String object.
Regular Expressions: The need for Regular expressions, Creating Patterns, RegExp object, test( ), compile(), exec( ), RegExp Properties, String methods for Regular expressions: search(), split(), replace() , match( )
JavaScript Object Models:Object Model overview, The initial JavaScript Object Model, Accessing Document Elements by Position and by Name, Event handling, DOM Event Model. Window object.

UNIT- IV

Form Handling: The need for Form checking, Accessing Forms and Fields, Form Fields: Common input element properties, Text fields, Text Area, Buttons, Checkboxes and Radio Buttons, Select Menus, Hidden Fields, Form Validation.

State Management: Using Cookies in JavaScript for User state management, storing cookies, reading cookies, setting cookie expiry date, deleting a cookie, Cookie Limitations

Suggested Readings:

1. Flanagan, D., JavaScript: The Definitive Guide, O'Reilly Media.,2020
2. David Flanagan, "*JavaScript: The Definitive Guide: Activate Your Web Pages"*, O' Reilly, 6th edition, 2011.
3. Thomas Powell, "*JavaScript: the Complete Reference"*, McGraw Hill, 3rd edition, 2012.
4. Douglas Crockford, "JavaScript: The Good Parts", O' Reilly, 1st edition, 2008.
5. Deitel, Deitel, Goldberg, "*Internet & World Wide Web How To Program*", 4th Edition, Pearson Education, 2009.
   Robert. W. Sebesta, "*Programming the World Wide Web*", 4th Edition, Pearson Education, 2011.

B23-DSE-504 Cloud Computing

Maximum marks: 70
Time: 3 hours

External: 50
Internal: 20
Credit: 4

Course Objectives:

1. *To understand the concept of Clouding Computing.*
2. *To know about Seven Step Model of Migration into a Cloud.*
3. *To get familiar with Cloud Paradigms.*
4. *To know about Virtual Machine infrastructure and Security in Cloud.*
5. *To understand the Integration of Private and Public Cloud*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Introduction to Cloud, Cloud Computing Reference Model, Distributed Systems, Virtualization, Web 2.0, Service Oriented Computing, Utility Oriented Computing, Parallel vs Distributed Computing.
Virtualization : Characteristics of Virtualiization Environment, Taxonomy of Virtualization Techniques, Pros and Cons of Virtualization.
Cloud Reference Model : Architecture, SAAS, PAAS, IAAS.

UNIT-II

Types of Cloud : Public, Private, Hybrid, Community.
Economics of Cloud.
Concurrent Computing : Programming Applications with Threads, Multithreading, Domain Decomposition, Functional Decomposition.
Task Computing : Characterizing a Task, Computing Categories, Framework for Task Computing.
Task Based Application Models : Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependency.

UNIT-III

Data Intensive Computing : Characterizing Data Intensive Computing, Challenges Ahead, Historical Prespectives, Storage System, Programming Platforms, Map Reduce Programming.
Cloud Platforms in Industry : Case Study of Amazon Web Services, Google App Engine, Microsoft Azure.

UNIT-IV

Scientific Applications of Cloud : Healthcare, Protein Structure Prediction, Gene Expression Data Analysis, Satellite Image Processing.
Business and Consumer Applications of Cloud : CRM, ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.
Energy Efficient and Green Cloud Computing Architecture.
Market Based Management of Cloud : Market Oriented Cloud Computing, Reference Model for Market Oriented Cloud Computing, Technologies and Initiative Supporting Market Oriented Cloud Computing, Observations.
Federal Cloud / Inter Cloud : Characterization and Definition, Cloud Federation Stack, Aspects of Interest, Technologies for Cloud Federations, Observations.
Third Party Cloud Service.

Suggested Readings:

1. Gupta, D., "*The Cloud Computing Journey*" Packt Publishing, 2024
2. Rajkumar Buyya, Christian Vecchiola and S. ThamaraiSelvi, "*Mastering Cloud Computing"*, McGraw Hill Education, 2016.
3. Lizhe Wang, Rajiv Ranjan, Jinjun Chen and BaualemBenatallah, "*CludComputing : Methodology Systems and Applications"*, CRC Press, 2012.
4. Kris Jamsa, "*Cloud Computing"*, Jones and Bartlett Learning, 2013.
5. NayanRuparelia, "*Cloud Computing"*, MIT Press, 2015

B23-DSE-505 Programming with Python

Maximum marks: 70 **External:** 50
Time: 3 hours **Internal:** 20
Credit: 4

Course Objectives:

1. *To understand the basics of Python programming.*
2. *To provide the detail of various components of Python.*
3. *To understand the strings and lists in Python.*
4. *To understand working of dictionaries and tuples.*
5. *To understand files in Python.*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Overview of Python, Comments, Reserve Keywords, Identifiers, Variables, Constants, Standard Data types, Operators, Control Statements, Iterative Statements..
Functions: Built in functions, Composition of functions, User defined Functions, Parameters, Function call, Return statement, Recursive function.

UNIT-II

Strings: Compound Data Type, Len function, Slices, Traversal, Escape Character, Formatting Operator, Formatting Functions.
Lists: Values & Accessing Elements, Traversal, Deleting Element, Built-in Operators, Built-in Methods.

UNIT-III

Tuples: Creating, Accessing Values in Tuples, Tuples Assignment, Tuples as Return Values, Variable length Argument Tuple, Basic Operations, Built-in- Tuple Function.
Dictionaries: Creating, Accessing Values, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary Keys, Operations in Dictionary, Built-in Dictionary Methods

UNIT-IV

Text Files and Exceptions: Text Files, Dictionaries, Exceptions, Exception with arguments, User defined exceptions.

Applications in Python: Managing Database using SQL: Database concept, Creating database & tables, Inserting data into tables, Retrieving data from table, Deleting data from table & deleting table.

Suggested Readings:

1. E. Balagurusamy , "*Introduction to Computing and Problem Solving Using Python",* McGrawHill Education, 2017.
2. Sheetal Taneja, Naveen Kumar, *"Python Programming A Modular Approach*", Pearson, 2017.
3. Rao R. Nageswara , *"Core Python Programming*", Dream Tech, New Delhi, 2018.
4. Satyanarayana, Mani M. Radhika, Jagadesh B.N , *"Python Programming*", India University Press, 2018.
5. Cassell Laura, Gauld Alan , *"Python Projects"*, Wiley Publication, New Delhi, 2014.

B23-DSE-506 Blockchain Technology

Maximum marks: 70 **External:** 50
Time: 3 hours **Internal:** 20
Credit: 4

Course Objectives:

1. *To learn elements of Blockchain technology*
2. *To understand Cryptocurrency-Bitcoin*
3. *To know the characteristics of a Smart Contract*
4. *To understand the Security concept of Blockchain*
5. *To learn Blockchain Platform using Go Language*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

Unit – I

Fundamentals of Blockchain: introduction, Origin of Blockchain, Blockchain Solution, components of Blockchain, block in Blockchain, the Technology and the future, Blockchain Types and Consensus Mechanism: Decentralization and Distribution, types of Blockchain, consensus Protocol, Cryptocurrency-Bitcoin, Altcoin and Token: Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrency, Usage, Public Blockchain System: Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

Unit – II

Smart Contracts: Introduction, Characteristics of a Smart Contract, Types of Oracles, Smart contracts in Ethereum, Smart Contracts in Industry,
Private Blockchain System: Key Characteristics of private Blockchain, Smart Contracts in Private Environment,
Consortium Blockchain: Introduction, Key characteristics of Consortium Blockchain, need of Consortium Blockchain,
Hyperledger platform

Unit – III

Security in Blockchain: Introduction , Securities Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance ,Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric,
Applications of Blockchain: Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Healthcare, Blockchain in Supply Chain, Blockchain and IoT,
Limitations and challenges of Blockchain.

Unit – IV

Blockchain Platform using Go Language: Introduction, learn to execute GoLang Program in Atom, Basic Programming, Packages, Creating Simple Blockchain using GoLang ,Creating Simple Blockchain with Proof of Work using GoLang, Connecting to Ethereum using GoLang,

Suggested Readings:

1. Imran Bashir, *Mastering Blockchain*, 2nd Edition, Packt Publishing, 2018.
2. Alan Wright, *Blockchain*, House of Books, 2021.
3. Daniel Dresher, Blockchain Basics, Apress, 2017
4. Roger Wattenhofer, *The Science of Blockchain*, Inverted Forest Publishing; 1st edition, 2016
5. Malanie Swan, *Blockchain: Blueprint for a New Economy*, O' Reilly, 2015
6. Jon Bodner, *Learning Go: An Idiomatic Approach to Real-World Go Programming*, O'Reilly, 2021
7. Alan A. A. Donovan and Brian W. Kernighan, *The Go Programming Language*, Addison-Wesley Professional; 1st edition,2015

B23-CSE-507 Data Communication and Networking

Maximum marks: 70 **External:** 50
Time: 3 hours **Internal:** 20
Credit: 4

Course Objectives:

1. ***To understand the Computer Networks and various types.***
2. ***To provide an overview OSI and TCP/IP Models.***
3. ***To understand the Communication model and Switching.***
4. ***To provide an overview of Data Link Layer and Wireless LAN protocol.***
5. ***To understand the concept of Network layer, Routing and Scheduling.***

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Introduction to Computer Networks and its uses, Network categorization and Hardware: Broadcast and point-to-point networks, Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Internetworks, Topologies, Wireless networks, Network Software: Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Comparison of OSI and TCP/IP Models. Introduction to Example Networks: Internet, Connection-Oriented Networks – X.25, Frame Relay, ATM.

UNIT-II

Data Communication Model, Digital and Analog data and signals, bit rate, baud, bandwidth, Nyquist bit rate, Guided Transmission Media – Twisted Pair, Coaxial cable, Optical fiber; wireless transmission – Radio waves, microwaves, infrared waves; Satellite communication.
Switching: Circuit Switching, Packet Switching; Multiplexing: Frequency Division Multiplexing Time Division Multiplexing, Synchronous and Asynchronous TDM, Modems, Transmission Impairments, Manchester and Differential Manchester encoding, ADSL Versus Cable.

UNIT-III

Data Link Layer Design issues: Framing, error control, Flow Control, Error Detection and correction; Elementary Data Link Protocols, Sliding Window Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols, Limited Contention Protocols; Wavelength division Multiple access protocol, Wireless LAN Protocol: MACA; IEEE 802.3 Ethernet, IEEE 802.4 Token Bus; IEEE 802.5 Token ring, Binary Exponential Backoff algorithm, Digital Cellular, Radio: Global System for Mobile Communication (GSM), Code Division Multiple Access(CDMA), Fiber Distributed Data Interface, Distributed Queue Dual Bus (DQDB).

UNIT-IV

Network Layer, Design issues , Virtual Circuit and Datagram Subnet, Routing Algorithms, Optimality principle, Shortest path Routing, Flooding , Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast and Multi Cast Routing, Routing for Mobile hosts, Routing in Adhoc Networks,, congestion Control Algorithms, General Principals Traffic Shaping, Leaky bucket token bucket, choke packets, Load Shedding.

Suggested Readings:

1. Singh, B., " *Data Communication and Networking: Understanding Network Architecture, Design, and Management "*, BPB Publication, 1st Edition, 2024
2. Andrew S. Tanenbaum, "*Computer Networks"*, Pearson, 6th Edition, 2021
3. Behrouz A Forouzan, "*Introduction to Data communications and Networking*", Tata Mc-Graw Hill, 4th Edition., 2013
4. Prakash C. Gupta, *"Data Communications and Computer Networks", PHI, 2006.*