SYLLABUS

MCA

1st SEMESTER

Session 2021-2022

Mission of SCS&IT, DAVV

To produce world-class professionals who have excellent analytical skills, communication skills, team building spirit and ability to work in cross cultural environment.

To produce international quality IT professionals, who can independently design, develop and implement computer applications.

Professionals who dedicate themselves to mankind, who are environment conscious, follow social norms and ethics.

School of Computer Science & IT,
Devi Ahilya Vishwa Vidyalaya, Indore
www.scs.dauniv.ac.in

Course Name MCA 1st Semester
Subject Code: CS-4009
Subject Name: Computer Organization and Architecture

Aim of the Subject

This course aims to give an understanding of the basic computer architecture, leading to strong foundation of assembly language, operating system, compilation process, performance aspects of software, IOT & Cloud Computing.

Objectives

- To develop understanding of core concepts of computer architecture from instruction execution viewpoint & memory interaction leading to basics of assembly language programming
- To develop understanding of different architectural styles, pipelining, various memory technologies
- To build foundation of IOT & Cloud basics from architecture point of view

Learning Outcomes

1. Students should understand the computer architecture, CPU-memory interaction, instruction execution process through assembly language of 8088 microprocessor.
2. Students should be able to understand different CPU Architectures like instruction pipelines, RISC/CISC, Cache memory, placement/replacement policies, cache coherence issues, memory technologies.
3. Students should be able to learn the basic concepts of IOT & Cloud so as to build strong foun-dation of these subjects from computer architecture point of view

Unit 1

Computer Organization: Digital and Analog computers, Major components of a digital computer, Memory addressing capability of a CPU, Word length of a computer, Processing speed of a CPU. Technological trends. Von Neumann model, Functional units and components in computer organization: The memory unit, the input and output subsystem, the bus structures, design of ALU in context of 8088 microprocessor.

Unit 2

Introduction to 8088/8086 Microprocessor: Architecture, Register Architecture: Accumulator, GPR, PC, IR, SP and Flag Register. Various instruction classification: Instruction Format, Opcode, Operand and Hex code. Addressing modes, Introduction to Assembly Language Programming: Instruction Operation Status, Various Instruction Sets: Data Transfer Group Instructions, Arithmetic Group

Instructions, Logical Group Instruction, Branch Group Instructions: Conditional and Unconditional and Machine control Instructions, interrupts, Direct memory access.

Unit 3

Micro-Operations, Functional Requirements, Processor Control, Hardwired Implementation, Micro-programmed Control, Introduction to RISC and CISC Architecture, Instruction pipelining: Instruction pipelining hazards, data dependency hazards and control hazards, overcoming hazards. Internal Memory: RAM, SRAM and DRAM, Interleaved and Associative Memory, Cache Memory: Data caches, instruction caches and unified caches, cache implementations, fully associative and direct mapped caches, write back versus write through caches.

Unit 4

Understanding IoT fundamentals, IoT architectures and protocols, Working of sensors and actuators, , Sensor Networks, Machine-to-Machine Communications, Interfacing with Arduino, Raspberry Pi, NVIDIA Jetson Nano (GPU) etc., Cloud platform for IoT, IoT Applications.

Unit 5

Grid Computing : data and computational grids, Grid architecture and its relations to various distributed technologies, Cloud computing : Evolution of cloud computing, Comparison with traditional computing architecture (client/server), Services provided at various levels, Parallel Computing : Flynn's Classification of Computer Architecture, Types of Parallelism, Parallel programming models.

Text Book(s)

1. Computer System Architecture, M. Morris Mano, Pearson Education.
2. Computer Organization & Architecture, William Stallings, 8e, Pearson Education.
3. Microprocessor Architecture, Programming and Applications with 8085/8080 by Ramesh S. Gaonkar.
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
5. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
6. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed System: Principles & Paradigms, Prentice Hall, 2007.

Reference Material(s)

Online Material will be provided as and when required.

Course Name MCA 1st Semester
Subject Code: CS-4122
Subject Name: Mathematical Foundation for Computer Application

Aim of the Subject

To develop logical and mathematical concepts commonly required in many areas of Computer Science.

Objectives

1. To be familiar with Propositions, Predicates and Set theory.
2. To provide the concept of Vector Spaces and Vector Subspaces those are mandatory in the area of Machine Learning.
3. To be able to form a strong base o f Mathematical Induction and Recurrence
Relations, so as to implement them easily in algorithms.
4. To understand Functions and Relations and consequently, their importance in Computer Science.
5. To explore Probability and Statistical analysis that will help in various
applications of Computer Science.

Learning Outcomes

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Unit 1

Logics, Prepositions, Predicates and Quantifiers. Introduction to Set theory, Set
Operations, Fuzzy Sets.
Introduction to Vector Spaces, General properties of Vector Spaces, Vector Subspaces.
Introduction to methods of Proof, Mathematical Induction, use of Mathematical Induction to solve different problems.

Unit 2

Functions, One-to-One Functions, Onto Functions, Inverse Function, Composition of Functions. Recurrence Relations, solving Recurrence Relations, Applications of Recurrence Relation. Basic understanding of Complexities, Complexity and analysis of various basic algorithms.

Unit 3

Relation, importance of Relations in Computer Science, properties and applications of Relations, Closures of Relations, Equivalence Relations, representing Relations,

Relation matrix, Relation graph, Composite relation, Operations on relations- union, intersection and join.

Unit 4

Correlation, Coefficient of Correlation, Rank Correlation, Partial and Multiple Correlations. Regression, Regression Coefficient, Lines of Regression. Curve fitting, methods of Least Square for fitting different Curves.

Unit 5

Conditional Probability, Bayes' Rule, Discrete and Random variables. Discrete Probability Distributions- Binomial Distribution, Poisson Distribution, Uniform Distribution etc. Continuous Probability Distributions- Rectangular, Gaussian Distribution, Gamma Distribution, Beta Distribution etc.

Text Book(s)

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, McGraw-Hill Education, ISBN: 9780070681880, 0070681880
2. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", 12th Edition, Sultan Chand & Sons, ISBN: 9789351611738, 9351611736
3. David C. Lay, "Linear Algebra and Its Applications", Pearson Education Limited, 4th Edition, ISBN: 9781292020556, 1292020555

Reference Material(s)

1. Jay L. Devore, Kenneth N. Berk, "Modern Mathematical Statistics with Applications", 2nd Edition, Springer New York, ISBN: 9781461403913, 146140391X
2. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, "An Introduction to Probability and

Course Name MCA 1st Semester
Subject Code: CS-4209
Subject Name: Data Structures using C++

Aim of the Subject

The aim of this course is to give you a feel for algorithms and data structures.student should end it appreciating that understanding the algorithm and data structures used for some problem is much more important than knowing the exact code for it in some programming language. Student should be aware of the fact that there are often several algorithms for some problem, and one algorithm may be better than another or one algorithm better in some circumstances and another better in others.

Objectives

The objectives are that student should know something of all of these by the end of the course. Student should be aware of algorithms and data structures: sorting and searching algorithms, categorizing efficiency in time and memory use, linked list and tree data structures, hash tables, stacks and queues. As well as knowing about them, student should be familiar enough with the concepts that should you need to take any of them further and make use of them, student will be able to do so.

Learning Outcomes

Student writes generalized code expressing an algorithm or data structure in a way that may be used in a variety of real-world situations. Come to know how to work out the efficiency of an algorithm, though we won't cover detailed formal analysis.

Unit 1

Introduction to Data Structure: Concepts of Data and Information, Classification of Data structures, Abstract Data Types, Data structures operations. Algorithms, Algorithm complexity notations like big Oh, Theta, and Omega. Time Complexity, Big –Oh -notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time. Implementation aspects: Memory representation. Static and Dynamic implementations. Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi dimensional array, Sparse Matrices, Pointer & Structure.

Unit 2

Stacks, Queues and Lists Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples : Infix, postfix, prefix representation, Applications : Mathematical expression Evaluation Definition: Queues & Lists: Array based implementation of Queues / Lists, Linked List implementation of Queues /

Lists, Circular implementation of Queues and Singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority queues , Applications.

Unit 3

Trees & Graphs Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal; pre-order, post-order, in-order traversal, Binary Search Trees, Implementations, Threaded trees, AVL Trees, Implementations , Balanced multi way search trees, Applications Definition of Undirected and Directed Graphs and Networks, The Array based implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal –Breadth first Traversal, Depth first Traversal, Connectivity of graphs; Connected components of graphs, Weighted Graphs, Applications.

Unit 4

Introduction to Recursion, Divide and Conquer Algorithm, Evaluating time Complexity. Straight Sequential Search, Binary Search, non –recursive Algorithms, recursive Algorithms, Indexed Sequential Search. Definition, Hash function, Collision Resolution Techniques, Hashing Applications.

Unit 5

Sorting Algorithms Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Efficiency of algorithms, Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays, The merge sort Algorithms, Quick sort Algorithm, Analysis of Quick sort, Picking a Pivot, A partitioning strategy, Heap sort, Heap Construction, Heap sort, bottom –up, Top –down Heap sort approach, Radix sort.

Text Book(s)

1.Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub, 6thEdition.
2.How to Program C++ by Paul Deitel , Harvey Deitel, Prentice Hall; 8 edition.

Reference Material(s)

1.Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum'soutline by TMH 2006,Special Indian Edition.
2.Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.

Course Name MCA 1st Semester
Subject Code: CS-5511
Subject Name: Operating Systems

Aim of the Subject

general understanding of structure of modern computers purpose, • structure and functions of operating systems • Illustration of key OS aspects by example

Objectives

1. To provide opportunity for the study of modern methods of information processing and its applications;
2. To acquaint students with knowledge of the computer systems with emphasis on their uses and limitation;
3. To develop among students the programming techniques and the problem solving skills through programming;
4. To foster among students an interest and confidence in using computers;
5. To encourage an understanding of the implications of computers in the modern world;
6. To prepare students who wish to go on to further studies in computer science and related subjects.

Learning Outcomes

By the end of the course student should be able to describe the general architecture of computers describe, contrast and compare differing structures for operating systems understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files.

Unit 1

Introduction: Evolution of operating systems, operating system concepts; activities, functions and services of operating system; Computer Systems: Mainframe, Desktop, Multiprocessors, Distributed, Clustered, Real time and Hand held systems. Compu ter Sys tem Opera tions, Storage hierarchy, Hardware pro tec tion, System calls,
System structures. Process Management: Process concepts, Process scheduling, Operation on processes.

Unit 2

Cooperating processes, Inter-process communication. Threads: multithreading models, threading issues, thread examples. CPU Scheduling: concepts, scheduling

criteria, scheduling algorithms, algorithm evaluation. Process synchronization: Critical section problem, Mutual exclusion and synchronization Techniques of inter process: Synchronization hardware, semaphore, classical problems of synchroniza tion, cri tical regions and moni tors. Deadlock: deadlock characterization,
deadlock handling methods.

Unit 3

Memory Management: Concepts, single user memory management. Partition memory allocation: paging, segmentation and segmentation with paging, Virtual memory management: concept, demand paging, process creation, page replacement, allocation of frames and thrashing.

Unit 4

File Management: File concepts, access methods, directory structure, file system mounting, sharing and protection of files. File system structure and implementation, allocation methods, free space management, reliability of file system. Unix file system.

Unit 5

Device Management: Goals of input/output software design, Structure of device
hardware and software. Layers of I/O software, structure of device drivers, Disk
driver, disk arm scheduling algorithms, terminal driver, clock driver etc.

Text Book(s)

1. A. Silberschatz, P. Galvin and Gagne, Operating System Concepts, Addison Wesley, 6th Edition, 1994.

Reference Material(s)

1. Operating systems, 4rth Edition, William Stallings, Pearson Education, 2003.

Course Name MCA 1st Semester
Subject Code: IC-4916
Subject Name: Communication Skills and Report Writing

Aim of the Subject

To improve the confidence, communication skills and presentation capabilities of students that will help them in placements and corporate life.

Objectives

To develop effective communication skills in students which will help them in facing interviews and group discussions

Learning Outcomes

1. Improved skills in personal interviews and group discussions
2. Development of power of expression

Unit 1

Fundamentals of Communication :
Definitions, Importance, Forms of communication, Process of communication, Channels, Barriers and Strategies to overcome barriers of communication

Unit 2

Listening:
Definitions, Importance, Benefits, Barriers, Approaches, Exercise and cases.
Group Discussions :
Definitions, Importance, Process, Points to be borne in mind while participating, Do's and Don'ts.

Unit 3

Presentation Skills :
Do's and Don'ts.
Interviews:
Types of Interviews, Points to be borne in mind as an Interviewer or an Interviewee. Commonly asked questions. Do's and Don'ts.

Unit 4

Transactional Analysis, Johari Window.
Written Communication:
Report Writing, Business Correspondence, Preparation of Manuals and Project Report, Minutes of meeting, Notes and Circulars.

Unit 5

Intense practice of Presentations, Group Discussions and Interviews.

Text Book(s)

1. Communication – K. K. Sinha
2. Organizational Behavior - Fred Luthans
3. Organizational Behavior - Stephen Robbins

Reference Material(s)

1. Communications Skills – M.V. Rodrigues
2. Business Communication - Lesikar and Flately

SYLLABUS

MCA

2nd SEMESTER

Session 2021-2022

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Course Name MCA 2nd Semester
Subject Code: CS-4405
Subject Name: Database Management System

Aim of the Subject

The student should learn database design and information retrieval concepts and apply these concepts in complex projects involving large database.

Objectives

- To present necessary concepts for database designing.
- Design conceptual, logical database model and physical model.
- Evaluate set of query using SQL and algebra.
- Concepts of RDBMS, and learn Object oriented modelling.
- To introduce transaction management and concurrency.
- To introduce storage structure and file management.
- To introduce query optimization and query processing.
- To introduce data mining and data warehousing.

Develop any multi-phased project as a part of a team

Learning Outcomes

1. Introduction provides the general overview of the nature and purpose of database systems. We explain how the concept of the database systems. We explain how the concept of database system has developed, what the common features of the database system are, what the database system does for the user, and how a database system interfaces with operating systems.
2. Database design provides the overview of the database-design process, with major emphasis on the database design using the entity relationship data model. Entity relationship data model provides a high level view of the issues in database design.
3. Relation database introduces the relational model of data, covering basic concepts as well as the relational algebra. A brief introduction to integrity constraints and focus on the most influential of the user- oriented relational languages: SQL.
4. SQL provide how to interface between a programming language and the database supporting SQL.
5. Introduction to the theory of relational database design. The theory of functional dependencies and normalization is covered, with emphasis on the motivation and intuitive understanding of each normal form. An overview of relational design and relies on an intuitive understanding of logical implication of functional dependencies. This allows the concept of normalization to be introduced prior to full coverage of functional dependency theory.

6. Transaction management focuses on the fundamentals of a transaction-processing system, including transaction atomicity, consistency, isolation, and durability as well as the notion of serializability. Focuses on concurrency control and presents several techniques for ensuring serializability, including locking, timestamping, and optimistic techniques.
7. Data storage and querying deals with disk, file, and file-system structure. A variety of data access techniques including hashing and B+ tree indices. Query-evaluation algorithms and query optimization provides an understanding of the internals of the storages and retrieval components of a database.

Unit 1

Introduction and Relational Model: Advantages of DBMS approach, various views of data, data independence, schema & sub-schema, primary concept of data models, database languages, transaction management, database administrator &user, data dictionary, database structure & architectures. Relational Model: Domains, relation, kind of relation, Relational databases, Various types of keys: candidate, primary, alternate & foreign keys, relational algebra with fundamental and extended operations, modification of database.

Unit 2

ER Model and SQL: Basic concept, design issues, mapping constraint, keys, ER diagram, weak& strong entity-sets, specialization & generalization, aggregation, inheritance, design of ER schema, Reduction of ER Schema to tables. SQL: Basic structure of SQL, Set operation, Aggregate functions, Null values, Nested Sub queries, derived relations, views, Modification of database, join relation, Domain, relation & keys, DDL in SQL. Programming concepts of PL/SQL, Stored procedure, Database connectivity with ODBC/JDBC 9. The concept of NoSQL, Brief history of NoSQL, SQL verses NoSQL, CAP Theorem (Brewer's Theorem), NoSQL pros/cons, Categories of NoSQL database, Production deployment, MongoDb, Key Features, practical with MongoDb.

Unit 3

Functional Dependencies: Basic definitions, Trivial & non trivial dependencies, closure set of dependencies & of attributes, Irreducible set of dependencies, FD diagram. Normalization: Introduction to normalization, non loss decomposition, First, second and third normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, join dependencies and fifth normal form.

Unit 4

Transaction Management: Basic concept, ACID properties, transaction state, Implementation of atomicity & durability, Concurrent execution, Basic idea of serializability. Concurrency & Recovery: Basic idea of concurrency control, the basic

idea of deadlock, Failure Classification, storage structure-types, stable storage implementation, data access, recovery & Atomicity: log based recovery, deferred database modification, immediate database modification, checkpoints.

Unit 5

Database Integrity, Storage Structure & File Organization: general idea, integrity rules, Domain rules, Attributes rules, assertion, trigger, integrity & SQL. Storage Structure: overview of physical storage media, magnetic disk: performance & optimization, RAID. File Organization: File organization, Organization of records in files, the basic concept of Indexing, ordered indices: B+ tree & B tree index files.

Text Book(s)

1. Database System concepts –Henry F. Korth , Tata McGraw Hill 6th Edition.

Reference Material(s)

1. “Fundamentals of Database Systems”, Elmasri R, Navathe S, Addison Wesley 4th Ed.
2. An introduction to database system-Bipin C. Desai
3. An introduction to Database System -C.J Date
4. SQL, PL/SQL The programming language of Oracle-Ivan Bayross

Course Name MCA 2nd Semester
Subject Code: CS-4305
Subject Name: Software Engineering

Aim of the Subject

Enable students to develop softwares using software develop life cycle

Objectives

1. Explain the importance of software engineering.
2. Understand the project planning and management in software development.
3. Practice function oriented and object oriented analysis and design.
4. Get insight into the testing and quality assurance approaches.
5. Learn the importance of software maintenance.

Learning Outcomes

1. Understand the application of software engineering approaches in software development.
2. Ability to plan and estimate projects.
3. Analyze and design software.
4. Produce quality software using testing and quality assurance mechanisms.
5. Understand the importance of software maintenance.

Unit 1

Introduction to Software Engineering and Software Processes: Software, Software Classifications and Characteristics, Software Crisis, What is Software Engineering? System Engineering Vs. Software Engineering, Software Engineering Challenges. Software Processes: Process model, Elements and Characteristics of Process model, Process Classification, Software Development Processes: SDLC, Waterfall model, Iterative Waterfall model, Prototyping model, Incremental model, Spiral model, RAD model, Agile Software Development: Principles, Practices & Methods; RUP process model, Component-Based Development model etc.

Unit 2

Project Management and Planning: Project management essentials, Project success and failures, Project Life Cycle, Project team structure and organization, Software Configuration Management, Risk Management. Project planning activities: Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques, Staffing and Personnel Planning, Project Scheduling and Miscellaneous Plans.

Unit 3

Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation. Requirements Analysis: Structured Analysis,

Object-oriented Analysis. Requirements Specification, Requirements Validation, and Requirements Management.

Unit 4

Software Design and Coding: Software Design Process, Characteristics of a Good Design, Design Principles, Modular Design (Coupling and Cohesion). Software Architecture. Design Methodologies: Function-oriented Design (Structured Design Methodology) and Object-oriented Design using UML, Logical Design. Coding principles, Coding process, Code verification and documentations.

Unit 5

Software Testing, Quality and Maintenance: Testing Fundamentals, Test Planning, Black-Box Testing, White-Box Testing, Levels of Testing, Usability Testing, Regression Testing, Program Slicing, Debugging Approaches. Quality Concept, Quality Factors, Verification and Validation, Quality Assurance Activities, Quality Standards: Capability Maturity Model (CMM), ISO 9000, Six Sigma. Best practices of Software Engineering. Software Reliability, Software Maintenance, Evolution, and Reengineering.

Text Book(s)

1. Software Engineering: Concepts & Practices- Ugrasen Suman, Cengage Learning, 2nd Edition.
2. Fundamentals of Software Engineering-Rajib Mall, PHI, New Delhi.
3. Object Oriented Analysis and Design Using UML, Ugrasen Suman et al, Cengage Learning.

Reference Material(s)

1. An Integrated Approach to Software Engineering- Pankaj Jalote, Narosa Publishing House.
2. Software Engineering-A practitioner's approach- R. S. Pressman, Tata McGraw-Hill International Editions, New York.
3. Object Oriented Analysis and Design with A

Course Name MCA 2nd Semester
Subject Code: CS-5216
Subject Name: Design and Analysis of Algorithm

Aim of the Subject

The aim is to teach the basic concepts of algorithms.

Objectives

The objective of the course is to teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm. In addition, the analysis of the algorithm will be used to show the efficiency of the algorithm over the naïve techniques.

Learning Outcomes

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.

Unit 1

Recall of asymptotic notation, big-oh, theta, big-omega, and introduce little-oh and little-omega. Worst case and average case complexity

Unit 2

Divide and Conquer: Integer multiplication revisited with an efficient algorithm that motivates and leads into recurrences. Solving recurrences using recurrence trees, repeated substitution, statement of master theorem. Brief recall of merge sort and its recurrence. Median in worst case linear time.

Unit 3

Application of Graph Traversal Techniques: Recall representation of graphs, BFS (as a method for SSSP on unweighted graphs), DFS, connected components, topological sorting of DAGs, biconnected components, and strongly connected components in directed graphs Greedy Algorithms: Greedy choice, optimal substructure property, minimum spanning trees -- Prims and Kruskals, Dijkstra's shortest path using arrays and heaps, fractional knapsack, and Huffman coding (use of priority queue).

Unit 4

Dynamic Programming: Integral knapsack (contrasted with the fractional variant), longest increasing subsequence, Edit distance, matrix chain multiplication, and independent sets in trees. (The instructor may choose a subset that fits within the time frame.)

Unit 5

NP-completeness: reduction amongst problems, classes NP, P, NP-complete, and polynomial time reductions

Text Book(s)

[1] Introduction to Algorithms, by Cormen, Leiserson, Rivest, and Stein, MIT Press, Third Edition, 2009. [CLRS]

Reference Material(s)

[1] Algorithms, by Dasgupta, Papadimitrou and Vazirani, McGraw-Hill Education, 2006.
[2] Computer Algorithms, by Horowitz, Sahni, and Rajasekaran, Silicon Press, 2007.

Course Name MCA 2nd Semester
Subject Code: CS-5613
Subject Name: Computer Networks

Aim of the Subject

Understand the fundamental concepts and basic principles of computer networks.

Objectives

1. Develop a knowledge of the function of basic concepts of computer network systems.
2. Understanding basic design principles in network protocols and Internet protocols.
3. Gain an understanding of the principles of operation of a wide variety of network technologies.
4. Develop an appreciation of how network services are developed and a knowledge of their uses.

Learning Outcomes

1. Familiarity with network terminologies, reference model, applications of network, design issues and computer network working.
2. Knowledge of Data link layer design issues, Framing, Error correction and Detection techniques.
3. Meaning of flow control and its methods.
4. Problems associated with broadcast network and multiple access control protocols.
5. Knowledge of LANs.
6. Design issues related to Network layer like routing, addressing and their protocols.
7. Introductory knowledge of Transport layer protocols like TCP and UDP.
8. Idea about client server architecture and working of DNS, HTTP and E Mail.
9. Security issues in computer network and Introduction to Cryptographic algorithms and Digital Signature.

Unit 1

Introduction: Overview, Goal and Applications of Computer Networks; Network Classification - LAN, MAN, WAN, Internetworks and topologies; Network Software - Protocol hierarchies, Design issues for the layers, Connection Oriented and Connection less services, Service primitives, Relationship between Services and Protocols; Switching Techniques – Circuit Switching and Packet Switching;

Reference models – OSI and TCP/IP, comparison and critique of OSI and TCP/IP reference models.
Physical layer: Guided Transmission Media- Magnetic Media, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics; Wireless Transmission- Electromagnetic Spectrum, Radio Transmission, Microwave Transmission; digital modulation and multiplexing; The public switched telephone network - Structure of telephone network; The mobile telephone system - Generations of mobile phones.

Unit 2

Data Link Layer: Design issues – Services, Framing, Error Control and Flow Control; Error Detection Techniques - Parity Check and Cyclic Redundancy Check (CRC); Error Correction Technique - Hamming code; Elementary Data Link Protocols - Unrestricted Simplex Protocol, Simplex Stop-and-Wait Protocol; Sliding Window Protocols - One-Bit Sliding Window Protocol, protocol using Go Back N and Selective Repeat; Data link layer in the Internet - PPP.

Unit 3

Medium Access Sublayer: Channel Allocation problem; Multiple access protocols- Pure Aloha, Slotted Aloha, CSMA Protocols, CSMA/CD, Collision-Free Protocols, wireless LAN protocols; IEEE MAC Sublayer protocols - Ethernet, Fast Ethernet, Gigabit Ethernet, wireless LANs and broadband wireless, Bluetooth; High speed LANs – Fast Ethernet, FDDI; Wireless LANs; Data Link Layer Switching – Bridges and Switches, their difference with Repeaters, Hubs, Routers and Gateways.

Unit 4

Network Layer: Design issues - Store-and-forward packet switching, services, implementation of connectionless and connection-oriented service, VC and datagram networks; Routing algorithms - Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, routing in Mobile hosts, routing in Ad Hoc networks; Congestion Control algorithms - General principle of Congestion control, leaky bucket algorithm, Token Bucket Algorithm; Internetworking - network difference, network connection, tunneling; The Network Layer in the Internet - Internet Protocol, Internet addressing and Internet Control protocols, ARP, DHCP and Mobile IP, Internet routing protocols - RIP, OSPF, BGP.

Unit 5

Transport Layer: Transport Services; Elements of transport protocols - Addressing, Connection establishment, Connection release, Error control and Flow control, Multiplexing; The Internet Transport Protocols - UDP and TCP, The TCP Service Model, The TCP Protocol.

Application layer: DNS, E-mail Protocols (SMTP, POP3, IMAP, MIME), WWW and HTTP, FTP, TELNET; Network Security - Cryptography, Symmetric Key Algorithms, Public key Algorithms and Digital Signatures.

Text Book(s)

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition,

Reference Material(s)

1.Pearson-Prentice Hall, 2011. 1. Behrouz A. Frouzan, Data Communications and Networking, McGraw-Hill Education, 5th Edition, 2013.
2. William Stallings, Data and Computer Communications, Pearson-Prentice Hall, 8 th Edition, 2007.
3. James F. Kurore & K

Course Name MCA 2nd Semester
Subject Code: CS-5617
Subject Name: Internet and Web Technology

Aim of the Subject

To give students a good understanding of basic concepts of object-oriented program design with the help of real world problem solving using JAVA. Enable students to develop web applications through web technology and database collaboration, especially through JSP and Servlet.

Objectives

To Briefly describe any course development objectives that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field). As the technologies in Java are changing frequently so with the textbook, latest changes will also be incorporated in the course using web-based material. Students will also be given programming examples and exercises on every topic. The programming assignments will be checked every week in the computer-lab.

Learning Outcomes

1. Understand basic principles of object-oriented program design using Java.
2. Understand the basic and some advanced issues related to writing classes and methods such as data, visibility, scope, method parameters, object references, and nested classes.
3. Understand the basic ideas behind class hierarchies, polymorphism, and programming to interfaces.
4. Get exposure to exceptions and basic I/O streams.
5. Understanding the concept and configuration of servers and web technology basics and their challenges.
6. Understanding various concepts related to collaboration, database handling inside web application.
7. Develop solid Java programming skills and the ability to put in practice the acquired knowledge and understanding of the Java language, object- oriented design and web applications in relatively simple case studies

Unit 1

Introduction to Java: Features of Java, Object-oriented Programming Overview, Introduction of Java Technologies, JVM architecture and its components, Java Program structure, Tokens, Control Constructs, Memory concepts, Introduction to Class, Objects, Methods and Instance Variables,

Naming Conventions, Constructors, Method Overloading, Static Method, Static Field, Math Class, this reference, Garbage collection and finalize. String Handling: The String Constructors, String Operations, Character Exaction, String Comparison, String Buffer. Arrays: Creating an array, Enhanced for Statement, Passing Multidimensional Arrays, Variable-Length Argument lists, Using Command-line Arguments. Wrapper Class: Introduction to wrapper classes. Inheritance: Relationship between Super classes and Subclasses, Using super, Constructor in Subclasses, The Object Class, Object Copying in Java. Polymorphism: Method Overriding, Upcasting, Dynamic Method Dispatch, final Field, Method and classes, Abstract classes and Methods.

Unit 2

Packages and Interfaces: Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, Creating own Packages. Defining an Interface, Properties of Interface, Advantages of Interface Achieving Multiple Inheritance through Interfaces, Variables in Interfaces, Exception Handling: Introduction, keywords, Types of Exceptions, Java Exception Hierarchy, finally Block, Chained Exceptions, Declaring new Exception Types. Streams and Files: Introduction, Data Hierarchy, Files and Streams, Sequential-access Text Files, Object Serialization, Random-Access files, Java Stream Class Hierarchy. Applets: Applet Basics, Applet Architecture, Applet Life Cycle Methods, Applet HTML Tag and Attributes, Executing Applet in Web Browser and in Appletviewer.

Unit 3

Multithreading: Introduction, Java Thread Model, Thread priorities, Thread life cycle, Creating Thread, Thread Execution, Thread Synchronization, Inter-Thread Communication. Introduction To GUI: Introduction, Overview of swing Components, Introduction to Event Handling, Common GUI Event Type and Listener Interfaces, Adapter Classes, Layout Managers, Database connectivity through different databases.

Unit 4

Introduction to HTTP, web Server and application Servers, Installation of Application servers, Deployment Descriptors, The Generic Servlet, Lifecycle of Servlet. Servlet Packages, Classes, Interfaces and Methods, Handling Forms with Servlet. Session handling API, Servlet Collaboration, Attributes and various scopes of an Attribute

Unit 5

JSP Basics: JSP lifecycle, Directives, scripting elements, standard actions, implicit objects, Session handling in JSP, Separating Business Logic and Presentation Logic, Building and using JavaBean. MVC Architecture, Database operations handling in Web applications.

Text Book(s)

1. M. Hall, L. Brown, “Core Servlets and Java Server Pages”, 2nd edition, Pearson Education
2. Java 2: The Complete Reference by Herbert Schildt, Tata McGraw-Hill, 8th Edition, 2011.

Reference Material(s)

1. C. Bauer, G. King, “Hibernate in Action”, Manning Press
2. B. Basham, K. Sierra, B. Bates, “Head First Servlet and JSP”, 2nd Edition, O'Reilly Media.
3. The Java Programming Language, Ken Arnold , James Gosling , David Holmes,

SYLLABUS

Master of Computer Applications

3rd SEMESTER

Session 2021 - 2022

Mission of SCS&IT, DAVV

To produce world-class professionals who have excellent analytical skills, communication skills, team building spirit and ability to work in cross cultural environment.

To produce international quality IT professionals, who can independently design, develop and implement computer applications.

Professionals who dedicate themselves to mankind, who are environment conscious, follow social norms and ethics.

School of Computer Science & IT,
Devi Ahilya Vishwa Vidyalaya, Indore
www.scs.dauniv.ac.in

Course Name: MCA 3rd Semester
Subject Code: CS-5717
Subject Name: Artificial Intelligence and Machine Learning

Aim of the Subject

To teach the fundamentals of Artificial Intelligence & Machine Learning

Objectives

Artificial Intelligence & Machine Learning explores the concepts and algorithms at the foundation of modern artificial intelligence, diving into the ideas that give rise to technologies like game-playing engines, handwriting recognition, and machine translation. Through hands-on projects, students gain exposure to the theory behind graph search algorithms, classification, optimization, reinforcement learning, and other topics in artificial intelligence and machine learning as they incorporate them into their own programs. By course's end, students emerge with experience in libraries for machine learning as well as knowledge of artificial intelligence principles that enable them to design intelligent systems of their own.

Learning Outcomes

By course's end, students emerge with experience in machine learning as well as knowledge of artificial intelligence principles that enable them to design intelligent systems of their own.

Unit 1

Overview of AI: AI: past, present, and future. Search: Depth-First Search, Breadth-First Search, Greedy Best-First Search, A* Search, Adversarial Search, Alpha-Beta Pruning, Depth-Limited Minimax. Knowledge: Knowledge- Based Agents, Propositional Logic, Inference, Knowledge Engineering, Inference Rules, Knowledge and Search Problems, Resolution, First Order Logic.

Unit 2

Uncertainty: Probability, Conditional Probability, Random Variables, Bayes' Rule, Bayesian Networks, Inference, Sampling, Likelihood Weighting, Markov Models, Hidden Markov Models. Optimization: Local Search, Hill Climbing, Simulated Annealing, Traveling Salesman Problem, Linear Programming, Constraint Satisfaction, Backtracking Search

Unit 3

Neural Networks: Activation Functions, Neural Network Structure, Gradient Descent, Multilayer Neural Networks, Backpropagation, Overfitting, Computer Vision, Image Convolution, Convolutional Neural Networks, Recurrent Neural Networks.

Unit 4

Machine Learning : Definition and overview, Regression, Simple Linear Regression, Multiple Regression, Assessing Performance, Ridge Regression, Feature Selection & Lasso, Nearest Neighbors & Kernel Regression

Unit 5

Machine Learning : Classification, Linear Classifiers & Logistic Regression, Learning Linear Classifiers, Overfitting & Regularization in Logistic Regression, Decision Trees, Handling Missing Data, Boosting.

Text Book(s)

[1] Artificial Intelligence: A Modern Approach (3rdedition), Russell and Norvig
[2] Tom Mitchell, Machine Learning, First Edition, McGraw Hill. 1997

Reference Material(s)

CS 50 CS50's Introduction to Artificial Intelligence with Python mooc of Harvard

Course Name: MCA 3rd Semester
Subject Code: CS-6630
Subject Name: Internet of Things

Aim of the Subject

To impart knowledge with a solid theoretical foundation, and strong practical skills in the fields of computer technology, communications networks and IT, that are required to develop a wide range of IoT applications.

Objectives

1. To provide understanding of tools and technologies involved in IoT
2. To explore various applications of IoT
3. To acquaint with data modelling and security requirements in IoT environment
4. To experiment on multiple sensors using Microcontroller/Microprocessor

Learning Outcomes

1. Understand IoT concept
2. Know software components, hardware components and communication technologies involved in IoT.
3. Gain knowledge of IoT Applications and Examples.
4. Get insight of data modelling in IoT
5. Learn role of cloud computing and security requirements in IoT
6. Develop and evaluate the real life applications of IoT by preparing projects designed with the Arduino.

Unit 1

Introduction to IoT: Definition, Characteristics, IoT design principles, Physical Design of IoT - Hardware and Software components; Logical Design of IoT- functional blocks, IoT communication models, Communication APIs; IoT network architecture, IoT enabling technologies, Introduction to cloud computing in IoT, advantages and disadvantages of IoT, IoT implementation challenges.

Unit 2

Domain specific IoTs: Introduction, home automation, cities, environment, energy, retail, logistics, agriculture, industry, health and lifestyle.
IoT and M2M: Introduction, machine-to-machine Communication, difference between IoT and M2M; SDN and NFV for IoT - Software Defined Networking, Network Function Virtualization.

Unit 3

Data Acquiring, Organizing and Processing: Introduction, data generation, data acquisition, data validation; Data categorization for storage, various types of data stores, organizing the data, transactions, business processes, integration; Online transactions and processing, stream processing, real-time processing, event stream processing, business process, business intelligence, distributed business process, enterprise systems, service oriented architecture(SOA).

Unit 4

Data Analytics and Machine Learning for IoT: Analytics phases - descriptive, predictive, and prescriptive analytics; Online analytical processing; Introduction to statistical and machine learning tools for data analytics; Introduction to Big data, Big data characteristics, Big data analytics.
Role of the cloud in IoT: Cloud Storage models and communication APIs for IoT, Security in IoT: Security challenges for IoT, IoT security practices.

Unit 5

Introduction to Arduino Programming: Familiarizing with Arduino Interfacing Board, configuration and architecture, Arduino IDE installation, program structure, data types, variables and constants, operators, control statements and loops, functions, strings, time, arrays, function libraries: I/O functions, Character functions, Math library, Interrupts, Communications. Integration of Sensors and Actuators with Arduino;

Text Book(s)

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-On Approach”, Universities Press (India) Private Limited, First edition, 2015.
2. Mayur Rangir, "Internet of Things - Architecture, Implementation and Security", Pearson India Education Services Pvt. Ltd. First edition, 2020.
3. Raj Kamal, “Internet of Things: Architecture and Design Principles”, McGraw Hill Education, India, First Edition, 2017.
4. Simon Monk, “Programming Arduino: Getting Started with Sketches”, McGraw Hill Publication; 1st edition, 2012.

Reference Material(s)

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press Inc., 2014.

2. Dr. Ovidiu Vermesan, Dr. Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, 2014
3. Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann, “Interconnecting Smart Objects with IP: The Next Internet”, Morgan Kaufmann Publishers, 2010
4. Michael Miller, “The Internet of Things - How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, Pearson Education Inc., 2015.
6. Tom Igoe, “Making Things Talk Using Sensors, Networks, and Arduino to see, hear, and feel your world”, Make Community, LLC; 3rd edition. 2017
7. Richard Blum, “Arduino Programming in 24 Hours”, Pearson Education; 1st edition, 2015.
8. Arduino Tutorial available at : https://www.tutorialspoint.com/arduino/index.htm

Course Name: MCA 3rd Semester
Subject Code: CS-6518
Subject Name: Cloud Computing

Aim of the Subject

To learn the main concepts, functions, key technologies, strengths, and limitations, current trends and practical's of cloud computing and the possible applications for state-of-the-art cloud computing.

Objectives

1. To understand the application and evolution of cloud computing.
2. To learn key technologies, pros and cons of cloud computing and the possible applications for state-of-the-art cloud computing.
3. To covers a series of current cloud computing technologies, including technologies for Virtualization, Infrastructure as a Service, Platform as a Service, Software as a Service.
4. To understand different cloud deployment models.
5. To study practical solutions provided by companies such as Google, Amazon, VMWare, Salesforce etc.
6. To learn the latest trends and technologies in cloud computing.

Learning Outcomes

- Learn the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
- Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
- Learn Hands-on exercises on AWS, Salesforce and Google Cloud.
- Understanding of appropriate cloud computing solutions and recommendations according to the applications.
- Learn the core issues and latest trends and technologies of cloud computing.

Unit 1

Cloud Computing definition, Types of cloud, Evolution of Cloud Computing , Applications cloud computing, Cluster Computing, Major Players in Cloud Computing, Issues and challenges in Cloud, Cloud stakeholders, SLAs, Economics of the Cloud

Cloud Models: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud. Advantages, disadvantages and applications of the deployment models.

Unit 2

Basics of Virtualization, Types of Virtualization, Virtualization using virtualbox, Virtualization Tools and Mechanisms , Creating virtual machines in AWS, Virtualization for Data-center Automation
Scalability, Load balancing, Server Management, Fault Tolerance, Cloud Watch

Unit 3

Types of Cloud services: Infrastructure as a Service: Compute Services -Virtual machines, clusters, HPC, Data Storage services and its categories- File storage, Block storage, Object storage, applications utilizing cloud storage. Network Services
Platform as a Service, Software as a Service: Applications, working, advantages and disadvantages.

Unit 4

Database as a Service, Functions as a service-Serverless Computing, Introduction to MapReduce, HDFS, Hadoop Framework. DevOps, Containers, Kubernetes.

Unit 5

Fog Computing, Edge Computing, Green Cloud
Practical's and Case Studies:
Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.
Cloud Service Providers- AWS, Microsoft Azure, Heroku, Github, Google Workspace, Salesforce

Text Book(s)

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering cloud computing: foundations and applications programming. Newnes, 2013.
2. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier – 2012

Reference Material(s)

• Cloud Computing "A Practical Approach" Anthony T. Velte, Toby J. Velte, Robert
Elsenpeter. McGraw-Hill.
• Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel
Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
• John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation,

Management, and Security", CRC Press, 2010.
- Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach",
TMH, 2009.
- Kumar Saurabh, " Cloud Computing – insights into New -Era Infrastructure", Wiley
India,2011.

Course Name: MCA 3rd Semester
Subject Code: CS-5615
Subject Name: Information Security

Aim of the Subject

The main aim of this course is to provide students with a background, foundation, and insight into the many dimensions of information security.

Objectives

1. Understand information security's importance in our increasingly computer-driven world.
2. Master the key concepts of information security and how they "work."
3. Develop a "security mindset:" learn how to critically analyze situations of computer and network usage from a security perspective, identifying the salient issues, viewpoints, and trade-offs.

Learning Outcomes

1. Explain the challenges and scope of information security;
2. Explain such basic security concepts as confidentiality, integrity, and availability, which are used frequently in the field of information security;
3. Explain the importance of cryptographic algorithms used in information security in the context of the overall information technology (IT) industry;
4. Identify and explain symmetric algorithms for encryption-based security of information;
5. Identify and explain public-key based asymmetric algorithms for encryption-based security of information;
6. Describe the access control mechanism used for user authentication and authorization;

Unit 1

Computer Security Concepts, Introduction to Information Security, Confidentiality, Integrity, and Availability, Assets and Threats etc.

Unit 2

Basic Cryptographic Concepts, Symmetric Encryption Algorithms, Purpose of Cryptography, Data Encryption Standard (DES), Triple DES, Advanced Encryption Standard (AES) etc.

Unit 3

Public-Key Encryption, Introduction to Public-Key Cryptography, Public-Key Encryption Algorithms, RSA Public-Key Algorithm, Diffie-Hellman Algorithm etc.

Unit 4

Access Control Mechanisms, Authentication, Access Control and Authorization, Security
Protocols and Solutions, Internet Protocol Security, Secure Sockets Layer, Pretty Good
Privacy.

Unit 5

Firewalls, Intrusion Detection, and Intrusion Prevention, Security Protocols and Solutions, Firewall, Host-Based IDS vs. Network-Based IDS, Network Attacks and Defense.

Text Book(s)

Stallings William, Cryptography and Network Security: Principles and Practice, 6th Edition, Pearson/Prentice- Hall.

Reference Material(s)

1. Mathew Bishop; Computer Security; Art and Science; Addison-Wisley Oct. 2007
2. Mathew Bishop; Introduction to computer Security; Addison-Wisley Oct 2004
3. Kaufman, Perlman and Speciner; “Network security”; Pearson Education 1995.
4. Atul Kahate; “Cryptography and Network Security”; Tata McGraw-Hill

Course Name: MCA 3rd Semester
Subject Code: CS-5517
Subject Name: Automata Theory and Compiler Construction

Aim of the Subject

The aim of this course is to provide students the theoretical knowledge needed to understand and analyze the behavior of discrete computing systems as well as abilities to design and implement compilers.

Objectives

1. To provide an understanding of automata, grammars, language translators.
2.To know the various techniques used in compiler construction.
3.To be aware of the process of semantic analysis.
4. To analyze the code optimization & code generation techniques.

Learning Outcomes

1. Adequate knowledge to understand abstract machine models and formal languages.
2. Basic knowledge of compilation steps; ability to apply automata theory and
knowledge on formal languages.
3. Ability to design and implement scanner modules in compilers.
4. Ability to identify and select suitable parsing strategies for a compiler for various
cases. Knowledge in alternative methods (top-down or bottom-up, etc).

Unit 1

Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Arden's theorem.

Unit 2

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler. Lexical Analysis: The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Implementation of Lexical Analyzer. The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG. Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers.

Unit 3

Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR

parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC, Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

Unit 4

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

Unit 5

Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.

Text Book(s)

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa.

Reference Material(s)

1. Michal Sipser, "Theory of Computation", Cengage learning.
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation",PHI.
3. Louden, "Compiler construction", Cengage learning.
4. A.V. Aho, R. Sethi and J.D Ullman, "Compiler: principle, Techniques and Tools", AW.
5. H.C. Holub, "Compiler Design in C", Prentice Hall Inc.

Cloud Computing
Laboratory Manual

1. Install Virtualbox/VMware Workstation with different flavour of linux or windows OS on top of windows.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Create a free account in AWS (if available) and create a virtual machine.
4. Explore data storage, server management and load balancing tools of AWS.
5. Explore Google workspace
6. Explore GitHub and Heroku.
7. Create a website using Wordpress and host it on cloud.
8. Create a free account in Salesforce(if available) and explore its functionalities.
9. Install Hadoop single node cluster and run simple applications like wordcount (Recommended).

AI & ML Assignment

1. a) Define Machine learning?Briefly explain the types of learning.
   b) Differentiate between Artificial Intelligence and Machine Learning with suitable example.

2. a) What are theadvantages and disadvantages of linear regression model?
   b) Thevaluesofindependentvariable*x*anddependentvalue*y*aregivenbelow:

X	0	1	2	3	4
Y	2	3	5	4	6

   Find the leastsquare regression line $y=ax+b$. Estimate the value of y when x is10.

3. a) Explain with example classification using backpropagation algorithm.
   b) What are issues in decision tree learning?How are they overcome?

4. a) Differentiate between supervised,unsupervised and reinforcement learning with example.
   b) Write Kmeans algorithm and separate{5,11,19,27,23,25,6,18,2,8,10,12,31,29,4}into 3clusters.

5. a) What are the elements of reinforcement learning?
   b) Describe the working behaviour of support vector machine with suitable example.

6. a) How is NaiveBayes algorithm useful for learning and classifying text?
   b) Explain Markov and auto-regressive model with example.

7. What is Intelligent Agent? Explain its structure.

8. Discuss any five *-- bot* used in everyday language along with their aim, method/ algorithm used and outcome.

9. How has AI impacted in Social Environment & our life? Illustrate with suitable cases.

10. Discuss the important features of following:
    i) XAI
    ii) Quantum Computing
    iii) Blockchain Technology
    iv) IoT

School of Computer Science & IT, DAVV

Course Scheme – August - December 2021

MCA 1st Semester – Section: A

Subject Code	Subject Name	L	T	P	C	Max. Internal marks	Max. Practical/ Project marks	Max. End Semester Exam marks	Total Marks	Faculty	LAB Faculty
CS-4009	Computer Organization and Architecture	3	1	2	5	30	20	50	100	Ms. Deepali Shukla	Ms. Deepali Shukla
CS-4122	Mathematical Foundation for Computer Application	2	1	0	4	40	-	60	100	Dr. Deepika Rai	
CS-4209	Data Structures using C++	3	1	2	6	30	20	50	100	Dr. Chaitali Uikey	Dr. Chaitali Uikey
CS-5511	Operating Systems	3	1	2	5	30	20	50	100	Mr. Mohit Varma	Mr. Mohit Varma
IC-4916	Communication Skills and Report Writing	2	1	0	3	40	-	60	100	Dr. Jyoti Jadwani	
CS-4809A	Comprehensive Viva	-	-	-	4	-	-	-	100		
	Total Credit →				**27**	Total Marks →			**600**		

For the subjects having 6 credits, minor project/ case study is compulsory.

School of Computer Science & IT, DAVV

Course Scheme – August - December 2021

MCA 1st Semester – Section: B

Subject Code	Subject Name	L	T	P	C	Max. Internal marks	Max. Practical/ Project marks	Max. End Semester Exam marks	Total Marks	Faculty	LAB Faculty
CS-4009	Computer Organization and Architecture	3	1	2	5	30	20	50	100	Ms. Deepali Shukla	Ms. Deepali Shukla
CS-4122	Mathematical Foundation for Computer Application	2	1	0	4	40	-	60	100	Dr. Deepika Rai	
CS-4209	Data Structures using C++	3	1	2	6	30	20	50	100	Ms. Tarjani Sevak	Ms. Tarjani Sevak
CS-5511	Operating Systems	3	1	2	5	30	20	50	100	Dr. Ugrasen Suman	Dr. Ugrasen Suman
IC-4916	Communication Skills and Report Writing	2	1	0	3	40	-	60	100	Dr. Jyoti Jadwani	
CS-4809A	Comprehensive Viva	-	-	-	4	-	-	-	100		
	Total Credit →				**27**	Total Marks →			**600**		

For the subjects having 6 credits, minor project/ case study is compulsory.

School of Computer Science & IT, DAVV

Course Scheme – August 2021

MCA 3rd Semester – Batch (A)

Subject Code	Subject Name	L	T	P	C	Max. Internal marks	Max. Practical/ Project marks	Max. End Semester Exam marks	Total Marks	Faculty	Lab Faculty
CS-5517	Automata Theory and Compiler Construction	3	1	2	5	30	20	50	100	Mr. Hitesh Ninama	Mr. Hitesh Ninama
CS-6518	Cloud Computing	3	1	2	5	30	20	50	100	Dr. Nitin Uikey	Dr. Nitin Uikey
CS-5715	Artificial Intelligence and Machine Learning	3	1	2	5	30	20	50	100	Dr. Deepak Abyankar	Dr. Deepak Abyankar
CS-5615	Information Security	3	1	2	5	30	20	50	100	Dr. Ajay Tiwari	Dr. Ajay Tiwari
CS-6630	Internet of Things	3	1	2	5	30	20	50	100	Ms. Pritika Bahad	Ms. Pritika Bahad
CS-5809A	Comprehensive Viva	-	-	-	4	-	-	-	100		
	Total Credit →				**29**	Total Marks →			**600**		

NOTE: For the subjects of 6 credits, minor project/ case study is compulsory.

School of Computer Science & IT, DAVV

Course Scheme – August 2021

MCA 3rd Semester – Batch (B)

Subject Code	Subject Name	L	T	P	C	Max. Internal marks	Max. Practical/ Project marks	Max. End Semester Exam marks	Total Marks	Faculty	Lab Faculty
CS-5517	Automata Theory and Compiler Construction	3	1	2	5	30	20	50	100	Dr. Chaitali Uikey	Dr. Chaitali Uikey
CS-6518	Cloud Computing	3	1	2	5	30	20	50	100	Dr. Shraddha Masih	Dr. Shraddha Masih
CS-5715	Artificial Intelligence and Machine Learning	3	1	2	5	30	20	50	100	Dr. Maya Ingle	Dr. Maya Ingle
CS-5615	Information Security	3	1	2	5	30	20	50	100	Mr. Hitesh Ninama	Mr. Hitesh Ninama
CS-6630	Internet of Things	3	1	2	5	30	20	50	100	Dr. Preeti Saxena	Dr. Preeti Saxena
CS-5809A	Comprehensive Viva	-	-	-	4	-	-	-	100		
	Total Credit →				**29**	Total Marks →			**600**		

NOTE: For the subjects of 6 credits, minor project/ case study is compulsory.

School of Computer Science & IT, DAVV

Course Scheme – January - June 2022

MCA 2nd Semester – Section: A

Subject Code	Subject Name	L	T	P	C	Max. Internal marks	Max. Practical/ Project marks	Max. End Semester Exam marks	Total Marks	Faculty	LAB Faculty
CS-4405	Database Management System	3	1	4	6	30	20	50	100	Ms. Tarjani Sevak	Ms. Tarjani Sevak
CS-4305	Software Engineering	3	1	0	4	40	-	60	100	Dr. Ugrasen Suman	
CS-5216	Design and Analysis of Algorithm	3	1	2	5	30	20	50	100	Dr. Chaitali Uikey	Dr. Chaitali Uikey
CS-5613	Computer Networks	3	1	0	4	40	-	60	100	Dr. Preeti Saxena	
CS-5617	Internet and Web Technology	3	1	4	6	30	20	50	100	Mr. Mohit Kumar Varma	Mr. Mohit Kumar Varma
CS-4809B	Comprehensive Viva	-	-	-	4	-	-	-	100		
	Total Credit →				**29**	Total Marks →			**600**		

For the subjects having 6 credits, minor project/ case study is compulsory.

School of Computer Science & IT, DAVV

Course Scheme – January - June 2022

MCA 2nd Semester – Section: B

Subject Code	Subject Name	L	T	P	C	Max. Internal marks	Max. Practical/ Project marks	Max. End Semester Exam marks	Total Marks	Faculty	LAB Faculty
CS-4405	Database Management System	3	1	4	6	30	20	50	100	Dr. Sanjay Tanwani	Dr. Sanjay Tanwani
CS-4305	Software Engineering	3	1	0	4	40	-	60	100	Dr. Nitin Uikey	
CS-5216	Design and Analysis of Algorithm	3	1	2	5	30	20	50	100	Dr. Deepak Abhyankar	Dr. Deepak Abhyankar
CS-5613	Computer Networks	3	1	0	4	40	-	60	100	Dr. Chaitali Uikey	
CS-5617	Internet and Web Technology	3	1	4	6	30	20	50	100	Mr. Mohit Kumar Varma	Mr. Mohit Kumar Varma
CS-4809B	Comprehensive Viva	-	-	-	4	-	-	-	100		
	Total Credit →				**29**	Total Marks →			**600**		

For the subjects having 6 credits, minor project/ case study is compulsory.

School of Computer Science & IT, DAVV

Course Scheme – January - June 2022

MCA 4th Semester – Section A and B

Subject Code	Subject Name	L	T	P	C	Max. Internal marks	Max. Practical/ Project marks	Max. End Semester Exam marks	Total Marks	Faculty	Lab Faculty
CS-5805B	Project				12				100	Ms. Tarjani Sevak / Mr. Hitesh Ninama	
	Total Credit →				**12**	Total Marks →			**100**		

For the subjects having 6 credits, minor project/ case study is compulsory.