

SBRR Mahajana First Grade College (Autonomous)
POST GRADUATE WING
Pooja Bhagavat Memorial Mahajana Education Centre
KRS Road, Metagalli, Mysuru – 570 016

Scheme & Syllabus of
M.Sc. (Computer Science) w.e.f. 2019-20

I Semester

Sl. No	Course Title	Type	Credits			Subject Code
			L	T	P	
1	Discrete Mathematical Structures	HC	3	1	0	19J1H1
2	Advanced Data Structures	HC	3	1	0	19J1H2
3	Data Communication	HC	4	0	0	19J1H3
Soft Core Courses (Choose at most 2 Courses)						
1	Java Programming	SC	3	0	1	19J1S1
2	Operating Systems	SC	3	1	0	19J1S2
3	Principles of Programming and Problem Solving	SC	3	0	1	19J1S3
4	Communication Skills	SC	4	0	0	19J1S4
5	Computer Architecture	SC	4	0	0	19J1S5
6	Numerical Algorithms	SC	4	0	0	19J1S6

II Semester

Sl. No	Course Title	Type	Credits			Subject Code
			L	T	P	
1	Design and Analysis of Algorithms	HC	2	1	1	19J2H1
2	Computer Networks	HC	3	1	0	19J2H2
3	Data Base Management Systems	HC	3	0	1	19J2H3
Soft Core Courses (Choose at most 2 Courses)						
1	System Software	SC	3	0	1	19J2S1
2	Computer Graphics	SC	2	1	1	19J2S2
3	Professional Ethics and Values	SC	3	1	0	19J2S3
4	Pattern Recognition	SC	3	1	0	19J2S4
5	Web Technologies	SC	3	0	1	19J2S5
	World Wide Web	OE	2	2	0	19J2O1

III Semester

Sl. No	Course Title	Type	Credits			Subject Code
			L	T	P	
1	Theory of Languages	HC	3	1	0	19J3H1
2	Python Programming	HC	3	0	1	19J3H2
3	Software Engineering	HC	3	1	0	19J3H3
Soft Core Courses (Choose at most 2 Courses)						
1	Artificial Intelligence	SC	3	1	0	19J3S1
2	Digital Image Processing	SC	3	0	1	19J3S2
3	C# Programming	SC	3	0	1	19J3S3
4	Android Programming	SC	3	1	0	19J3S4
5	Big Data Analytics	SC	3	1	0	19J3S5
	E-Commerce	OE	3	1	0	19J3O2

IV Semester

Sl. No	Course Title	Type	Credits			Subject Code
			L	T	P	
1	Dissertation	HC	0	2	10	19J4H1
Soft Core Courses (Choose at most 2 Courses)						
1	Compiler Construction	SC	3	1	0	19J4S1
2	Advanced Data Base Management System	SC	2	1	1	19J4S2
3	Data Mining	SC	3	1	0	19J4S3
	Office Automation	OE	2	2	0	19J4O3

HC**DISCRETE MATHEMATICAL STRUCTURES****[3:1:0]****Objectives:**

- Learn the fundamentals of counting theory, set theory, logic, quantifiers, and relations.
- Learn different proof techniques like direct or indirect, proof by contradiction; check the validity of a given argument.
- Understand the concepts of functions and relations to solve a given problem.
- Learn the concepts of graph theory and applications.

Outcomes:

- Apply the concepts of set theory, logic, quantifiers and relations in specifying and solving problems.
- Identify the quantifiers and their uses and Make use of fundamentals of logic theory.
- Apply the mathematical induction principle and different methods to solve the given problem.
- Make use of basic concepts of graph theory and solve the given problem.

Unit I

Principles of Counting: The Rules of Sum and Product, Permutation, Combinations, combinations with repetition and Problems.

Sets and Subsets: Set Operations, Membership table method and Venn diagram method and the Laws of Set Theory, Addition principle-Counting and Venn Diagrams, A First Word on Probability.

Unit II

Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic theory, Logical Implication – Rules of Inference. Argument – Definition, validity and invalidity.

The Use of Quantifiers: Quantifiers, Definitions, Argument representation using quantifiers, validity.

Proofs of Theorems- Direct and Indirect method - contradiction and contra positive method.

Unit III

Relations and Functions: Properties of the Integers: Mathematical Induction, The Well Ordering Principle- Mathematical Induction (Alternative form)(problems),Recursive Definitions

Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions – Stirling Numbers of the Second Kind, Special Functions, The Pigeon-hole Principle, Function Composition and Inverse Functions.

Unit IV

An Introduction to Graph Theory: Definitions and examples Sub graphs, Complements, and Graph Isomorphism, Vertex Degree : Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles.

Graph coloring and Chromatic Numbers. Definitions, Properties and examples rooted trees, Trees and sorting. Weighted Trees and Prefix codes. Spanning trees- minimal spanning tree by Prim's and Krushkal's Algorithm.

References

1. Discrete and Combinatorial Mathematics, Ralph P. Grimaldi, 5th Edition, Pearson Education.
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, McGraw Hill.

3. Discrete Mathematical Structures with Applications to Computer Science by Tremblay and Manohar, McGraw-Hill Publications.
4. A Treatise on Discrete Mathematical Structures, Jayant Ganguly, Sanguine-Pearson.
5. Discrete Mathematical Structures –by Dr. D.S. Chandrashekaraih.

HC**ADVANCED DATA STRUCTURES****[3:1:0]****Objectives:**

- Learn about and understand different data structures like dictionaries, hash tables, priority queues, and different types of search trees.
- Understand how the above data structures can be represented.
- Understand how different operations like insertion, deletion, searching, etc. can be implemented in the above mentioned data structures.
- Understand string matching algorithms and operations on tries.

Outcomes:

- Understand the ADT specification of dictionary data structure, priority queue and binary search trees.
- Perform insertion, deletion and searching operation on dictionary, priority queue and binary search trees.
- Perform the sorting using external sorting.
- Identify the applications of string matching algorithms and tries.

Unit I

Dictionaries, linear list representation, skip list representation, operations insertion, deletion and searching, hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, comparison of hashing and skip lists.

Unit II

Priority Queues — Definition, ADT, Realizing a Priority Queue using Heaps, Definition, insertion, Deletion, External Sorting- Model for external sorting, Multi-way merge, Poly-phase merge.

Unit III

Search Trees , Binary Search Trees, Definition, ADT, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations — Insertion, Deletion and Searching, Introduction to Red —Black and Splay Trees, B-Trees, B-Tree of order m, Comparison of Search Trees

Unit IV

Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer —Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries and Suffix tries.

References

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India), 2nd edition, Universities Press Orient Longman.
2. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons.
3. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education, Second Edition.
4. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson.
5. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

HC**DATA COMMUNICATION****[4:0:0]****Objectives:**

- To learn the principles of data communication
- Understand the need for protocol architectures and the design of different protocol models.
- Understand different signal encoding techniques.
- Understand different link layer design issues and protocols.

Outcomes:

- Understand the terminologies used in data transmission and physical and transmission characteristics of transmission media.
- Understand the signal encoding techniques and digital data communication techniques.
- Familiarize oneself with data link control protocols and different types of multiplexing.
- Comprehend the different switching techniques.

Unit I : Overview and Data Communication

Data communication and networking: communication model, data communications, networks, internet, the need for protocol architecture, the TCP/IP protocol, OSI model, data transmission concepts and terminology (simplex and duplex modes), Analog and Digital transmission, transmission impairments, channel capacity, guided transmission media (twisted pair, co-axial cable, fibre optic cable, satellite links), Wireless transmission, wireless propagation, line-of-sight transmission.

Unit II : Signal Encoding Techniques and Digital Data Communication Techniques

Digital data-digital signals, analog signals-analog data, digital signals-analog data, analog signals. Asynchronous and synchronous transmission, types of errors, error detection, error correction, line configurations.

Unit III : Data link Control Protocols and Multiplexing

Flow control, error control (LRC/EDC/ARQ), High-Level Data Link Control (HDLC)

Multiplexing: Frequency Division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, asymmetric digital subscriber line, XDSL.

Unit IV : Circuit Switching, Packet Switching and Asynchronous Transfer Mode

Switched communication networks, circuit switching networks, circuit switching concepts, soft switch architecture, packet switching principles, X.25, frame relay, protocol architecture, ATM cells and transmissions.

References

1. Data and Computer Communication – William Stallings, Eighth Edition, PHI.
2. Data Communications and Networking by Behrouz A Forouzan

SC**JAVA PROGRAMMING****[3:0:1]****Objectives:**

- To gain an understanding of the object oriented paradigm and concepts in general.
- Learn the basics of the Java environment and the programming language.
- To learn how to implement different object oriented concepts in Java.
- To learn about using files and creating packages.

Outcomes:

- Understand different aspects of object oriented paradigm.
- Develop an ability to model problems and solutions using java.
- Able to utilise inheritance, polymorphism and other principles to model solutions.
- Able to create and use packages.

Unit I: Object-Oriented Programming (OOPS) concepts:

Classes & Objects, Pillars Of Object Oriented Programming, OOPS concepts and terminology, Encapsulation & Examples, Abstraction & Examples, Inheritance: Advantages of OOPS, What is Java?, Execution Model Of Java, Bytecode, First Java Program, Compiling and Interpreting Programs, The JDK Directory Structure, Data types and Variables: Primitive & non-Primitive Datatypes & Declarations, Variables & Types, Numeric & Character Literals, String formatting and Parsing, String Literals, The Dot Operator.

Unit II: Methods:

What are Methods? Method Structure, Declaration Of Methods, Calling Of Methods, Defining Methods, Method Parameters Scope, static methods, Operators and Expressions:

Expressions, Operator Precedence, The Cast Operator, Control Flow Statements, While and do-while Loops, for Loops, The continue Statement, The break Statement, Objects and Classes: Defining a Class, Creating an Object, Accessing Class Members, Instance Data and Class Data, Defining Methods, Constructors, Access Modifiers, Inheritance & Polymorphism: Inheritance in Java, Types Of Inheritance, Method Overloading, Run-time Polymorphism, Method Overriding, super keyword.

Unit III: Java Files and I/O:

What is a Stream?, Reading and Writing to Files (only txt files), Input and Output Stream classes, using the file class, Using Streams, creation of files, reading/writing characters, bytes, Interfaces and Abstract Classes: What is an Interface, Defining Interfaces, Separating Interface and Implementation, Implementing and Extending Interfaces, Abstract Classes.

Unit IV: Packages:

What is a Package?, Advantages of using a Package, Types Of Packages, Naming Convention, Steps For Creating Packages, The import Statement, Static Imports, CLASSPATH and Import, Defining Packages, Package Scope, Exception Handling: Exceptions Overview, Exception Keywords, Catching Exceptions, The finally Block, Exception Methods, Declaring Exceptions, Defining and Throwing Exceptions, Errors and Runtime Exceptions, Assertions.

References

1. Programming with JAVA- A Primer, E. Balagurusamy, Tata Mc-Graw-Hill.
2. JAVA for you- P Koparkar, Tata Mc-Graw-Hill.

SC**OPERATING SYSTEMS****[3:1:0]****Objectives:**

- To learn about the fundamental principles of operating system, processes and their communication
- To learn about various operating system issues related to process management like threads, process scheduling, synchronisation and deadlocks.
- To learn about various memory management techniques, including virtual memory, paging and segmentation.
- To know about disk and file management and the distributed file system concepts.

Outcomes:

- Able to comprehend the operating system components and its services
- Able to understand how process is created and various process related components of the operating system.
- Able to comprehend how memory management and virtual memory management is done.
- Able to understand different file and directory structures and how files are stored in secondary storage.

Unit I

Introduction -Computer System Organisation – Computer system architecture – Operating system operations - Operating systems services-System calls- Types of system calls – Operating system structure.

Processes-process concept- process scheduling-operation on processes. Multithreaded programming – Multithreading models – Threading issues.

Unit II

Process Scheduling - Scheduling criteria-Scheduling algorithms – Thread scheduling - Multiple-processor Scheduling.

Process Synchronization – Critical Section problem – Peterson’s solution - Semaphores-Classical problems of synchronization - critical regions – Introduction to Monitors.

Unit III

Deadlocks – System model - Deadlock Characterization - Deadlock handling - Deadlock Prevention - Deadlock avoidance - Deadlock Detection - Deadlock Recovery.

Memory Management – Swapping - Contiguous Memory allocation -Segmentation Paging.

Virtual Memory Management - Demand paging – Copy on write - Page Replacement - Thrashing.

Unit IV

File System – File concept – Access methods – Directory structure – Directory and disk structure - File Systems structures - Directory Implementation - Allocation Methods - Free Space management.

Disk Structures – Disk attachment - Disk Scheduling – Disk management.

References

1. “Operating Systems Concepts”, Abraham Silberschalz Peter B Galvin, G.Gagne, 9th Edition, John Wiley & Sons.
2. “Modern operating Systems”, Andrew S.Tanenbaum, Third Edition, PHI.
3. “Operating Systems: A Concept-based Approach”, D M Dhamdhare, Second Edition, Tata McGraw-Hill.

4. "Operating Systems", H M Deital, P J Deital and D R Choffnes, 3rd edition, Pearson Education.
5. "Operating Systems: Internals and Design Principles", William Stallings, Seventh Edition, Prentice Hall.

SC PRINCIPLES OF PROGRAMMING AND PROBLEM SOLVING [3:0:1]**Objectives:**

- To introduce the steps involved problem solving and attributes of software design.
- To introduce notations to describe syntax and semantics of programming languages
- To analyse the behaviour of simple programs in imperative languages using concepts such as binding, scope, control structures, subprograms and parameter transmission techniques.
- To introduce the concepts distributed computing and network programming.

Outcomes:

- Learn the steps involved in problem solving and the stages involved in translation.
- Learn elementary data types and structured data types.
- Comprehend the need of inheritance and its various types.
- Learn the various conditional statements, control structures and different types of parameter transmission techniques.

Unit I

Language Design Issues: Why study programming languages?, The impact of programming paradigms: Problem solving, What is a programming language?, Software design, C overview.

Language Translation Issues: Programming Language Syntax: General syntactic criteria, Syntactic elements of a language.

Stages in translation: Analysis of the source program, Synthesis of the object program.

Elementary data types: Properties of types and objects: Data objects, Variables and constants, Data types, Declarations, Assignment and initialization. Scalar data types: Numeric data types, Enumerations, Booleans, Characters. Composite data types: Files and Input-Output.

Unit II

Encapsulation:

Structured data types: Structured data objects and data types, Specification of data structure types, Declaration and type checking for data structures, Vectors and Arrays, records, Lists, Sets.

Abstract data types: Evolution of the data type concept, Information hiding. Encapsulation and good program design, Type definitions.

Inheritance: Derived classes, Methods.

Unit III

Sequence control: Implicit and explicit sequence control, sequencing with arithmetic expressions: Tree-structure representation, Execution-time representation. Sequence control between statements: Basic statements, Structured sequence control.

Subprogram control: Subprogram sequence control: Simple call-return subprograms, Recursive subprograms. Parameter transmission: Actual and formal parameters, Methods for transmitting parameters, Transmission semantics.

Unit IV

Distributed Computing: Variations on subprogram control: Exceptions and exception handlers. Parallel programming: Principles of parallel programming. Hardware developments: Processor design, System design.

Network Programming: The World Wide Web, Evolution of scripting languages, Applets, XML.

References

1. “Programming languages – Design and Implementation” – 4th Edition by Terrence W Pratt, Marvin V Zelkowitz and T.V. Gopal.
2. Fundamentals of Programming languages by Ellis Horowitz

SC**COMMUNICATION SKILLS****[4:0:0]****Objectives:**

- The factors governing good communication and how good communication skills can be developed.
- How good communication skills are a critical building block to both personal and business success.
- How to use effective communication skills in business.
- The need to modify communication depending on business situation and circumstances.

Outcomes:

- Understand and apply knowledge of human communication and language processes as they occur across various contexts from multiple perspectives.
- Understand and evaluate key theoretical approaches used in the interdisciplinary field of communication.
- Find, use, and evaluate primary academic writing associated with the communication discipline.
- Communicate effectively orally and in writing.

Unit I

Importance of communication, its basic model, formal and informal communications, barriers to communication, feedback and its effectiveness, Non- Verbal communication - Etiquettes.

Unit II

Oral communication, Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills, – Public speaking- Expressing Techniques, importance of listening, role of visual aids, persuasive communication.

Unit III

Written communication – Effective writing – Paragraph – Essay- Reports – Letters- Articles – Notices, Agenda & Minutes.

Unit IV

Interview skills: Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview- Mock Interview - Quick Tips.

References

1. Soft skills: know yourself & know the world, Dr. Alex K.
2. Communication for results – C Hamilton & Parker.
3. Instrument of Communication – P Meredith.
4. Basic Management skills for all – E H McGrath.
5. Managerial Communication – P M Timm.
6. Thesis and Assignment writing – Anderson.

SC**COMPUTER ARCHITECTURE****[4:0:0]****Objectives:**

- To conceptualize the basics of organizational and architectural issues of a digital computer.
- To analyse performance issues in processor and memory design of a digital computer.
- To comprehend various data transfer techniques in digital computer.
- To analyse processor performance improvement using instruction level parallelism

Outcomes:

- Develop an ability to understand the concept of cache mapping techniques.
- Develop an ability to understand basics of organizational and architectural issues of a digital computer.
- Acquire knowledge and understanding the theory of Digital Design and Computer Organization to provide an insight of how basic computer components are specified.
- Develop an ability to conceptualize instruction level parallelism.

Unit I : Parallel Computer Models

The state of Computing - Evolution of Computer Architecture, System Attributes to Performance. Multiprocessors and Multicomputer Shared Memory Multiprocessors, Distributed – Memory Multicomputer Multivector and SIMD Computers – Vector Supercomputers, SIMD supercomputers conditions of Parallelism – Data and Resource Dependencies, Hardware and software parallelism.

Unit II : Processor and Memory Hierarchy

Process Technology – Instruction Pipelines, Processors and Coprocessors, Instruction Set Architectures, Representative CISC Processors, Representative RISC Processors, Superscalar Processors. Memory Technology, Inclusion, Coherence and Locality. Cache Memory organization – Cache Addressing modes, Direct mapping and Associative caches, Set Associative Cache. Shared – Memory organizations – Interleaved Memory organization

Unit III : Pipelining

Linear Pipeline processors – Asynchronous and Synchronous Models, Instruction Pipeline Design – Mechanisms for instruction Pipelining, Arithmetic Pipeline Design – Computer Arithmetic Principles, Arithmetic Pipeline Stage, Multifunctional Arithmetic Pipelines

Unit IV : Multiprocessors

Multiprocessor system Interconnects – Hierarchical Bus system, Cache Coherence Problem. Message – Passing Mechanisms – Message – Routing Schemes, Deadlock and Virtual Channels, Multithreaded Architecture – Multithreading Principles, Issues and Solutions

References

1. Advanced Computer Architecture – Kai Hwang – Tata McGraw Hill.
2. Parallel Computer Architecture, David E Culler, J.P.Singh and Anoop Gupta.
3. Computer Architecture and Organization – John. P. Hayes – Third Edition –Tata McGraw Hill.

SC**NUMERICAL ALGORITHMS****[4:0:0]****Objectives:**

- To introduce the different types of errors in computing
- Finding the roots of the non-linear equations, Numerical integration and Ordinary differential equations.
- Finding solutions of simultaneous linear algebraic equations.
- Introducing interpolation and statistical methods .

Outcomes:

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks such as solution of non-linear equations, numerical integration and ordinary differential equations.
- Gain an understanding of interpolation and statistical methods.

Unit I

Introduction to Numerical Computing: Introduction, Numeric Data, Analog Computing, Digital Computing, Process of Numerical Computing and Characteristics of Numerical Computing.

Approximations and Error in Computing: Introduction, Significant Digits, Inherent Errors, Numerical Errors, Modelling errors, Blunders, Absolute and relative Errors, Blunders and Error Propagation.

Roots of Nonlinear Equations: Bisection method, False position method, Newton Raphson method and Secant method.

Unit II

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule.

Ordinary Differential Equations: Euler's method, Modified Euler's method, Runge-Kutta II and IV order methods.

Unit III

Solutions of Simultaneous Linear Algebraic Equations: Gauss Elimination method, Gauss Jordan method and LU Decomposition method.

Iterative methods: Jacobi's iterative method and Gauss-Seidel iterative method.

Unit IV

Interpolation: Newton-Gregory forward interpolation, Newton-Gregory backward interpolation, divided differences, Newton's divided difference and Lagrange's interpolation.

Statistical methods: Introduction, Definitions, Classifications, Frequency Distribution, Mean – Arithmetic Mean for grouped and ungrouped data and Geometric Mean for grouped and ungrouped data.

References

1. Numerical Methods – E Balaguruswamy, Tata McGraw-Hill.
2. Engineering Mathematics Vol. III - A by Dr. K.S. Chandrashekar, Sudha Publications.
3. Computer Oriented Numerical Methods by Rajaraman V.
4. Fundamentals of Mathematical Statistics by Gupta and Kapoor
5. Probability and Statistics for engineers and scientists by Ronald E. Walpole and Raymond H Mayers

6. Mathematical Statistics by John Freund.

HC**DESIGN AND ANALYSIS OF ALGORITHMS****[2:1:1]****Objectives:**

- Comprehend the performance analysis of an algorithm.
- Understand time and space complexity of various data structures.
- Comprehend time and space complexities of an algorithm.
- Learn different design strategies like divide and conquer, transfer and conquer, greedy, dynamic programming, backtracking and branch and bound

Outcomes:

- Compare between different data structures. Pick an appropriate data structure for a design situation.
- Analyze Performance of algorithms using asymptotic analysis.
- Model problems and solutions using different design paradigms.
- Synthesize algorithms, and analyze them.

Unit I : Introduction

Algorithms, structured algorithms, analysis of algorithms, complexity analysis and profiling, asymptotic complexity, review of stack, queues, Recursion, heaps and heap sort, case studies(complexity analysis and profiling)- prime and Fibonacci numbers, GCD and LCM, sorting algorithms- selection sort, bubble sort and insertion sort.

Unit II : Divide and conquer & Transfer and conquer

Divide and conquer general method, binary search, Maximum and minimum element in list, merger sort, quick sort. Transfer and Conquer – solution to simultaneous equations by triangularization, diagonalization algorithms.

Unit III : Greedy method and Dynamic programming

Greedy method-General method, optimal storage on tapes, knapsack problem, job sequencing with deadlines, optimal merge pattern, Minimum cost spanning trees(prim's algorithm and Kruskal's algorithm),single source shortest paths. Dynamic Programming-General methods, multistage graphs, all pair's shortest paths, Travelling salesman problem, 0/1 Knapsack problem

Unit IV : Backtracking and Branch and Bound

General method for backtracking, 8-queen Problem, sum of subsets problem.

Branch and Bound general method, 0/1 knapsack problem, travelling salesman problem.

References

1. "Fundamentals of Computer Algorithms" Ellis Horowitz, Sartaj Sahni and Sanguthevar, Rajasekaran Galgotia Publications.
2. "Introduction to the Design & Analysis of Algorithms", Anany V. Levitin Pearson Education, 3rd edition.
3. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein.

HC**COMPUTER NETWORKS****[3:1:0]****Objectives:**

- Understand fundamental principles of design of network architectures and software.
- Analyse the function and design strategy of medium access control sub layer.
- Understand the design and implementation of network layer and transport layer.
- Acquire basic knowledge of various application protocols for internet security issues and services.

Outcomes:

Students will develop an ability to:

- To comprehend the functionalities needed for network communication into layers
- Choose the required functionality at each layer for given application.
- Comprehend different algorithms used in different layers.
- Understand the working principles of various application protocols.

Unit I

Network Software: Protocol hierarchies, Design issues for the layers, Connection Oriented and Connection less Services, Service Primitives; Reference Models: OSI, TCP/IP, Comparison of OSI and TCP reference models.

Medium Access Control Sublayer : The Channel Allocation problem, Multiple access protocols: ALOHA, Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access protocols, Persistent and Non persistent CSMA, CSMA with collision detection, Collision-Free protocols: Bit map protocol, Binary countdown; Limited Contention protocols; Brief introduction to IEEE 802 standards; Ethernet MAC address, Brief introduction to Wireless LAN's, Brief introduction to Bluetooth.

Unit II

Network layer design issues, Routing Algorithms: Optimality principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing; Congestion Control Algorithms: Congestion Prevention Policies, Jitter Control, Techniques for achieving good quality of service, Congestion control for multicasting; Internetworking, The Network layer in the Internet.

Unit III

Transport Layer : The Transport service, Elements of Transport protocols: Addressing, Connection Establishment, Connection Release, Error control and Flow control, Multiplexing, Crash recovery; The Internet Transport protocols: UDP, TCP.

Unit IV

Introduction to Application Layer, The Domain Name System, Electronic Mail : Brief overview of Architecture, Service, Message Formats, and Message delivery, Brief architectural overview of the World Wide Web.

Streaming Audio and Video : Digital Audio and Digital Video, Streaming stored media and live media.

References

1. Computer Networks, Andrew S Tanenbaum ,5th Edition, PHI publications.
2. Computer Networks:A Top-Down Approach, Forouzan, Behrouz A., Mosharraf Firouz., TaTa McGraw Hill publications, First Edition.

3. Data & Computer Communications, Stallings, William, Pearson Education Asia, 6th Edition.
4. Data communications and Computer Networks, Prakash C. Gupta, 1st Edition, 5th Reprint, PHI.

HC**DATABASE MANAGEMENT SYSTEMS****[3:0:1]****Objectives:**

- Learn and practice data modelling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Apply normalization techniques to normalize the database.
- Comprehend the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

Outcomes:

- Comprehend data models and schemas in DBMS.
- Use SQL- the standard language of relational databases.
- Understand the functional dependencies and design of the database.
- Understand the concept of Transaction and Query processing.

Unit I

Overview of Database Systems and Entity- Relationship Model

A historical perspective, file system versus a DBMS, advantages of a DBMS, levels of abstraction in a DBMS, structure of a DBMS, people who work with databases, entity, entity types, entity sets, attributes, keys, relationships, relationship sets and additional features of ER-model-key constraints, participation constraints and weak entities.

Unit II

Relational model, Relational Algebra and Structured Query Language

Relational model- Concepts, relational constraints and relational database schemas. Relational algebra - Basic and additional relational operations with examples. Data definition, constraints and schema changes in SQL, Basic queries in SQL: insert, delete and update statements and joins in SQL, views in SQL.

Unit III

Database Design, Overview of storage and indexing

Informal design guidelines for relational schemas, functional dependencies, normal forms, general definitions of first, second, third and boyce-codd normal forms.

File organization and indexing: sequential file organization, heap file organization, clustered indexes primary and secondary indexes, hash based indexing and B+ tree-based indexing.

Unit IV

Overview of transaction management

The ACID properties, consistency and isolation, atomicity and durability, transaction on schedules, concurrent execution of transactions, motivation for concurrent execution, serializability, anomalies due to interleaved execution, lock-based concurrency control, strict two phase locking and performance of locking.

References

1. Fundamentals of Database Systems by Navathe and Elmasri –Pearson Education, Fifth Edition.
2. Database Systems Concepts, 3rd edition by Abraham Silberschatz, Henry Korth and S. Sudarshan, Tata McGraw Hill.
3. Principles of database systems by Ullman, Computer Science press.

4. DBMS by Prof. S.Nandagopalan, 7th Revised Edition.

SC**SYSTEM SOFTWARE****[3:0:1]****Objectives:**

- Understand the design of an assembler for a simple machine architecture.
- Understand the need and design of a macro processing facility.
- Learn about loading, different loading schemes and issues related to it, and implementation of a loader.
- Get an overview of compiler functions and learn about basic lexical analysis and parsing.

Outcomes:

- Develop an Ability to master the design of assembler.
- Able to understand various issues related to processing macros.
- Able to understand different loaders schemes, and related issues.
- Develop ability to write simple lexical analyser and parser with Lex and Yacc.

Unit I

Introduction, general machine structure, general approach to a new machine, assemblers, general design procedure, design of assembler- statement of problem, data structure, format of data bases, algorithm, look for modularity.

Unit II

Macro language and the macro processor – macro instructions, features of a macro facility, macro instruction arguments, conditional macro expansion, macro calls within macros, macro instructions defining macros, implementation of a restricted facility.

Unit III

Loaders, Loader schemes, design of an absolute loader, design of a direct linking loader- specification of problem, specification of data structures, format of data bases, algorithm.

Unit IV

Introduction to Compilers : Language Processors, Structure of a Compiler.

Introduction to Lex and Yacc: The Simplest Lex Program, Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, Using LEX, Using YACC – Grammars, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions

References

1. “Systems Programming”, John J. Donovan, Tata McGraw-Hill.
2. Compilers: Principles, Techniques, and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2nd Edition, Pearson.
3. Lex & Yacc, John R. Levine, Tony Mason, Doug Brown, 2nd Edition, O'Reilly.
4. System Software: An introduction to system programming, Leland L.Beck and D.Manjula, 3rd edition.
5. Systems Programming and Operating Systems, D. M. Dhamdhare, Second Revised Edition, Tata McGraw-Hill.

SC**COMPUTER GRAPHICS****[2:1:1]****Objectives:**

- Provide an overview of various device level algorithms.
- Provide an understanding of homogeneous coordinates and various 2D and 3D transformations
- Provide an introduction to 3D concepts like projections, curves.
- Make the students understand how to implement the computer graphics concepts using OpenGL.

Outcomes:

Acquire knowledge and understanding of:

- The structure of an interactive computer graphics system, and the separation of system components.
- Device level algorithms that renders various shapes and clipping operations.
- 2D and 3D geometrical transformations and viewing.
- Techniques for representing 3D geometrical objects.

Unit I

Graphics hardware: Video display devices, Raster-scan systems, Graphics software : Coordinate representations, Graphics functions, standards, Introduction to OpenGL.

Graphics Output Primitives: Coordinate reference frames, Two-Dimensional reference frame in OpenGL, OpenGL Point Functions, Line Functions, Curve functions.

Scan-Conversion: Line-Drawing Algorithms: DDA, Bresenham's, Setting frame-buffer values, Circle-Generating algorithms : Midpoint Circle Algorithm.

Unit II

Filled area primitives: Scan-line polygon fill algorithm, Boundary fill algorithm, Flood fill algorithm, Inside-outside tests. Brief overview on Ant aliasing methods.

2D geometrical transformations: Basic two-dimensional geometric transformations, Homogeneous Coordinates and Matrix Representation, Inverse Transformations, Brief overview of Composite transformations, Reflection, Shear, OpenGL functions for two-dimensional geometric transformations, Programming examples.

2D viewing: Windows and viewports, Two-dimensional viewing pipeline, clipping window, Normalization and viewport transformations, Brief overview of OpenGL 2D viewing functions.

Unit III

2D Clipping Algorithms: Point clipping, Line clipping: Cohen- Sutherland and Liang-Barsky Line clipping, polygon fill-area clipping: Sutherland-Hodgman algorithm, Text clipping.

3D geometrical transformations: 3D translation, 3D scaling. 3D rotation: coordinate-axis rotations, general 3D rotations, Other 3D transformations, Affine transformations, OpenGL geometric transformation functions.

Unit IV

Three-dimensional viewing: Overview, Three-dimensional viewing pipeline, Projection transformations, 3D viewing functions.

Spline representations : Interpolation and Approximation splines, parametric and Geometric continuity conditions, Bezier spline curves, B-Spline curves.

Visible surface detection : Classification of visible surface detection algorithms, Back- Face detection, Depth buffer method.

References

1. Computer Graphics with OpenGL, Donald D. Hearn, M. Pauline Baker, Warren Carithers, Fourth Edition, Pearson India Education Services.
2. Computer Graphics Principles & Practice in C, Foley, Vandam, Feiner, Hughes, Pearson Education.
3. Open GL Super Bible : Comprehensive Tutorial and Reference, Richard S Wright and Jr. Michael Sweet, 7th Edition, Pearson Education.
4. Computer Graphics, Roy A. Plastock, Gordon Kalley, Schaum's Outlines, McGraw Hill.
5. Computer Graphics 2nd Edition (Paperback) by Steven Harrington, Tata McGraw Hill.

SC**PROFESSIONAL ETHICS AND VALUES****[3:1:0]****Objectives:**

- Create awareness among technical students about the importance of professional ethics.
- The effect of technology on the societal issues.
- How to develop technologies that do not disturb the psychological well-being of the society.
- To learn about the pros and cons of intellectual property laws.

Outcomes:

- Know the importance of ethics and methods of developing technologies.
- Identify the values and ethics of professional development.
- Understand the causes, effects and control measures for various types of societal failures.
- Gain knowledge about various ethical management methods.

Unit I : Effects of Technological Growth:

- Science, Technology and Engineering as Knowledge and as Social and Professional Activities.
- Rapid Technological growth and depletion of resources. Related latest Reports, Limits of growth; sustainable development.
- Energy Crisis; Renewable Energy Resources.
- Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics.
- Appropriate Technology Movement of Schumacher: later developments.
- Technology and developing nations. Problems of Technology transfer. Technology assessment, impact analysis.
- Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centred Technology.

Unit II : Profession and Human Values:

- Nature of values: Value Spectrum of a 'good' life.
- Value Crisis in contemporary society.
- Psychological values: Integrated personality; mental health Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution.
- Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity.
- Moral and ethical values: Nature of moral judgments; canons of ethics; Ethics of virtue; ethics of duty; ethics of responsibility.

Unit III : Ethics of Profession:

- Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical Responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond. Case studies

Unit IV : IPR:

- Introduction to IPR, IPR Laws in India

References:

1. Blending the best of the East & West, Dr. Subir Chowdhury, EXCEL.

2. Ethics & Management. & Indian Ethos, Ghosh, VIKAS.
3. Business Ethics, Pherwani, EPH.
4. Ethics, Indian Ethos & Management., Balachandran, Raja, Nair, Shroff Publishers.
5. Values & Ethics of Profession & Business, S. K. Sarangi, Asian Books Private Limited.

SC**PATTERN RECOGNITION****[3:1:0]****Objectives:**

- Understand pattern recognition systems.
- Learn the different techniques of estimations and component analysis.
- Learn the different supervised & unsupervised learning techniques.

Outcomes:

- Acquire the knowledge on basics of pattern recognition systems
- Demonstrate the techniques of estimations and component analysis.
- Implement different supervised & unsupervised learning techniques.

Unit I : Introduction

Machine perception, Pattern recognition systems, Design cycle, Learning and adaptation.

Introduction, Bayesian decision theory - Continuous features, Classifiers Discriminate functions and Decision surfaces, Normal density and Discriminant functions for the Normal Density, Bayes decision theory- Discrete features

Unit II : Maximum Likelihood and Bayesian Parametric Estimation

Introduction, Maximum likelihood estimation, Bayesian estimation, Bayesian parametric estimation, Sufficient statistics, Problems of dimensionality, Component Analysis and Discriminants

Unit III : Nonparametric Techniques

Introduction, Density estimation, Parzen windows, K-Nearest Neighbour estimation, The nearest neighbor rule, Metrics and Nearest Neighbour Classification, Fuzzy Classification, Basics of Neural networks, Support vector machines

Unit IV : Unsupervised Learning

Mixture Densities and Identifiability, Maximum – Likelihood Estimates, Application to Normal Mixtures, Unsupervised Bayesian Learning, Data Description and Clustering, Criterion Functions for Clustering, Hierarchical clustering, Online clustering, Graph Theoretic Methods,

References

1. Pattern Classification, R.O Duda, P.E. Hart and D.G. Stork, 2nd Edition, Wiley publications
2. Pattern Recognition and Image Analysis, Earl Gose, Richard, Johnsonbaugh, Steve Jost, PHI.

SC**WEB TECHNOLOGIES****[3:0:1]****Objectives:**

Help students understand:

- Basics of Internet and how communication happens over the World Wide Web.
- The basic building blocks of web pages using HTML and CSS.
- Use of Java script and PHP.
- How Data driven, dynamic web pages can be created using database connectivity.

Outcomes:

Develop ability to:

- Implement HTML5 pages using fundamental tags.
- Develop style sheet using CSS for a given problem.
- Extend JavaScript to validate a form with event handler for a given problem.
- Develop a dynamic website with database backend.

Unit I

Introduction to Internet, WWW, Web Browsers, and Web Servers, URLs, MIME, HTTP, Security.

Quick introduction to HTML5 : Creating simple web page, basic text formatting, presentation elements, phrase elements, lists, font, grouping elements, basic links, internal document links, email link, Image, Audio and Video, image maps, image formats, Adding flash content and video, Tables – attributes, nested tables, Forms – Attributes, form controls, Frames – Frame set, nested frames, attributes. Introduction to HTML 5 - New tags of HTML 5 – embedding Media content, building input forms, painting on canvas.

Cascading Style Sheet : Introduction, Levels of Style Sheet and specification formats, embedded style sheet, External Style Sheet, inline Style Sheet, Class and ID method, DIV and SPAN tags, Inheritance with CSS, Introduction to CSS 3, HTML 5 and CSS3.

Unit III

JavaScript: JavaScript in HTML, Language Basics – Variables, operators, statements, functions, Data type conversions, reference types, Document object Model - browser object model - window object, location object, navigator object, screen object, history object, Events and Event handling, Button elements, Navigator object, validations with regular expressions. Introduction to Dynamic documents, Positioning elements, moving elements, elements visibility, changing colors and fonts, dynamic content, Locating mouse cursor, reacting to a mouse click, dragging and dropping of elements.

Unit III

PHP : Introduction to Server side Programming, Introduction to PHP , PHP and HTML, essentials of PHP, Why Use PHP, Installation of Web Server, WAMP Configurations, Writing simple PHP program, embedding with HTML, comments in PHP, Variables, Naming Conventions, Strings, String Concatenation, String functions, float functions, Arrays, Array – Key pair value, Array functions, is SET, UNSET, gettype(), settype(), control statements (if, switch), Loops, User Defined Functions (with argument, return values), global variable, default value, GET - POST method, URL encoding, HTML Encoding, Cookies, Sessions, Include statement. File:read and write from the file. Ethical use of features of PHP.

Unit IV

PHP with MySQL, Creating Connection, Selecting Database, Perform Database (query), Use returned data, close connections, file handling in PHP – reading and writing from and to FILE. Using MySQL from PHP (Building a Guestbook).

References

1. Beginning HTML, XHTML, CSS, and JavaScript, Jon Duckett, Wiley Publishing.
2. JavaScript Step by Step, Microsoft Press, Steve suehring, 2nd Edition, PHI.
3. Beginning PHP 5.3, Matt Doyle, Willey Publishing.

OE**WORLD WIDE WEB****[2:2:0]****Objective:**

- To provide the conceptual and technological development in the field of Internet and web designing.
- To provide a comprehensive knowledge of Internet, its applications and the TCP/IP protocols widely deployed to provide Internet connectivity worldwide.
- To understand how the World Wide Web with its widespread usefulness has become an integral part of the Internet.
- To provide an overview of basic concepts of web design.

Outcomes:

- Understand the working scheme of the Internet and World Wide Web.
- Understand fundamental tools and technologies used for web design.
- Comprehend the technologies for Hypertext Mark-up Language (HTML).
- Figure out the various security hazards on the internet and need of security measures.

Unit I

Introduction to Internet: What is Internet?, Evolution and History of Internet, Growth of Internet, Internet Services, How does the Internet Work?, Anatomy of Internet, Internet addressing, Internet vs. Intranet, and Impact of Internet.

Internet Technology and Protocol: ISO-OSI Reference Model, TCP/IP Protocol Suit, Data Transmission, Switching, Routers and Gateways, and Network Protocols.

Unit II

Internet Connectivity: Getting connected, Different types of connections, Levels of Internet Connectivity and Internet Service Provider.

Internet Tools and Multimedia: Current trends on Internet, Interactivity tools, Multimedia and Animation.

WWW and Web Browser: WWW, Evolution of Web, Basic Elements of WWW, Web Browsers and Search Engines.

Unit III

Web Publishing: Web Publishing, Standard Generalized Mark-up Language(SGML), Web Page Design.

HTML: An Introduction, HTML Categories, HTML Lists, HTML Tables, HTML Links, HTML Forms, HTML Frames, Style Sheets, Adding Pictures and Image Attributes.

Unit IV

Computer Networks: Computer Networks, Network Components, Network Topologies, Types of Network Architecture, Networks, Medium of Communication and Network Security.

Internet and Web Security: Overview of Internet Security, Aspects and Need of security, E-Mail Threats and Secure E-Mail, Web Security and Privacy concepts, Firewall, Cryptography, Digital Signature, Authentication, Authorization and Access Control, Copyright issues and Virus.

References

1. Internet Technology and Web Design by Instructional Software Research and Development (ISRD) Group, Tata MC Graw Hill.
2. Programming the World Wide Web, 4th Edition by Robert W. Sebesta.

HC**THEORY OF LANGUAGES****[3:1:0]****Objectives:**

- To learn the core concepts of automata theory and formal languages.
- To learn fundamentals of Regular and Context Free Grammars and Languages.
- To understand the relation between Regular Language and Finite Automata.
- To understand the relation between Contexts free Languages and PDA.

Outcomes:

- Acquire a fundamental understanding of the core concepts in automata theory and formal languages
- Develop ability to model grammars and automata (recognizers) for different language classes.
- Develop an ability to identify formal language classes and prove language membership properties.
- Develop an ability to prove and disprove theorems establishing key properties of formal languages and automata.

Unit I: Introduction to Automata and Languages

Brief introduction to Formal Proof: Deductive Proofs, Proving equivalences about sets, the contra positive, Proof by contradiction, Counterexamples, Central concepts of automata theory: Alphabets, strings, languages.

Finite Automata: Deterministic Finite Automata, Nondeterministic Finite Automata, Equivalence of DFA and NFA, Finite Automata with Epsilon transitions.

Unit II: Regular Expression and Regular Languages

Regular Expressions, Finite Automata and Regular Expressions: Converting DFAs to regular expressions by eliminating states, converting regular expressions to automata, Applications of regular expressions, Brief overview of algebraic laws of regular expressions.

Properties of Regular Languages : The pumping lemma for regular languages, Applications of the pumping lemma, Closure properties and decision properties of regular languages (proofs not necessary), Minimization of DFAs

Unit III: Context Free Grammars

Context-Free Grammars, Parse Trees, Applications of context-free grammars, Ambiguity in grammars and languages.

Normal Forms of Context-free grammars

Unit IV: Pushdown Automata and Context Free Languages

Pushdown Automata : Definition, Languages of a PDA, Equivalence of PDAs and CFGs, Deterministic Pushdown Automata.

The pumping lemma for context-free languages, Closure properties of context-free languages (proofs not needed).

References

1. "Introduction to Automata Theory, Languages and Computation", Hopcroft J.E and Ullman, J.D, Narosa Publishing House, Delhi.
2. "Introduction to Languages and Theory of Computation", John C Martin, 2nd edition, TMH Publication.

3. "Formal Languages and Automata theory", Basavaraj S. Anami, Karibasappa K G, Wiley India.
4. "Formal Languages and Automata Theory", C K Nagpal, Oxford University press.

HC**PYTHON PROGRAMMING****[3:0:1]****Objectives:**

- Understand programming paradigms brought in by Python.
- To learn to use python for text processing and file handling, with a focus on Regular Expressions, List and Dictionaries.
- Learn how to use python for Data mining with a case study.
- Learn how to use python for Image processing with a case study.

Outcomes:

- Develop ability to program in Python with hands on Regular Expression, and write Text Processing scripts.
- Write file handling scripts.
- Learn to use Python for Data and Image processing.
- Get hands on experience of Cluster Analysis using Python.

Unit I

Python Fundamentals: Introduction, Python Objects, Built-in Functions, Numbers and Strings, Conditionals and Loops, Functions, Passing Arguments, String Functions

Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules

Unit II

Regular Expressions: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python. Dictionaries: Introduction, Operators, Built-in Functions, Built-in Methods, Dictionary Keys.

Data Processing: Storing in List and Strings, Dispersion, Central Tendency, Mean Median Mode, Frequency Distribution, Standard Deviation Using Files for large dataset, statistics with real data, reading data from internet, Accessing Stock Market Data, Correlating Stock data

Unit III

Image Processing and Data Mining: Introduction, RGB Color Model, Object for Image Processing, Image Processing (Negative Images, Gray Scale, Resizing, Stretching, Flipping, Edge Detection)

Unit IV

What is Data Mining? Implementing Cluster Analysis on Simple Data, Distance between two points, Clusters and Centroids, File Processing, Visualization.

References

1. Core Python Programming, Chun, J Wesley, Second Edition, Pearson.
2. Python Programming in Context, Bradley N Miller, David L Ranum, Second Edition.
3. Head First Python, Barry, Paul, 2nd Edition, O Rielly.
4. Learning Python, Lutz, Mark, 4th Edition, O Rielly.
5. "The Python Tutorial" at <https://docs.python.org/3/tutorial/index.html>
6. "Beginners Guide to Python" at <https://wiki.python.org/moin/BeginnersGuide>

HC**SOFTWARE ENGINEERING****[3:1:0]****Objectives:**

- Understand the phases in a software project.
- Gain knowledge on the fundamental concepts of requirements engineering and Analysis Modelling.
- Understand the major considerations for enterprise integration and deployment.
- Learn various testing and maintenance measures.

Outcomes:

- Identify the key activities in managing software project and compare different process models.
- Apply the Concepts of requirements engineering and Analysis Modelling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance.

Unit I: SOFTWARE PROCESS AND PROJECT MANAGEMENT

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model – Project Scheduling – Scheduling, Earned Value Analysis – Risk Management.

Unit II: REQUIREMENTS ANALYSIS AND SPECIFICATION

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

Unit III: SOFTWARE DESIGN

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

Unit IV: TESTING AND IMPLEMENTATION

Software testing fundamentals-Internal and external views of Testing-white box testing- basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques: Coding practices-Refactoring.

References

1. “Software Engineering – A Practitioner’s Approach”, Roger S. Pressman, Seventh Edition, Mc Graw-Hill.
2. “Software Engineering”, Ian Sommerville, 9th Edition, Pearson Education Asia.
3. “Fundamentals of Software Engineering”, Rajib Mall, Third Edition, PHI.
4. “Software Engineering - A Precise Approach”, Pankaj Jalote, Wiley India.
5. “Software Engineering”, Kelkar S.A.,PHI.

SC**ARTIFICIAL INTELLIGENCE****[3:1:0]****Objectives:**

- To provide an overview of artificial intelligence (AI) principles and approaches.
- To develop a basic understanding of the building blocks of AI in terms of intelligent agents like Search, Knowledge representation, inference, logic, and learning.
- To provide an overview of knowledge representational structures like slot and fillers.
- To have knowledge of expert systems, learning and planning which plays a considerable role in some applications.

Outcomes:

- Implement the basic concepts of AI.
- Comprehend the fundamentals of knowledge representation, inference and theorem proving.
- Represent knowledge of the world using logic and infer new facts from that knowledge.
- Explain how Artificial Intelligence enables capabilities that are beyond conventional technology.

Unit I: Introduction

AI Problems, AI Techniques, Defining the Problem as State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.

Unit II: Heuristic Search Techniques and Knowledge Representation

Generate and Test, Hill climbing, BFS, DFS, Knowledge Representation Issues, Approaches to Knowledge Representation, Procedural Versus Declarative Knowledge, Inferential Versus Inheritable Knowledge, Normal Forms in Predicate Logic and Clausal Forms, Introduction to Non-monotonic Reasoning, Logics for Non-monotonic Reasoning.

Unit III: Knowledge Representational Structures

Weak Slot and Filler Structures: Semantic Nets, Frames.

Strong Slot and Filler Structure: Conceptual Dependency, Scripts.

Unit IV: Game Playing, Planning and Expert Systems

Game Playing: Minimax Search Procedure, Adding Alpha-Beta Cut Offs, Planning-Goal Stack Planning, Expert Systems: Expert System Versus Conventional Computer, Expert System Shells, and Explanation Based Learning.

References

1. "Artificial Intelligence", Rich Elaine Knight Kevin – Tata McGraw Hill.
2. "Introduction to Artificial Intelligence and Expert system", Patterson W Dan – Prentice Hall.

SC**DIGITAL IMAGE PROCESSING****[3:0:1]****Objectives:**

- Understand the fundamentals of digital image processing.
- Learn the different Image enhancement techniques.
- Understand the image segmentation techniques.

Outcomes:

- Demonstrate the concepts of digital image processing.
- Impart knowledge about image enhancement in spatial and frequency domains.
- Implement the techniques of image segmentation.

Unit I: Introduction and Digital Image Fundamentals

What is Digital Image Processing?, The Origins of Digital Image Processing, Examples of Fields that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Image Processing System, Elements of Visual Perception, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations

Unit II: Image Enhancement in the Spatial Domain

Some Basic Gray Level Transformations, Histogram Processing, Enhancement using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Unit III: Image Enhancement in the Frequency Domain

Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering.

Unit IV: Image Segmentation

Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-based Segmentation, Segmentation by Morphological Watersheds.

Reference

1. Digital Image Processing – Rafael C. Gonzalez and Richard E. Woods, 2nd Edition, Pearson Education.

SC**C# PROGRAMMING****[3:0:1]****Objectives:**

- To provide an overview of the .NET framework.
- Understand Object-Oriented Paradigm using C# programming.
- Learn extended OOP's concept in C# environment.
- Understand the concepts of interfaces and multithreading.

Outcomes:

- Acquire the knowledge of .NET framework.
- Develop an ability to write programs in C#.
- Implement the extended OOP's concept in C# environment.
- Develop applications using standard C# libraries.

Unit I

Understanding .NET: The C# Environment: The .Net Strategy, The Origins of .Net Technology, The .NET Framework, The Common Language Runtime, Framework Base Classes, Benefits of the .NET Approach.

Overview of C#: Introduction, A Simple C# Program, Namespaces, Adding Comments, main Returning a Value, Using Aliases for Namespace Classes, passing String Objects to Write Line Method, Command Line Arguments, Main with a Class, Providing Interactive Input, Using mathematical Functions, Multiple main Methods, Compile Time Errors, Program Structure, Program Coding Style.

Methods in C#

Introduction, Declaring Methods, The Main Method, Invoking Methods, Nesting of Methods, Method Parameters, Pass by Value, Pass by Reference, The Output Parameters, Variable Argument Lists, Method Overloading.

Arrays, Strings, Structures and Enumerations.

Unit II

Classes and Objects: Introduction, Basic Principles of OOP, Defining a Class, Adding Variables, Adding Methods, Member Access Modifiers, Creating Objects, Accessing Class members, Constructors, Static Members, Static Constructors, Private Constructors, Copy Constructors, Destructors, Member Initialization, The this Reference, Nesting of Classes, Constant Members, Read-only Members, Properties, Indexers.

Operator Overloading: Introduction, Over loadable Operators, Need for Operator Overloading, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Comparison Operators.

Unit III

Inheritance: Introduction, Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Defining Subclass Constructors, Multilevel Inheritance, Hierarchical Inheritance.

Run-Time Polymorphism: Overriding methods, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes, and Sealed Methods.

Managing Errors and Exceptions: Introduction, What is Debugging?, Types of Errors, Exceptions, Syntax of Exception handling Code, Multiple Catch Statements, Using Finally

Statements, Nested Try Blocks, Throwing Our Own Exceptions, Checked and Unchecked Operators.

Unit IV

Interfaces: Introduction, Defining an Interface, Extending an Interface, Implementing Interfaces, Interfaces and Inheritance, Abstract Class and Interfaces.

Multithreading in C#: Introduction, Understanding the System. Threading Namespace, Creating and Starting a Thread, Scheduling a Thread, Synchronizing Threads, Thread Pooling.

Delegates and Events: Introduction, Delegates, Delegate Declaration, Delegate Methods, Delegate Instantiation, Delegate Invocation, Multicast Delegates, Events.

References

1. PROGRAMMING IN C# - A PRIMER by E Balaguruswamy, Third Edition, and Tata McGraw-Hill.
2. C# 4.0: The Complete Reference by Herbert Schildt, Tata McGraw-Hill.

SC**ANDROID PROGRAMMING****[3:1:0]****Objectives:**

- Learn to build simple android applications.
- Get an understanding of essentials of application design and user interface design.
- Understand different android APIs used to store and manage the data through SQLite.
- Understanding different android networking and web APIs to share the data between the applications.

Outcomes:

- Build sample android application.
- Develop user interfaces for android applications.
- Develop android applications to share data between different applications.
- Deploy android applications.

Unit I: Introduction to Android

History of Mobile Software Development, The Open Handset Alliance, The Android Platform Android SDK, Building a sample Android application, Anatomy of Android applications, Android terminologies.

Unit II: Android Application Design Essentials

Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings , Using Intent Filter, Permissions , Managing Application resources in a hierarchy , Working with different types of resources.

Unit III: Android User Interface Design Essentials

User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Unit IV: Using Android APIs

Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers , Using Android Networking APIs , Using Android Web APIs , Using Android Telephony APIs , Deploying (selling) your Android application

References:

1. “Android Wireless Application Development”, Lauren Darcey and Shane Conder, 2nd edition, Pearson Education.
2. “Professional Android 2 Application Development”, Reto Meier, Wiley India.
3. “Beginning Android”, Mark L Murphy, Wiley India.
4. “Pro Android”, Sayed Y Hashimi and Satya Komatineni, Wiley India.

SC**BIG DATA ANALYTICS****[3:1:0]****Objectives :**

- To identify the characteristics of datasets and compare the trivial data and big data for various applications.
- To introduce students the concept and challenge of big data.
- To know the implementation of parallel processing with Map Reduce.
- To teach students in applying skills and tools to manage and analyze the big data.

Outcomes :

- Understand the concept and challenges of big data and why existing technology is inadequate to analyse the big data.
- Develop an ability to collect, manage, store, query, and analyse various form of big data.
- Understand the significance of No SQL databases over RDBMS.
- Map the impact of big data for business decisions and strategy.

Unit I: Wholeness of Big Data

Introduction; Understanding Big Data, Caselet: IBM Watson : A Big Data system; Capturing Big Data; Benefitting, Management, Organizing and Analyzing Big data; Technology Challenges for Big Data; Big Data Sources and Applications

Unit II: Big Data Architecture and Distributed Computing Using Hadoop

Google query Architecture; Standard Big Data Architecture; Big data Architecture Examples – IBM Watson, Ebay, Netflix, Paypal; Introduction to Hadoop Framework, HDFS Design Goals, Master Slave Architecture; Installing HDFS – Reading and Writing Local files into HDFS, Reading and Writing Data Streams into HDFS

Unit III: Parallel Processing with Map Reduce:

Introduction, How Google search Works, Map Reduce overview; Sample Map Reduce Application: Word count, Map Reduce Programming, Map Reduce Jobs Execution, Hive and Pig Language capabilities

Unit IV: No SQL databases

Introduction, RDBMS Vs NOSQL, Types of NoSQL Databases, Architecture of No SQL, CAP theorem; HBase – Architecture Overview, Reading and Writing Data; Cassandra – Architecture Overview, Protocols, Data Model, Cassandra Writes and Reads, Replication

References

1. Big Data Made Accessible by Anil Maheshwari.
2. Big Data Analytics by M. Vijayalakshmi Radha Shankarmani
3. Data Science and Analytics by VK Jain

OE**E-COMMERCE****[3:1:0]****Objectives:**

- To impart knowledge on E-Commerce.
- To provide an overview of various applications connected with E-Commerce.
- To enable the learner for aiming careers in special software development involving E-Commerce technologies.
- Understand the security issues in E – commerce.

Outcomes:

- Analyse the impact of E-commerce on business models and strategy
- Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational structures.
- Assess electronic payment systems and its securities.
- Recognize and discuss global E-commerce issues.

Unit 1: Introduction to E-Commerce

Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Unit 2: Business to Business E-Commerce

Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational Ecommerce. Business models for E-commerce, Business Process Re-Engineering.

Unit 3: Business to Consumer E-Commerce and E-Business

Consumer trade transaction, Web metrics, Elements of E-Commerce, Industry impacts of E-business. Integrating Intranet and internet web applications across multiple networks. Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Unit 4: Security Issues

How criminals plan attacks, passive attack, Active attacks, cyber stalking, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security, Search engines, Intelligent agents in E-Commerce Electronic payment systems

References

1. E-Commerce: Strategy, Technologies & Applications, David Whitley, McGraw Hill.
2. E-commerce: The Cutting Edge of Business, K. K. Bajaj and Debjani Nag, 2nd Edition, McGraw Hill.
3. Handbook of Electronic Commerce, Shaw et al., Springer.
4. Global Electronic Commerce- Theory and Case Studies, C. Westland and T. H. K. Clark, University Press.
5. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Sunit Belapure and Nina Godbole, Wiley India.

SC**COMPILER CONSTRUCTION****[3:1:0]****Objectives:**

- To introduce principal structure of compiler, basic theories and methods used for different parts of compiler.
- To impart knowledge of fundamentals of language translator, structure of a typical compiler, parsing methods etc.
- To design various phases of compiler such as Lexical analyser, parser etc.
- To distinguish different optimization techniques in the design of compiler.

Outcomes:

- Gain an understanding of how compilers translate source code to machine executable.
- Utilize tools to automate compiler construction.
- Comprehend how to perform parsing (top down and bottom up) and understand how compilers generate code to manage memory during runtime.
- Be familiar with techniques for simple code optimizations.

Unit 1

Introduction and Lexical Analysis (Scanning)

What is a compiler? A high level view of compilation, General Structure of a compiler, an overview of compilation technology.

Regular Languages/Expressions, finite state machines, building regular expressions from finite automation.

Unit 2

Syntax Analysis (Parsing)

Expression Syntax, Context Free Grammars, Top-Down Parsing, Bottom-Up Parsing.

Unit 3

Semantic Analysis

Context-Sensitive Analysis, Attribute Grammars, Symbol Tables, Type Checking.

Unit 4

Intermediate Representations

Properties, taxonomy, graphical IRs, Linear IRs, storage management, the procedure abstraction, linkage convention, run-time storage organization, code optimization, code generation

Reference:

1. Compilers, principles, techniques and tools, Aho, A.V., Sethi R and Ullman J.,D., Addison Wesley.
2. "Engineering a compiler", Keith Cooper, Linda Torczon, Morgan Kaufmann.
3. The Essence of Compilers, Hunter R., Prentice Hall.

SC**ADVANCED DATABASE MANAGEMENT SYSTEM****[2:1:1]****Objectives:**

- To evaluate emerging architectures for database management systems.
- To develop an understanding the manner in which relational systems are implemented and the implications of the techniques of implementation for database performance.
- To assess the impact of emerging database standards on the facilities which future database management systems will provide.

Outcomes:

- Critically assess new developments in database technology.
- Interpret the impact of emerging database standards.
- Evaluate the contribution of database theory to practical implementations of database management systems.

Unit I: Database Design Methodology, Query Processing and Physical Design

Database Design and Implementation process, UML diagrams as an aid to Database Design Specification, Overview of Query Processing : Measures of Query cost, Algorithms for SELECT and JOIN Operations, Pipelining : Implementation of Pipelining, Evaluation algorithms for pipelining, Overview of Query Optimization, Physical Database Design in Relational Databases.

Unit II: Transaction Processing Concepts, Object and Object-Relational Databases

Introduction to Transaction Processing: Transaction and System Concepts, Desirable Properties of Transactions, Transaction Support in SQL.

Concepts for Object Databases: Overview of Object-Oriented Concepts, Object Identity, Object Structure, and Type Constructors, Encapsulation of Operations, Methods, and Persistence, Type Hierarchies and Inheritance. Overview of the Object Model of ODMG, Overview of SQL and its Object-Relational Features, Evolution of Data Models and Current Trends.

Unit III: Security, Advanced Modelling and Distribution

Database Security : Security issues, Enhanced Data Models for Advanced Applications: Active Database Concepts and triggers, Distributed Databases: Distributed Database Concepts, Data Fragmentation, Transparency, Distributed Transactions, Types of Distributed Database Systems, Overview of Concurrency Control Distributed Databases.

Unit IV: Emerging Technologies

Overview of Data Mining Technology, Emerging Database Technologies and Applications: Mobile Databases, Multimedia Databases, Geographic Information Systems (GIS).

References:

1. Fundamentals of Database Systems – Fifth Edition – Ramez Elmasri, Shamkant B Navathe.
2. Database System Concepts – Abraham Siberschatz, Henry F. Korth, S. Sudarshan, Fifth Edition- McGraw – Hill.
3. Database Systems – Thomas Connolly, Carolyn Becg – Third Edition – Pearson Education.
4. An Introduction to Database Systems – Eight Edition- Date C J - Addison Wesley.
5. Strategic Database Technology – Simon A R, Morgan Kaufmann.

SC**DATA MINING****[3:1:0]****Objectives:**

- To get an understanding of methods and applications of Data mining.
- Understand the rules related to association, classification and clustering analysis.
- Compare and contrast between different classification and clustering algorithms

Outcomes:

Develop ability to:

- Identify data mining problems.
- Choose between classification and clustering solution.
- Model problems and solutions using data mining techniques.

Unit I:**Introduction:** What is data mining? Challenges, Data Mining Tasks.

Data: Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity.

Unit II:**Association Analysis:** Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.**Unit III:****Classification:** Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.**Unit IV:****Clustering Analysis:** Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph Based Clustering, Scalable Clustering Algorithms.**References:**

1. "Introduction to Data Mining", Pang-Ning Tan, Michael Steinbach, Vipin Kumar Pearson.
2. "Data Mining -Concepts and Techniques", Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann Publisher, 3rd Edition.
3. "Mastering Data Mining" Michael.J.Berry, Gordon.S.Linoff, Wiley Edition, second edition.
4. "Principles of Data Mining", David Hand, Heikki Mannila and Padhraic Smyth, The MIT Press.
5. "Data Mining Techniques", Arun K Pujari, University Press.

OE**OFFICE AUTOMATION****[2:2:0]****Objectives:**

- Provide a basic introduction to computers and computing environment.
- Enable the students in crafting professional documents using word pre-processors.
- Enable students use spreadsheets for tabulating and calculating data and create graphical representations of data.
- Enable students to design professional presentations.

Outcomes:

- Understand the basics of computer hardware and software.
- Prepare documents of different types.
- Ability to develop and use spreadsheets for tabulating and analysing for productivity.
- Prepare presentations.

Unit I

Introduction to Computers, Basic Anatomy of Computers and Introduction to MS-Office.

Unit II

MS-Word – Word Basics, Formatting Features, Menu, Commands, Tool Bars and their Icons, Mail Merge and Macros Creating Tables.

Unit III

MS-Excel - Introduction, Menu, Commands, Tool Bars and their Icons, and Functions.

Unit IV

MS-Power Point – Menu, Toolbar, Navigating in PowerPoint, Working with PowerPoint and Introduction to MS-Access.

References:

1. MS Office for Everyone – Sanjay Saxena, Vikas Publishing House.
2. Step by Step Microsoft Office XP, PHI.