SYLLABUS

For

Master of Science (M.Sc.)

in

Computer Science
(A Four Semester Course)

Government Autonomous College
Rourkela -769004
Odisha
(2021-22)

Phone : 91-661-2664586
Email : principalgacr@gmail.com
www.gacrkl.ac.in

Course Structure for M. Sc in Computer Science

SEMESTER – I

Course No	Course Title	Marks
MCS101	Computer Organization & Architecture	75
MCS102	Data structure through JAVA	75
MCS103	Operating Systems	75
MCS104	Theory of Computation	75
MCS105	Lab Based on MCS 101, 102,103, 104	100
	Total	**400**

SEMESTER - II

Course No	Course Title	Marks
MCS201	Design Methods and Analysis of Algorithms	75
MCS202	Advance Computer Networks	75
MCS203	Unix network System Programming	75
MCS204	Linear algebra and Probability	75
MCS205	Lab based on MCS 201, 202, 203, 204	100
	Total	**400**

SEMESTER - III

Course No	Course Title	Marks
MCS301	Artificial Intelligence	75
MCS302	Software Engineering	75
MCS303	Mobile computing	75
MCS304	Database Engineering	75
MCS305	Seminar	50
	Field Study	25
	Survey Report/ Literature Review	25
MCS306	Lab on MCS 301, 302, 303, 304	100
	Total	**500**

SEMESTER - IV

Course No	Course Title	Marks
MCS401	ELECTIVE-I (Real time system)	75
MCS402	ELECTIVE-2 (Cryptography and NS)	75
MCS403	Internet and Web Technology	75
MCS404	Numerical Analysis	75
MCS405	PROJECT with VIVA	100
MCS406	Lab based on MCS 401, 402, 403, 404	100

	Total	500
	Grand Total	1800

MCS405 : Students will require to pursue a dissertation allotted to them in accordance with their preference subject to their supervisor's approval. They will have to submit the dissertation done by them during the semester.

Theory Papers: 75 marks (End semester 60 marks + Internal 15 marks)

Elective Course : Any Two of the following

MCS311: Advanced Computer Architecture

MCS312: Soft Computing Techniques

MCS313: Compiler Design

MCS314: Distributed Operating System

MCS315: Parallel Computing

MCS316: Cryptography & Network Security

MCS317: Image Processing

MCS318: Bioinformatics

MCS320: Distributed Database

MCS320: Real Time System

MCS-101   *Computer Organization & Architecture*   **Marks : 75**

Unit-I
Basic Structure of Computer- Functional Units- Bus structure- Performance- Evolution-
Performance- Machine Instructions and programs- Memory Operation- Instruction and
Instruction sequencing- Addressing modes- Basic I/O operations

Unit-II
Input/Output organization- Accessing I/O devices- Interrupts- DMA, Arithmetic- Design of fast
adders- Binary Multiplication - Floating point numbers and operations.

Unit-III
Processing unit- Fundamental concepts- Execution of a complete instruction- Multiple bus
organization- Hardwired control- Microprogrammed control- Performance evaluation-
Processor architecture-Pipelining: Basic concepts-Hazards.

Unit-IV
Memory system- RAM and ROM- Cache memories- Performance considerations- Associative
memories- Mapping- Direct mapping- Associative mapping- Set associative mapping.

Text book

[1]   Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", 5th
        Edition, Tata Mc-Graw Hill, 2002.

References
[1]   Hayes, J.P., "Computer Architecture and Organization", 3rd Edition, Tata Mc-Graw
        Hill, 1998.
[2]   Patterson, D. A., and Hennessy, J.L., "Computer Organization and Design:The
        Hardware/Software Interface", 3rd Edition, Elsevier, 2005.
[3]   M. Morris Mano, "Computer System Architecture", 3rd Edition, PHI, 2000.

Unit-I

Fundamentals of Algorithms & Data Structure
Algorithm: Analysis of Algorithm –Time Complexity, Space Complexity – Amortized Time Complexity – Asymptotic Notation., Data Types, Abstract Data Types, Arrays : Single & Multidimensional Arrays, Sparse Matrices Representations.

Unit-II
Linear Data Structures
Stacks Representation, PUSH and POP operations Application of stacks, Infix, Post fix, Prefix expressions, Queues: Representation, implementation & operation on queues, Array implementation of priority queue, Priority Queues, Dequeues, Circular Queues.

Unit-III
Non-Linear data structures
Linked list: Singly linked lists, doubly linked lists, Circular linked list.
Trees: Binary Trees: representation & Trees Traversal, threaded binary trees, Binary search Tree, B tree, B+ tree, AVL tree, General Expression Trees, constructing an expression tree. Graphs & their Applications, Linked representation of Graph, Adjacency Matrix, Adjacency list, Graph Traversal: BFS, DFS.

Unit-IV
Sorting & Searching Techniques
Bobble sort, Quick sort, selection sort, Heap sort, insertion sort, merge sort, radix sort & efficiency considerations, Sequential Search, Binary Search, Fibonacci Search

T**ext book**
1.   Debasis Samanta, "Classic Data Structures", 2nd Edition, PHI Learning Pvt. Ltd., 2009.

References
1.   S. Lipschutz, "Data Structures (Schaums Outline series)", Mcgraw Hill Education 1st Edition, 2014
.
2.   J. P. Tremblay & P. G. Sorenson, "Introduction to Data Structures with applications", McGraw Hill Higher Education; 2nd Revised edition, 1983

3.   Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education. 2nd Edition, 1997

MCS-103   **OPERATING SYSTEM**   *Marks : 75*

Unit-I
Operating System Introduction, Structures – Simple Batch, Multi programmed, time-shared, Parallel, Distributed Systems, Real time systems, System components, Operating-System services.

Unit-II
Process and CPU scheduling – Process concepts and scheduling, operation of processes, cooperating processes, threads and inter process communication – scheduling criteria, Scheduling Algorithm.

Unit-III
Memory Management and Virtual memory – Logical versus Physical address, space, swapping, contiguous allocation, paging, segmentation, demand paging, demand segmentation, page replacement, page replacement algorithm.

Unit-IV
Process Management and Synchronization – The critical section problem, synchronization hardware, semaphores, and classical problems of synchronization, Deadlocks – System Model, Dead locks characterization, Methods for Handling Dead locks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

Text book.
1   Abraham Silberschatz and Peter Baer Galvin "Operating Systems concepts" John wiley & sons, Inc., 7th Edition. ,2007

References

1   Charles Crowley, "Operating System: A Design- Oriented Approach", Tata Mc-Graw Hill., 1st Edition, 2001

2   Pabitra Pal, Choudhury, "Operating Systems: Principle and Design", Prentice Hall of India, 2009 Edition

3   J Archer Harris, "Schaum.s Outline of Operating Systems", Tata Mc-Graw Hill. ,2001

MCS-104   *Marks : 75*

Unit-I
Finite Set Automata:- Formal Definition, Finite State Machine, Deterministic Finite Automata ,Transaction System, Non-deterministic finite Automata, Equivalence of NFA and DFA, Finite automata with ?-transition, Two –way Finite Automata, Minimization of finite Automata

Unit-II
Regular Language and Expression:- Regular Language, Regular Expression, Finite Automata regular expression, Pumping Lemma, Regular Sets and Regular Grammar Equivalence of two finite Automata

Unit-III
Introduction to Context-free Grammar, Context-free Language:-Derivation Tree, Ambiguity in Context free Grammar, Simplification of Context free Grammars, Normal Forms for Context free Grammars, Pushdown Automata:- Basic definitions, Model of pushdown Automata, Deterministic Pushdown Automata , Working principle of Pushdown Automata,

Unit-IV
Turing Machine:-Turing Machine Model, Representation of Turing Machine, Language Acceptability of Turing machines, Design of Turing Machine, NP-Completeness:-The Class P, The class NP, NP-Complete problems.

Text book

1.   N. Chandrasekharan, and K. L. P. Mishra, "Theory of computer science: Automata language and computation",Prentice Hall of India,3rd Edition,2006

References
1.   J. C. Martin, "Introduction to Languages and the Theory of Computation", Tata-McGraw Hill., 4th Edition, 2011
2.   H. R. Lewis and C.H. Papadimitriou, "Elements of the Theory of Computation", Prentice Hall of India,2nd Edition,1997
3.   J.E. Hopcroft, J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition,2006
4.   Anand Sharma, "Theory of Automata and Formal language", Laxmi Publications, 2nd Edition.,2006

MCS-201 Design Methods and Analysis of Algorithms *Marks : 75*

Unit-I
INTRODUCTION : Algorithm, O-notation, Omega notation and theta notation, Heaps and Heap sort, Sets and disjoint set, union and find algorithms.

Unit-II
DIVIDE AND CONQUER :merge sort , quick sort, matrix multiplication, strassen's matrix multiplication.
GREEDY METHOD : optimal storage on tapes, knapsack problem , job sequencing with deadlines, minimum spanning tree, Single source shortest paths.

Unit-III
DYNAMIC PROGRAMMING : Multistage Graphs, optimal binary search, trees, O/1 knapsack problem, Traveling sales person problem, floor shop scheduling.

Unit-IV
BACK TRACKING : n-queen problem, sum of subsets problem, graph, coloring , Hamiltonian cycles.
BRANCH AND BOUND : LC search, bounding, LC branch and bound, FIFO branch and bound, .

Text book:

1. Introduction to Algorithms, H. Cormen, PHI, 3rd Edition, 2011.

Reference:

1. E. Howrowitz and Shanl, Fundamentals of computer algorithms, GALGOTIA PUBLICATIONS, 1st Edition, 2004

2. ULLMAN, "Design and analysis of algorithms", Addison wisely ,1st Edition, 1994.

Unit-I
Protocol and the TCP/IP Suite: The Need for a Protocol Architecture, TCP/IP Protocol Architecture, The OSI model, Internetworking. Transmission control protocol, User Datagram Protocol, The internet protocol, IPv6.

Unit-II
Packet Switching Network, Frame Relay Network, ATM Protocol Architecture, ATM Logical Connection, ATM Cells, ATM Service Categories, ATM Adaptation Layer (AAL), The Emergence of High-Speed LAN, Ethernet.

Unit-III
How Queue Behave, Why Queuing Analysis? Queuing Models, Single-Server Queues, Multi server Queues, Queues with priorities, Network of Queues, Other Queuing Models, Estimating Model Parameters, Self- Similar Data Traffics, Examples of Self- Similar Data Traffics, Performance Implication of Self-Similarity, Modeling and Estimation of Self- Similar Data Traffics.

Unit-IV
Effect of Congestion, Congestion and Control, Traffic Management, Congestion Control in Packet Switching Network, The Need for Flow and Error Control, Link Control Mechanism, ARQ Performance, TCP Flow Control, TCP Congestion Control, Internet Routing Principles, Distance-Vector Protocol: RIP, Link-State Protocol: OSPF

Text book:

1.   William Stallings, "High-Speed Networks and Internets: Performance and Quality of Service", Pearson Education, 2nd Edition, 2002.

References:

1.   Behrouz A. Forouzan, "Introduction to Data Communications and Networking", McGraw-Hill Education (India). 4th Edition, 2007,

2.   Andrew S. Tanenbaum, "Computer Networks", Pearson Education, 4th Edition, 2003

Unit-1 Machine Structure, Evolution of the Components of a Programming System (Assembler, Loader, Macros, Compilers), Evolution of Operating System, Operating System Users Viewpoint, Function, Batch Control Language.,

Unit-2 Introduction: Unix Operating systems, Difference between Unix and other operating systems, Features and Architecture, Installation, Booting and shutdown process, System processes (an overview), External and internal commands, Creation of partitions in OS, Processes and its creation phases – Fork, Exec, wait, exit.

 Unit-3 Shell introduction and Shell Scripting: Shell and various type of shell, Various editors present in Unix, Different modes of operation in vi editor, Shell script, Writing and executing the shell script, Shell variable (user defined and system variables), System calls, Using system calls, Pipes and Filters.

 Unit-4 Unix Control Structures and Utilities: Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep).

Text Books:
1. Sumitabha, Das, Unix Concepts And Applications, Tata McGraw-Hill Education, 2017, 4/Ed.
2. Abraham Silberschatz and Peter Baer Galvin "Operating Systems concepts" John wiley & sons, Inc., 7th Edition. ,2007

Reference Books:

1. Nemeth Synder & Hein, Linux Administration Handbook, Pearson Education, 2010, 2/ Ed

MCS204   **Linear Algebra and Probability**   **Marks:75**

Unit-I

Matrix,Determinant,Rank of matrix, Echelon form of matrix,Row Reduced Echelon form(RREF). System of linear equation(Homogeneous and Non- homogeneous equation),Test of consistency, LU-decomposition method,Eigen value and Eigen vector.

Unit-II

Vector space,vector sub space,span of a set ,Linear dependent and linear independent set of vectors,Basis.

Unit-III

Sample space,Event,mutually exclusive events,exhaustive events,equally likely events Axiom of probability, some useful theorems,conditional probability,Independent events,Theorem of Total probability and Baye's theorem.

Unit-IV

Random variable,probability distribution,discrete probability distribution,continuous probability distribution,Probability density function,Expectation of a random variable.some important distributions:uniform distribution,Normal distribution,exponential distribution,poisson distribution and binomial distribution.

Text book:

1. V KRISHNAMURTY, "Text book of LINEAR ALGEBRA",

2. T V REERAJAN "Probability Statistics and Randam Processes"

MCS301   **Artificial Intelligence**   **Marks:-75**

UNIT-I
Intelligent agents, Uninformed search strategies (BFS, DFS,DLS,IDS,BD). Informed search (Greedy Best first and A*), Constraint satisfaction Problems, 4 queen problem and Graph colouring in CSP.

Unit-II
Knowledge and Reasoning: Logical agent (Wumpus world), Propositional logic, Inference rule in propositional logic, First order logic, CNF for first order logic, Semantic network, Script, Frame.

UNIT-III
Learning And NLP: supervised and unsupervised learning, Neural network, neuron structure and application, Mcculloch-pitts model, perception learning rule, Natural Language Processing: Different steps in NLP, Ambiguity, Communication, sentence tree.

UNIT -IV
Fuzzy set, fuzzy terms, operation in fuzzy set, fuzzy relation, membership functions, composition: max-min, max-product, Fuzzy extension principle and example, Defuzzification functions.

Text book:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence, A modern approach", Pearson Education, 2nd Edition, 2011

References:

1. Elaine Rich &Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3rd Edition, 2008
2. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", 1st Edition
3. S.N. Deepa S.N. Sivanandam, Principles of Soft Computing, 2ed Kindle Edition

UNIT-I

Introduction: why study software engineering, Software Life Cycle Models, Classical Waterfall Model, Phase of classical waterfall model, Iterative waterfall model, Prototyping Model, Evolutionary Model, Spiral Model.

UNIT-II

Metric for Project Size Estimation, Lines of Code (LOC), Function Point Metric, Project Estimation Techniques, Empirical Estimation Techniques, Heuristic Techniques, Analytical Estimation Techniques, Expert Judgment Technique, Delphi cost Estimation, COCOMO – A Heuristic Estimation Technique, Basic COCOMO Model, Intermediate COCOMO, Complete COCOMO, COCOMO2.

UNIT-III

Staffing Level Estimation, Norden's Work, Putnam's Work, Work Breakdown Structure, Activity Networks and Critical Path Method, Gantt Charts, PERT Charts, Risk Management, Risk Identification, Risk Assessment, Risk Containment.

UNIT-IV

Software Design, Cohesion and Coupling, Function-Oriented Design, DFDs, Object-Oriented Design, Use Case Model Development, coding & testing, Black Box Test Suite Design Approach, White Box Testing, Basic Concepts Statement Coverage, Branch Coverage, Condition Coverage, Path Coverage, McCabe's Cyclomatic Complexity Metric, Data Flow-based Testing, Mutation Testing

Suggested text book:

1.　　Rajib Mall, "Fundamentals of Software Engineering", 4th Edition, PHI, 2014.

References:

1.　　Roger Pressman S, "Software Engineering A Practitioners Approach",McGraw Hill, 8th Edition,2014

Unit-I

GSM, GPRS, 3G, Wireless LANs Characteristics, Blue tooth: Architecture, Radio Layer, Base band Layer, Link Management Protocol, L2CAP and Security. Mobile Transport and Network Layer Introduction,

Unit-II

IEEE 802.11: Architecture, Physical Layer, MAC Layer, MAC Management, 802.11a and 802.11b. HIPERLAN: History, WATM, BRAN and HiperLAN2.

Unit-III

Traditional TCP: Congestion Control, Slow Start, Fast Retransmit and Implications of Mobility. Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP and Fast Retransmit.

Unit-IV

Mobile IP: Introduction, IP Packet Delivery, Agent Discovery, Registration, Mobile Ad-hoc Networks: Routing, Destination Sequence Distance Vector, Dynamic Source Routing, Cellular Networks Cellular Concept, Frequency Reuse, Channel Allocation Management, Interference: Co-channel and Adjacent Interference. System Capacity, Improving Cell Capacity and Coverage: Cell Splitting, Sectoring, Repeaters

Text books:

1.   Schiller, "Mobile Communications", Addison –Wesley, 2003

References:

1.   T. S. Rapport, "Wireless Communications, Principle and Practices",Prentice Hall,2nd Edition,2002.

2.   Forouzan, "Data Communications and Networking", Tata McGraw Hill,5th Edition,2013

Unit-I

Organization of Database, Components of Database Management System, Database abstraction & independency, Data Models:-Entity –Relationship Model, Integrity Constraints.

Unit-II

Relational Algebra, Relational, Calculus, Tuple Calculus System, The Domain Calculus System, Functional Dependency, Armstrong's, Axioms, Normal Forms,

Unit-III

Query Processing and Optimization, Steps for Query Optimization, cost-based query optimization, Heuristic query optimization, Join, Types of join

Unit-IV

Transaction Processing:- Transaction, Serializability, Locking, Non-Locking Schedulers, Database Recovery.

Text book:

1.   Arun K Majumdar, Pritimoy Bhattacharayya "Database Management Systems", Tata McGraw Hill, 2006.

References:

1.   Silberschatz. Korth. Sudarshan, "Databse System Concepts", McGraw Hill, 6th Edition,2011

MCS403   **Internet & Web Technology**   **Marks:75**

Unit I
Static Web Pages : Web Pages - types and issues, tiers; WWW-Basic concepts, web client and web server, universal resource locator (url), HTML different tags, sections, image & pictures, listings, tables, frame.

Unit II
Java Script: Data types, variables, operators, conditional statements, array object, date object, string object. Introduction to CGI

Unit III
Dynamic Web Pages: The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation.

Unit IV
J2SE 1.4: Concepts and Prerequisites: Data Types, Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multi Threading Java Servlet: Brief origin and advantages over CGI. JSP :Concept of MVC Architecture and the role of JSP, JSP life cycle.

Text **book:**

1.   Dietel Dietel Nieto, "Internet and Worldwide web, How to Program", Pearson Education, 4th Edition, 2008

Reference :

1.   Douglas E. Comer, "Internetworking with TCP/IP, Volume 1: Principles, Protocols and Architecture", PHI Learning Pvt. Ltd, Fifth Edition, 2006.

2.   Ralph Moseley, "Developing Web Applications", Wiley India, 2008.

3.   Eric Jendrock, D. Carson, I. Evans, D. Gollapudi, K. Haase, C. Srivastha, "The Java EE6 Tutorial", Pearson India, Volume-1, 4th Edition, 2010,.

MCS404   **NEUMERICAL ANALYSIS**   **Marks:75**

Unit-1
Error : round off, local truncation, global truncation, Method of iteration Newton-Raphson method - Regula Falsi method, bisection method, secant method.

UNIT -2
Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

Unit-3
Introduction to graph theory, Graph terminology, Representation of graphs, Isomorphism, Connectivity, Euler and Hamiltonian paths, Shortest path problems, Planar graph, Graph coloring, Introduction to trees, Application of trees, Tree Traversal, Minimum Spanning tree.

Unit-4
Solutions of differential equations : Numerical solution of ordinary differential eqiation of first order - Euler's method - Modified Euler's method - Picard's method of successive approximation - Runge-Kutta method (Second and third order only).

Text Book:

1. **S.S. Sastry** : Introductory Methods of **Numerical Analysis**, Fourth Edition, PHI.

Reference book:

1. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5th Edition, New Delhi, 2007

2. Brian "A friendly introduction to Numerical analysis", Pearson Education, Asia,   New Delhi, 2007.

Elective Course : Any TWO of the following

MCS311　　　　　　**Advanced Computer Architecture**　　　　**Marks:- 75**

Unit- I
Performance evaluation, Processor architecture, pipelining, pipeline hazards, issues in pipelined processor implementation.

Unit- II
Instruction level parallelism, hardware and compiler support for branch rediction, out-of-order Instruction issue,

Unit-III
speculative execution and other techniques for high-performance

Module -IV
Instruction and data cache organizations, multilevel caches, parallel memory systems, Support for virtual memory. Multiple processor systems, Interconnection networks, shared memory system, memory models, cache coherence.

Text book :

1.　　Hennessy J. L., D. Patterson, " Computer Architecture　A quantitative Approach" , Morgan Kaufmann, 5th edition,2011

References:

1.　　John Paul Shen, Mikko Lipasti, " Modern Processor Design Fundamentals of Superscalar Processors", McGraw Hill International Edition, 2005.

2.　　Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architecture A Design Space Approach", Addison Wesley, 1997.

MCS312   **Soft Computing Techniques**   **Marks: 75**

UNIT -I
Basic concept of Soft computing, Hard vs soft computing, Application of soft computing, FUZZY set, operation in fuzzy set, fuzzy relation, membership functions, composition: max-min, max-product, Fuzzy extension principle (with example), Defuzzification functions.

UNIT – II
Neural network, brain vs ann, neuron structure and application, Mcculloch-pitts model, Activation function, perception learning rule, ADALINE,.

UNIT – III
Hopfield network, Bidirectional Associative memory, Kohonen Self Organizing Maps, Learning Vector Quantization.

UNIT - IV
K-mean clustering, supervised vs unsupervised learning. Eigenvalue and eigenvector of a matrix, Dimensionality reduction: Principal Component Analysis (steps and application), Nearest neighbour, K-Nearest Neighbour. Genetic algorithm: population, mutation, crossover, particle swarm optimization.

Text book:

1. S.N. Deepa S.N. Sivanandam, Principles of Soft Computing, 2ed Kindle Edition

References:

1. Russel and Norvig, "Artificial Intelligence" pearson Education, 2nd edition, 2011.
2. J. S. R. Jang, C. T. Sun, E. MizutaniNeuro - Fuzzy & Soft Computing : A Computational Approach to Learning and Machine Inttelligence First Edition

MCS313   **Compiler Design**   **Marks: 75**

Unit I

Introduction on the phase of the complier – Lexical Analysis, Regular Expression, Non deterministic Automata, Deterministic Automata equivalent to NFA's. Minimizing the states of DFA, Implementation of Lexical Analyzer.

Unit II

Syntax Analysis – Top down Parsing Concepts, Recursive Descent Parsing, Predictive Parsers, Non recursive Pedictive Parsing – Bottom Up Parsing, Handle pruning, Shift reduce parsing – Operator Predence Parsing – Error recovery in Parsing, LR Parsers, Parser Generators – YACC.

Unit III

Intermediate Code Generation: Syntax directed Definitions, Construction of Syntax trees – Top down Translation, Bottom up Evaluation of inherited Attributed, Recursive Evaluators, Assigning Space at Complier Construction time – Type ,checking – Overloading of functions and operators Polymorphic function.

Unit IV

Storage Organization : Storage Organization, Storage Allocation Strategies, Parameter Passing, Symbol tables, Dynamic Storage Allocation, Intermediate Languages – Representation of Declarations, Assignment Statement, Boolean Expression, Back patching, Procedure calls.

Text book:-

1.   Alfred Aho, Ravi Sethi, Jeffy D.Ullman, "Compilers – Principles, Techniques and Tools", Pearson Education, 2nd Edition, 2009.

References:

1.   Dhamdhere D.M., "Compiler Construction Principles and Practice", Macmillan India,2nd Edition, 2000.

2.   Reinhard Wilhlm, Director Mauser, "Compiler Design", Addison Wesley, 1995.

MCS314   **Distributed Operating System**   **Marks: 75**

Unit-I
Introduction to Distributed Systems : Distributed Systems : Goals Hardware Concepts Software- design.2. Communication in Distributed Systems : Layered Protocol - ATM Networks Client server model-remote procedure call- group communication.

Unit-II
Synchronization : Clock Synchronization – mutual Exclusion – election atomic transactions – dead locks.4. Processes and Processors : Threads – system models processor allocation – Scheduling fauit tolerance – real time distributed systems.

Unit-III
Distributed file systems: File System design and implementation – trends in distributed file systems.

Unit-IV
Shared Memory : Introduction – bus based multi processors ring based multiprocessors switched multiprocessors – NUMA comparison of shard memory systems – consistency models – page based distributed shared memory – shared variable

Text book:

1.   Andrew S. Tanenbaum," Distributed Operating System" , Pearson Education, 1995.

References:

1.   P. K. Sinha, "Distributed Operating System",PHI, 2014

2.   Mukesh Singhal, Niranjan G. Shivaratri "Advanced concepts in operating systems", McGraw-Hill, 1994

MCS315   **Parallel Computing**   **Marks:75**

Unit-I

Introduction to Parallel Computing: Supercomputers and grand challenge problems, Modern Parallel Computers, Data Dependence Graph, Data Parallelism, Functional Parallelism, Pipelining and Data Clustering.

Unit-II

Interconnection Networks: Switch Network Topologies, Direct and Indirect Network Topology, Bus, Star, Ring, Mesh, Tree, Binary Tree Network, Hyper Tree Network, Hybrid, Hypercube, Perfect Shuffle Network, Torus and Butterfly Network.

Unit-III

Performance Analysis: Introduction, Execution Time, Speedup, Linear and Super linear Speedup, Efficacy and Efficiency, Amdahl's Law and Amdahl Effect, Gustafson-Barsis's Law, Minsky's Conjecture, The Karp-Flatt Metric, The Isoefficiency Metric, Isoefficiency Relation, Cost and Scalability.

Unit-IV

Parallel Computational Models: Flynn's Taxonomy, PRAM, EREW, CREW, ERCW, CRCW, Simulating CRCW, CREW & EREW, PRAM algorithms.

Text book:

1.   Hwang and Briggs, "Computer Architecture and Parallel Processing", McGraw Hill,1984

References:

2.   Crichlow, "Introduction to Distributed and Parallel Computing", PHI,2nd Edition,1996.

Unit-I
INTRODUCTION : The need for security-security approaches-principles of security-Plain Text and Cipher Text-substitution and Transposition Techniques-Encryption and Decryption- Symmetric and Asymmetric Cryptography- types of attacks

Unit-II
SYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS: overview of symmetric key cryptography-DES, AES. ASYMMETRIC KEY CRYPTOGRAPHIC ALGORITHMS: Overview of asymmetric key cryptography- RSA algorithm-symmetric and asymmetric key cryptography together digital signatures.

Unit-III
PUBLIC KEY INFRASTRUCTURE : Introduction-Digital certificates- Private Key management-PKI and Security INTERNET SECURITY PROTOCOLS: Basic concepts-SSL-SHTTP-TSP-SET-SSL versus SET- 3D

Unit-IV
Secure protocol-Electronic money-Email security-WAP security-security in GSM user authentication mechanisms : Introduction-Authentication basics passwords- authentication tokens-certificate based authentication-biometrics authentication-Kerberos.

Text books:

1.   Forouzan, "Cryptography and Network security", Tata McGraw-Hill Pub Company Ltd.,2nd Edition,2010.

References :

1   Atul Kahate, "Cryptography and Network security", Tata McGraw-Hill Pub Company Ltd., 3rd Edition,2013..

2.   Charlie Kaufman, Radia Perlman & Mike Speciner, "Network Security Private Communication in a public world",Prentice Hall of India Private Ltd., 2nd Edition,2002

2.   William Stallings, "Network Security Essentials Applications and Standards", Pearson Education, 5th Edition,2013

3.   Roberta Bragg, Mark Phodes-Ousley, Keith Strassberg, "Network Security: The Complete Reference", Tata Mcgraw-Hill,2003

Unit-I

Fundamentals of Image Processing Image Acquisition, Image Model, Sampling, Quantization, Relationship between pixels, distance measures, connectivity , Image Geometry, Photographic film. Histogram: Definition, decision of contrast basing on histogram, operations basing on histograms like image stretching, image sliding, Image classification. Definition and Algorithm of Histogram equalization.

Unit-II

Image Transforms:- A detail discussion on Fourier Transform, DFT,FFT, properties. A brief discussion on WALSH Transform , WFT, HADAMARD Transform, DCT. Image Enhancement: (by SPATIAL Domain Methods) a)Arithmetic and logical operations, pixel or point operations, size operations, b. Smoothing filters- Mean, Median, Mode filters – Comparative study, c.. Edge enhancement filters – Directorial filters, Sobel,   Laplacian, Robert, KIRSCH, Homogeneity & DIFF Filters, prewitt filter, Contrast Based edge enhancement techniques. Comparative study. d. Low Pass filters, High Pass filters, sharpening filters. – Comparative Study. e. Comparative study of all filters. f. Color image processing.

Unit-III

Image enhancement : (By FREQUENCY Domain Methods). Design of Low pass, High pass, EDGE Enhancement, smoothening filters in Frequency Domain. Butter worth filter, Homomorphic filters in Frequency Domain. Advantages of filters in frequency domain, comparative study of filters in frequency domain and spatial domain.

Unit-IV

Image compression: Definition, A brief discussion on – Run length encoding, contour coding, Huffman code, compression due to change in domain, compression due to quantization, Compression at the time of image transmission. Brief discussion on:- Image Compression standards.

Text book:

1.   Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing",Pearson,3rd Edition,2009

References:

1.   R. Weeks, "Fundamentals of Electronic Image Processing", Wiley,1996
2.   Milan Sonka , Vaclav Hlavac, Roger Boyle, "Image processing, Analysis, and Machine", Cengage Learning,4th Edition,2014

MCS318   **Bioinformatics**   **Marks:- 75**

Unit-I
Introduction:-Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy. Protein Information Resources:-Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases

Unit-II
Genome Information Resources -DNA sequence databases, specialized genomic resources . DNA Sequence analysis Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

Unit-III
Pair wise alignment techniques-Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot,Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

Unit-IV
Multiple sequence alignment -Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and Searching

Text book :

1.   T K Attwood & D J Parry-Smith, " Introduction to Bioinformatics", Benjamin Cummings,2001

References:
2.   J. M. Claverie, C. Notredame, "Bioinformatics a beginner's guide", Willy India Pvt. Ltd,2003

3.   Arthur, M. Lesk, "Introduction to Bioinformatics", OXFORD publishers (Indian Edition),3rd Edition,2008

MCS319   **Distributed Databases**   **Marks:75**

Unit-I

Features of Distributed Databases, Features of centralized databases, level of distributed Transparency – Reference Architecture, Types of Data Fragmentation, Distribution Transparency, Access primitives, Integrity constraints.

Unit-II

Distributed Database design - A frame work, the design of database fragmentation the allocation of Fragment. Translation of Global queries into Fragment queries, Query optimization.

Unit-III

Distributed Transaction Management – A framework, transaction atomicity, Phase commit, Concurrency control: Foundations, distributed deadlocks, timestamps.

Unit-IV

Reliability : Basic concepts, commit protocols, consistent view of Network, Detection and Resolution of Inconsistencies, check points and cold restart.

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Text book

1.   Stefano Ceri , Giuseppe Pelagatti, "Distributed Database Systems Principles and systems", McGraw Hill Education,3rd Edition, 2008

References

1.   Andrew S. Tanenbaum , Maarten van Steen , "Distributed Systems: Principles and Paradigms", Pearson, 2nd Edition,2006

 2.   OZSU ," Principles of Distributed Database Systems", Springer*, 3rd Edition ,2010*

MCS320   **Real Time Systems**   **Marks: 75**

Unit-I
Introduction to Real-Time systems, applications of Real-Time systems, basic model of Real-Time systems, characteristics of Real-Time systems, types of Real-Time systems: hard, firm, soft, timing constraints, modeling timing constraints

Unit-II
Real-Time task scheduling: basic concepts, clock driven scheduling, table driven scheduling, cyclic, schedulers, hybrid schedulers, event driven scheduling, EDF Scheduling, RMA, DMA, resource sharing among RT tasks, Priority inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol

Unit-III
Scheduling Real-Time tasks in multiprocessor and distributed systems, Fault-tolerant scheduling of tasks, clocks in distributed Real-Time systems,

Unit-IV
Commercial Real-Time Operating Systems, timers, UNIX and Windows as RT OS, POSIX, PSOS, VRTX, QNX, RT Linux, Lynx, other RT OS, benchmarking RT OS, RT communications, QoSframework, models

Text book :

1.   Rajib Mall, "Real-Time Systems Theory and Practice",,Pearson Education India, -2009

References :

1.   P. A. Laplante, "Real-Time Systems Design & Analysis", Willey, 3rd Ed, 2004.

2.   C. M. Krishna and K. G. Shin, "Real-Time Systems", McGraw Hill, reprinted 2004.

3.   J. W. S. Liu, "Real-time Systems", Pearson Education, 6th impression, 2008.