ADIKAVI NANNAYA UNIVERSITY
RAJAMAHENDRAVARAM

REGULATIONS FOR
Two Year M.Sc.(CS) Degree Course
(w.e.f. the academic year 2016-2017 admitted Batch).

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
RAJAH RAJAH NARENDRA NAGAR
RAJAMAHENDRAVARAM-533296
ANDHRA PRADESH
INDIA

1. INTRODUCTION

M.Sc Computer Science Programmeis governed by rules and regulations as approved by AdikaviNannaya University. These academic rules and regulations are effective from the academic year 2016-17, for students admitted into Two Year M.Sc.(CS) programme offered by the Affiliated Colleges of Adikavi Nannya University

2. PROGRAMME OFFERED

2 Year M.Sc (CS) Programme offered affiliated colleges of AdikaviNannaya University

3. ELIGIBILITY CRITERIA FOR ADMISSION

3.1. The candidates for Admission into M.Sc (CS) programme shall have one of the following Qualifications.

Programme	Qualifications
M.Sc(CS)	(i) Mathematics as a course of study at 10+2 level; and (ii) Three year B.Sc. degree programme with Mathematics and computer science / Three year B.C.A. degree programme

3.2. Admission is made on the basis of AKNUCET rank. When AKNUCET qualified candidates are not available, admission will be on the basis of merit in the qualifying examination. Students with or without AKNUCET rank should have obtained a minimum of 50% marks in the qualifying examination to become eligible for admission.

3.3. Reservation of seats as per the Govt/University norms.

ADIKAVI NANNAYA UNIVERSITY

Master of Science in Computer Science(M.Sc.(CS))

Course Structure and Scheme of Valuation w.e.f. 2016-17

I Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Practical	External	Internal		
MCS1.1	Discrete Mathematical Structures	4	-	75	25	100	4
MCS1.2	Data Structures & File Structures	4	-	75	25	100	4
MCS1.3	Computer Organization and Architecture	4	-	75	25	100	4
MCS1.4	Object Oriented Programming using C++ and Java	4	-	75	25	100	4
MCS1.5	Advanced Computer Networks	4	-	75	25	100	4
MCS1.6	Data Structure Using C++ Lab	-	3	50	50	100	2
MCS1.7	Computer Organization Lab	-	3	50	50	100	2
					Total	700	24

II Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Practical	External	Internal		
MCS2.1	Formal Languages & Automata Theory	4	-	75	25	100	4
MCS2.2	Relational Data Base Management Systems	4	-	75	25	100	4
MCS2.3	Advanced Operating Systems	4	-	75	25	100	4
MCS2.4	Elective I	4	-	75	25	100	4
MCS2.5	Elective II	4	-	75	25	100	4
MCS2.6	Advanced JAVA Programming Lab	-	3	50	50	100	2
MCS2.7	Relational Data Base Management Systems Lab	-	3	50	50	100	2
					Total	700	24

Elective I: Data Warehousing & Data Mining /Image Processing/Bio- Informatics/Computer Graphics
Elective II: Web Technologies/Mobile Computing/Wireless Sensor Networks/Soft Computing

III Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Practical	External	Internal		
MCS3.1	Artificial Intelligence	4	-	75	25	100	4
MCS3.2	Object Oriented Software Engineering	4	-	75	25	100	4
MCS3.3	Information Security and Cryptography	4	-	75	25	100	4
MCS3.4	Elective III	4	-	75	25	100	4
MCS3.5	Elective IV	4	-	75	25	100	4
MCS3.6	Object Oriented Software Engineering Lab and Mini Project	-	3	50	50	100	2
MCS3.7	Network Programming and Web Programming Lab	-	3	50	50	100	2
MCS3.8	Seminar on Advanced Topics				100	100	3
					Total	800	27

Elective III: Big Data Analytics/Statistical Quality Assurance Techniques/Geo Informatics/Semantic Web
Elective IV: Cloud computing/Pervasive Computing/Operations Research/Parallel Computing

IV Semester

Code	Name of Subject	Internal Evaluation	External Evaluation	Credits
MCS4.1	Project work	50	100	15

Total: 90

- Candidates can do their thesis work within the department or in any industry/research organization for One Full Semester (4^{th} semester). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor(CO-Guide) should be from the industry/research organization.
- Although credits are allotted for the thesis work they will not be taken for the calculation of CGPA.
- A publication of a paper on the thesis work in a National/International Conference proceedings with presentation certificate or a paper on the thesis work be communicated to a National/International Journal & accepted for publication for the submission of thesis at the end of 4^{th} semester is mandatory.
- The candidate has to defend his dissertation in a Viva-voce examination to be conducted by the above committee. The committee should submit a report, with signatures of all the members, candidate wise, with grade A-Excellent/ Grade B-Good/Grade C- fair/ Grade D- Reappear.
- The external examiner shall be nominated by the Chairman, Board of Examiner in CSE as per the norms of the University.
- Although credits are allotted for the Dissertation work they will not be taken for the calculation of CGPA.

Detailed Syllabus for M.Sc. (CS)

MCS1.1: Discrete Mathematical Structures

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

UNIT I: Sets, relations and functions: Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction. Permutations and combinations; recurrence relation and generating functions.

Unit II: Algebraic structures and morphisms: Algebraic structures with one binary operation - semigroups, monoids and groups, congruence relation and quotient structures. Free and cyclic monoids and groups, permutation groups, substructures, normal subgroups.
Algebraic structures with two binary operations, Lattices, Principle of Duality, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algebras, Uniqueness of Finite Boolean Algebras, Boolean Functions and Boolean Expressions, Propositional Calculus.

Unit III: Mathematical logic: Syntax, semantics of Propositional and predicate calculus, valid, satisfiable and unsatisfiable formulas, encoding and examining the validity of some logical arguments.
Proof techniques: forward proof, proof by contradiction, contrapositive proofs, proof of necessity and sufficiency.

Unit IV: Graph Theory: Graphs and digraphs, trees, Eulerian cycle and Hamiltonian cycle, adjacency and incidence matrices, vertex colouring, planarity.

Text Book

J. P. Tremblay and R. P. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, 2001.

Reference Books:

Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw-Hill.
C. L. Liu, **Elements of Discrete Mathematics**, 2nd Edition, Tata McGraw-Hill, 2000.

MCS1.2 Data Structures & File Structures

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: IntroductiontoDataStructures
TheStack: Primitiveoperations – AsanAbstractDataType–ImplementingtheStack operations using Arrays, and Structures
Queues:TheQueueasAbstractDataType–SequentialRepresentation,TypesofQueues – Operations – Implementation using Arrays, and Structures

Unit II
Linked List:Operations – Implementation of Stacks, QueuesandpriorityQueues. CircularLists:Insertion,DeletionandConcatenationOperations_StacksandQueuesas CircularLists_DoublyLinkedListsApplications.
Trees:Binary Trees Operations and Applications. BinaryTreeRepresentation:NodeRepresentation–ImplicitarrayRepresentation–Choice ofRepresentation–BinaryTreeTraversal–ThreadedBinaryTreesandtheirTraversal–Trees andtheirApplications
TreeSearching:InsertionintoaBinarySearchTree–DeletingfromaBinarySearchTree– Efficiency of Binary Search Tree operation

Unit III: File Processing Operations
Physical and logical files, opening, reading & writing and closing files in C, seeking and special characters in files, physical devices and logical files, file-related header files in C
Secondary Storage
Disks – organization, tracks, sectors, blocks, capacity, non-data overhead, cost of a disk access,Magnetic Tape – types, performance, organization estimation of tape length and data transmission times
Journey and buffer Management
File manager, I/O buffer, I/O processing, buffer strategies and bottlenecks

UNIT IV: File Structure Concepts
A stream file, field structures, reading a stream of fields, record structures and that uses a length indicator, Mixing numbers and characters – use of a hex dump, reading the variable length records from the files
Managing records in C files
Retrieving records by keys, sequential search, direct access, choosing a record structure and record length, header records, file access and file organization
Organizing files for performance
Data compression, reclaiming space – record deletion and storage compaction, deleting fixed-length records for reclaiming space dynamically, deleting variable-length records, space fragmentation, replacement strategies.
Indexing
Index, A simple index with an entry sequenced file, basic operations on an indexed, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure – inverted lists
Indexed sequential file access and prefix B^+ Trees
Indexed sequential access, maintaining a sequence set, adding a simple index to the sequence set, the content of the index: separators instead of keys, the simple prefix B^+ tree, simple prefix B^+ tree maintenance, index set block size, internal set block size, internal structure of index set blocks: a variable order B-tree, loading a simple prefix B^+ tree
Hashing
Collisions in hashing, a simple hashing algorithms, hashing functions and record distributions, memory requirements, collision resolution by progressive overflow, buckets, deletions

Textbooks:
1.DataStructures UsingCand C++YddishLangsam, MosheJ.AugensteinandAaronM. Tanenbaum, Prentice HallOf India (2^{nd}Edition)(Chapters1to8)
2. Data Structures, Algorithms and Applications withC++, SahaniMc-GrawHill.

Text Book: File Structures – An Object Oriented Approach with C^{++} by Michael J. Folk, Bill Zoellick and Greg Riccardi,, Pearson

MCS1.3: Computer Organization& Architecture

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Register Transfer and Micro operations
Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.
Basic Computer Organization and Design:
Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Unit II: Micro programmed Control:
Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.
Central Processing Unit:
Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC)

Unit III: Input/output Organization:
Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.
Memory Organization:
Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Unit IV: Overview of Computer Architecture:
Evolution of Computer Systems, Parallelism in uni- processor System, Parallel Computer Structures, Architectural Classification Schemes, Parallel Processing Applications.

Text Book:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept. 2008
2. Computer Architecture and Parallel Processing, Kai Hwang and Faye A. Briggs, McGraw Hill, International Edition1985.

Reference Book:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. "Computer System Architecture", John. P. Hayes.
3. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier).

MCS1.4: Object oriented Programming Using C++ & JAVA

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Fundamentalsofobjectorientedprogramming: IntroductiontoObjectOriented Paradigm,proceduralParadigm,BenefitsOfOOP, AnOverviewOfClasses,ObjectsandMethods,Inheritanceand Polymorphism

Basics ofC++:StructureOfC++Program,DataTypesAndDeclaration,ExpressionsAnd OperatorPrecedence,ProgramFlowControl,Functions,ScopeofVariables,InlineFunctionsand DefaultArguments,DynamicAllocationNewAndDeleteOperators.

Unit II: Classes & Objects: ClassesAnd Objects, UserDefinedDataTypes,Constructors&Destructors,ControllingandAccessibility,ClassMembers,MemberFunction s,FriendFunctions,ThisPointer,StaticandConstant MemberFunctions,Type Conversions, Functionselection,FriendFunctions , FunctionAdapters,StringLibrary, ClassTemplates,Function Templates, Member FunctionTemplates,.

Inheritance & Polymorphism: DerivedClasses, Syntax Of Derived Classes, Making PrivateMembers Inheritable, Single, Multilevel,Multiple, Hierarchical, HybridInheritance, Polymorphism, Operator Overloading, Function Overloading , Pointers, pointers to objects,thispointer, pointers to derived classes, virtual and purevirtualfunctions.

Unit III: IntroductiontoJAVA: Applets & Applications, Structure of Java Program, Introduction toClassesand Objects, Arrays, stringsand Vectors,

Packagesand Interface,andMulti threading: Packages,Interfaces, creating, extending, stopping, blocking threads, thread states, threadmethods,exceptions,priorityin threads, synchronization, Runnableinterface.

Unit IV: Exception Handling In C++ &Java: Exception, Handling, ThrowingExceptions,TryBlocks,Handlers,Exception Specification,StandardExceptionsAndUses.

Streams & Files: Managing Console I/OOperations, Working With FilesUsingAssert.H,Signal.H,Managing I/O Files In Java,

TextBooks:

1. ObjectOrientedProgramminginC++,RobertLafore
2. Introduction to JAVA PROGRAMMING byY.Daniel Liang (PHI)

References:

1. Object OrientedProgrammingin C++: N. Barkakati, PHI
2. ObjectOrientedProgrammingusingC++,IraPohl,PEARSONEDUCATIO
3. JAVA2.0-CompleteReference :HerbertSchildt&F.Naughton.
4. Objectoriented Programmingusing C++: E. Balagurusamy, PHI.
5. ProgrammingwithJAVA-Aprimer:E.Balagurusamy,PHI

MCS1.5:Advanced Computer Networks

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.
Data Communications: Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, **Broad** Band ISDN , ATM Networks,

Unit II: Data Link Control, Error Detection & Correction, Sliding Window Protocols, LANs & MANs:
IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5, 802.6, High Speed LANs.
Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Net work Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

Unit III: Internet Transport Protocols: TRANSPORT Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.
Over View of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

Unit IV: Network Devices: Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.
Advanced Concepts in Networks: Over View of Cellular Networks, Adhoc Networks, Mobile Adhoc Networks, Sensor Networks, Virtual Private Networks .Delay Tolerant Networks DTN, Ipvs,.

Text Book:

1. Computer Networks, Andrews S Tanenbaum,, Edition 5, PHI, ISBN:-81-203-1165-5

References:

2. Data Communications and Networking , Behrouz A Forouzan , Tata McGraw-Hill Co Ltd , Second Edition, ISBN: 0-07-049935-7
3. Computer networks, Mayank Dave, CENGAGE.
4. Computer networks, A system Approach, 5thed, Larry L Peterson and Bruce S Davie, Elsevier.
5. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
6. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

MCS1.6: Data Structures using C ++ Lab

Instruction: 3 Periods/week **Credits: 2**
External: 50 Marks, Internal: 50 Marks **External Exam: 3 Hrs**

Implementation of Data Structures and Algorithms using C++

1. To perform various operations such as insertion, deletion, display on single linked lists.

2. To implement
(i) Stacks using linked list. (ii) Queues using linked list.

3. To perform different types of searching techniques on a given list
(i) Sequential search (ii) Transpose sequential search (iii) Binary search(iv) Fibonacci search

4. To perform different types of sortings on a given list
(i) Bubble sort (ii) Insertion sort (iii) Selection sort(iv) Merge sort

5. To perform different types of sortings on a given list
(i) Quick sort (ii) Shell sort (iii) Radix sort (iv) Topological sort

6. To perform the following
(i) To convert the given infix expression to postfix expression
.(ii) To evaluate the given postfix expression.

7. To perform various operations on graphs
(i) Vertex insertion.
ii) Vertex deletion.
iii) Edge insertion.
(iv)Edge deletion.
(v) BFS.
(vi) DFS.

8. To implement dictionaries using hashing technique

9. To perform various operations on binary heap.

10. To perform various operations on Binary search tree.

11. To perform operations on AVL trees.

12. To perform various operations on B-tree.

MCS1.7: Computer Organization Lab

Instruction: 3 Periods/week **Credits: 2**
External: 50 Marks, Internal: 50 Marks **External Exam: 3 Hrs**

I–CYCLE:DigitalLogicDesignExperiments:

1. TTL Characteristics and TTL IC Gates
2. Multiplexers&Decoders
3. Flip-Flops
4. Counters
5. ShiftRegisters
6. BinaryAdders&Subtractors
7. ALU

II–CYCLE: 8085AssemblyLanguageProgramming:

1. 8085AssemblyLanguageProgrammingaccordingtotheorycourse Microprocessors-Iusingthefollowingtrainers:
   - KeyboardMonitorof8085µPTrainer.
   - SerialMonitorof8085µPTrainerwithTerminal
   - 8085LineAssemblerof8085µPTrainerwithPCasTerminal
   - 8085CrossAssemblerusingIn-CircuitEmulator(ICE)with8085µPTrainerand PCasTerminal
   - GradedProblemsaretobeusedaccordingtothesyllabusofCOMPUTER ORGANIZATION

2. PENTIUMCLASSPCARCHITECTUREFAMILIARIZATION HARDWARE&SOFTWAREPARTSDEMONSTRATION

MCS2.1: Formal Languages & Automata Theory

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Finite Automata and Regular Expressions: Basic Concepts of Finite State Systems, Deterministic and Non-Deterministic Finite Automata, Finite Automata with ϵ-moves, Regular Expressions, Mealy and Moore Machines, Two-Way Finite Automate, Applications of FSM.
Regular sets & Regular Grammars: Basic Definitions of Formal Languages and Grammars, Regular Sets and Regular Grammars, Closure Properties of Regular Sets, Pumping Lemma for Regular Sets, Decision Algorithm for Regular Sets, Myhill-Nerode Theorem, Minimization of Finite Automata.

Unit II: Context Free Grammars and Languages: Context Free Grammars and Languages, Derivation Trees, Simplification of Context Free Grammars, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL's, Decision Algorithm for CFL.
Push down Automata: Informal Description, Definitions, Push-Down Automata and Context freeLanguages, Parsing and Push-Down Automata.

Unit III: Turing Machines: The Definition of Turing Machine, Design and Techniques for Construction of Turing Machines, Combining Turing Machines.
Universal Turing Machines and Undecidability : Universal Turing Machines. The Halting Problem, Variants of Turing Machines, Restricted Turing Machines , Decidable & Undecidable Problems - Post Correspondence Problem.

Unit IV: Chomsky Hierarchy of Languages: Regular Grammars, Unrestricted Grammars, Context Sensitive languages, Relationship between Classes of Languages.

Text books:

1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman , Pearson Education Asia.

Reference books:

1. Introduction to languages and theory of computation – John C. Martin (MGH)
2. Theory of Computation, KLP Mishra and N. Chandra Sekhar, IV th Edition, PHI
3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)

MCS2.2: Relational Database Management Systems

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Database Systems: Introduction to the Database Systems, Introduction three layered Architecture, Data Modeling, Concepts of Relational Models and Relational Algebra,
SQL: Introduction to SQL Queries, Integrity Constraints, Joins, Views, Intermediate and Advanced SQL features and Triggers.

Unit II: Database Design: Overview of the Design process, E-R Models, Functional dependencies and other kinds of dependencies, Normal forms, Normalization Techniques and Schema Refinement.
Database Application Design and Development: User Interfaces and Tools, Embedded SQL, Dynamic SQL, Cursors and Stored procedures, JDBC, Security and Authorization in SQL, Internet Applications.

Unit III: **Query Evaluation:** Overview, Query processing, Query optimization, Performance Tuning.
Database System Architectures: Centralized and Client-Server Architecture, Server system Architecture, Parallel and Distributed database, Object based databases and XML. Advanced data types in databases. Cloud based data storage systems.

Unit IV: Transaction Management: Overview of Transaction Management, Transactions, Concurrency control, Recovery systems, Advanced Transaction Processing
Case Studies: Postgre SQL, Oracle, IBM DB2 Universal Database, Microsoft SQL Server.

Text Books:
Database System Concepts, AviSilberschatz , Henry F. Korth , S. Sudarshan McGraw-Hill, Sixth Edition, ISBN 0-07-352332-1.

References:
Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke,McGraw-Hill

MCS2.3: Advanced Operating Systems

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction To Operating Systems, Types Of Operating Systems, Operating System Structures. Operating-System Services, System Calls, Virtual Machines, Operating System Design And Implementation.

Process Management: Process Concepts, Operations On Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple -Processor Scheduling. Thread Scheduling.

Unit II: Process Synchronization & Deadlocks: The Critical Section Problem, Semaphores, And Classical Problems Of Synchronization, Critical Regions, Monitors, Deadlocks,-System Model, Deadlocks Characterization, Methods For Handling Deadlocks, Deadlock- Prevention, Avoidance, Detection,& Recovery from Deadlocks.

Memory Management & File System Implementation: Logical Versus Physical Address Space, Paging And Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing, File System Implementation -Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers

Unit III: **Distributed Operating Systems:** Distributed System Goals**,** Types Of Distributed Systems, Styles & Architecture Of Distributed Systems, Threads, Virtualization, Clients, Servers, Code Migration, and Communication in Distributed Systems.

Distributed Systems & Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols

Unit IV: Fault Tolerance, Security: Introduction To Fault Tolerance, Process Resilience,, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery, Secure Channels, Access Control, Security Management

Case Study: Over View Of UNIX, LINUX, Windows NT , Android And IOS Operating systems

Text Books:

1. Silberschatz& Galvin, 'Operating System Concepts', Wiley.
2. "DISTRIBUTED SYSTEMS", Second edition, Andrew S.Tanenbaum, Maarten Van teen.

References:

1. William Stallings-"Operating Systems"- 5th Edition - PHI
2. Charles Crowley, 'Operating Systems: A Design-Oriented Approach', Tata Hill Co.,1998 edition.
3. Andrew S.Tanenbaum, 'Modern Operating Systems', 2nd edition, 1995, PHI.
4. Advanced Concepts in Operating systems.Distributed, Database and Multiprocessor operating systems, Mukeshsinghal, NiranjanG.Shivaratri, Tata McGraw Hill Edition.
5. Dhamdhere, "Operating Systems - A concept based approach", 2nd Edition, TMH, 2006.

MCS2.4:Elective I :Data Warehousing & Data Mining

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to Data Mining: Evolution of I T into DBMS,Motivation and importance of Data Warehousing and Data Mining,Kinds of Patterns, Technologies, Basic Data Analytics: Data Objects and Attributes Types, Statistical Descriptions of Data, Data Visualization, Estimating Data Similarity and Dissimilarity, Major Issues in Data Mining., Data Mining Applications

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modeling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Unit II: Data Mining Primitives & Data Cubes: DataMining Primitives, Data Mining Tasks, Data Mining Query Language, DesigningGraphical user Interfaces based on aData Mining Query language, Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, BUC Computing for Iceberg Cubes, Star-Cubing Using Dynamic Star-Tree Structure, Pre-computing Shell Fragments for Fast High-Dimensional OLAPs.

Data Mining Concept Description:: Data Preprocessing: Pre-processing the Data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation; **Data** Architectures of Data Mining Systems; Characterization and Comparison, Concept Description, Data Generalization and Summarization; Analytical Characterization: Analysisof AttributeRelevance, Mining Class Comparisons, Discriminating between Different Classes, Mining Descriptive & Statistical Measures in Large Databases.

Unit III: Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP-Growth Approach, Mining Frequent Patterns using Vertical Data Formats, Mining Closed and Max Patterns, Pattern Evaluation Methods

Classification: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy Advanced Methods: Classification by Back Propagation, SVM, Associative Classification, Lazy Learning, Fuzzy Sets, Rough Sets, Genetic Algorithms, Multiclass Classification, Semi-Supervised Classification

Unit IV: Cluster Analysis: Basic Concepts, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Evaluation of Clustering Solutions

Semantic Web Mining: Introduction, Concepts in Semantic Web Mining,XML, RDF & Web Data Mining, Ontologies and Web Data Mining,Agents in Web Data Mining, Web Mining and Semantic Web As a Data Base, semantic Interoperability and Web Mining Web Mining Vs Semantic Web Mining

Text Book:

1. Data Mining- Concepts and Techniques by Jiawei Han, MichelineKamber and Jian Pei –Morgan Kaufmann publishers –--3rd edition

References:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication
2. Data Mining –Introductory and Advanced by Margarett Dunham -- Pearson Education publishers
3. Data Warehousing for Real –world by Sam Annahory-- Pearson Education publishers
4. Web Data Mining and Applications in Business Intelligence and Counter Terrorism, BavaniThuraisingham, CRC Press, June 2003

MCS2.4 :Elective I: Image Processing

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Fundamentals of ImageProcessing:ImageAcquisition,ImageModel,Sampling, Quantization,RelationshipBetweenPixels,DistanceMeasures,Connectivity,Image Geometry,PhotographicFilm.Histogram:Definition,DecisionOfContrastBasingOn Histogram,OperationsBasingonHistogramsLikeImageStretching,ImageSliding,Image Classification.DefinitionandAlgorithmofHistogramEqualization.
ImageTransforms:ADetailDiscussionOnFourierTransform,DFT,FFT,Properties WALSH TransForm,WFT,HADAMARDTransform,DCT

Unit II: ImageEnhancement:
ArithmeticandLogicalOperations,PixelorPointOperations,SizeOperations,SmoothingFilters-Mean,Median,ModeFilters–ComparativeStudy- EdgeEnhancementFilters–DirectorialFilters,Sobel,Laplacian,Robert,KIRSCH Homogeneity&DIFFFilters,PrewittFilter,ContrastBasedEdgeEnhancement Techniques–ComparativeStudy, LowPassFilters,HighPassFilters,SharpeningFilters.–ComparativeStudy- Color Fundamentals and Color Models, ColorImageProcessing.

Unit III: ImageEnhancement:DesignofLowPass, HighPass,EDGEEnhancement,SmootheningFiltersinFrequencyDomain.ButterWorth Filter,HomomorphicFiltersinFrequencyDomainAdvantagesofFiltersinFrequency Domain,ComparativeStudyofFiltersinFrequency, DomainandSpatialDomain.
ImageCompression: RunLengthEncoding, ContourCoding,HuffmanCode, Compression Due to Change in Domain, Compression Due toQuantizationCompressionattheTimeofImageTransmission.BriefDiscussionon:-ImageCompressionStandards.

Unit IV: ImageSegmentation:CharacteristicsofSegmentation, DetectionofDiscontinuities,ThresholdingPixelBasedSegmentationMethod.Region BasedSegmentationMethods, SegmentationbyPixelAggregation,SegmentationbySub RegionAggregation,HistogramBasedSegmentation,SpiltandMergeTechnique, MotioninSegmentation
Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Boundary Extraction, Region Filling, Connected Components, Thinning, Thickening, Skeletons , Pruning Extensions to Gray – Scale Images Application of Morphology in I.P
Image , Video & Multimedia Communications: Multi-scale and multi-orientation representation; Geometry and texture representation; Object based representation; Hierarchical representation; Sparse representation, Multimedia with image and video content; Multimedia event synchronization;

TextBook:

DigitalImageProcessing,RafaelC.GonzalezAndRichardE.Woods, AddisionWesley

ReferenceBooks:

1. FundamentalsOfElectronicImageProcessingByArthyr–R–Weeks,Jr.(PHI)
2. ImageProcessing,Analysis,AndMachineVisionByMilanSonkaVaclanHalavacRogerBoyle,VikasPublishingHouse.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan& T. Veera Kumar, TMH
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, Wiley-Blackwell

MCS2.4:Elective I :Bio- Informatics

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

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.

Multiple sequence alignment

Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

Unit IV: **Secondary database searching**

Importance and need of secondary database searches, secondary database structure and building a sequence search protocol .

Analysis packages

Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Text Books:

1. Introduction to Bioinformatics, by T K Attwood & D J Parry-Smith,Addison Wesley Longman
2. Bioinformatics- A Beginner's Guide by Jean-Michel Claveriw, CerdricNotredame, WILEY dreamlech India Pvt. Ltd

Reference Books:

1. Introduction to Bioinformatics by M.Lesk OXFORD publishers (Indian Edition)

MCS2.4 :Elective I: Computer Graphics

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction: Computer Graphicsandtheirapplications,ComputerAidedDesign-ComputerArt, Entertainment, EducationandTraining, GraphicalUserInterfaces;OverviewofGraphicssystems:VideoDisplayDevices, RasterScansystems, random scansystems, Graphicsmonitorsandworkstations, Inputdevices, hardcopydevices, GUIandInteractiveInputMethods, WindowsandIcons, VirtualRealityEnvironments, Graphicssoftware

Outputprimitives: PointsandLines, **,** LineandCurveAttributes-ColorandGrayscale levels LineDrawingAlgorithms, LoadingtheFrame buffer, Linefunction, CircleGeneratingAlgorithms, EllipseGeneratingAlgorithms, OtherCurves, ParallelCurveAlgorithms, CurveFunctions, PixelAddressing, AreaFillAttributes, FilledArea Primitives, FilledAreaFunctions, CellArray, Character Generation, CharacterAttributes, BundledAttributes, InquiryFunctions ,Antialiasing

Unit II: ThreeDimensionalConceptsandObjectrepresentations:3Ddisplaymethods-3D Graphics, PolygonSurfaces, CurvedLinesandSurfaces, QuadraticSurfaces, Super Quadrics, BlobbyObjects, SplineRepresentations, CubicSplinemethods, BézierCurves andSurfaces, BSplineCurvesandSurfaces,

Two & ThreeDimensionalTransformations: Two Dimensional Transformations: BasicTransformations, Matrix Representations, HomogeneousCoordinates, CompositeTransformations, Other Transformations, TransformationsbetweenCoordinateSystems, AffineTransformations-, TransformationFunctions-, RastermethodsforTransformation Three Dimensional Transformatio**ns:**Translation-, Rotation, scaling, OtherTransformations, CompositeTransformations, 3DTransformation Functions, ModelingandCoordinateTransformations,

Unit III: Viewing,Pipeline and structures: ViewingCoordinates,Projections, ViewVolumes, GeneralProjectionTransformations, Clipping-, Hardware Implementations**,** ConceptsofStructuresandBasicmodels, Editing, HierarchicalModelingwithStructures,

Visualization: ThreeDimensionalViewing, Visualization- Image Processing-TheviewingPipeline, ViewingCoordinateReference Frame, Window-to-ViewportCoordinateTransformation, TwoDimensionalViewing Functions, ClippingOperations, PointClipping, LineClipping, PolygonClipping-Curve Clipping, TextandExteriorClipping.

Unit IV: Visual Computing: Computational and mathematical methods for creating, capturing, analyzing and manipulating digital photographs, Introductory Topics on computer graphics, computer vision, and machine learning, Programming assignments intended to give hands-on experience with creating graphical user interfaces, and with implementing programs for synthesizing and manipulating photographs.

Visual Transformation & Projection: Graphics pipeline, perception and color models, camera models, transformations and projection, projections, lighting, shading, global illumination, texturing, sampling theorem, Fourier transforms, image representations, convolution, linear filtering, diffusion, nonlinear filtering, edge detection, optical flow, image and video compression, Creation of Visual EffectsOptical Flow Video Compression, Radon Transform Texture

TextBook:

1. ComputerGraphicsCVersion,DonaldHearn&M.PaulineBaker,PearsonEducation,NewDelhi,2004
2. D. Forsyth and J. Ponce, *Computer Vision: A Modern Approach*, Prentice Hall Inc., 2003

ReferenceBooks:

1. ProceduralElementsforComputerGraphics,DavidF.Rogers,TataMcGrawHillBookCompany,NewDelhi,2003

2. ComputerGraphics:Principles&PracticeinC,J.D.Foley,S.KFeiner,AVanDamF.HJohnPearsonEducation,2004
3. ComputerGraphicsusingOpenGL,FranscisSHillJr,PearsonEducation,2004.
4. *Computer Vision and Image Processing: A Practical Approach using*
5. *CVIPtools*, S. E. Umbaugh,, Prentice Hall, 1998

MCS2.5: Elective II: Web Technologies

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to HTML, Core Elements, Links and Addressing, Images, Text, Colors and Background, Lists, Tables and Layouts, Frames, Forms, Cascading Style Sheets.

Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script

Unit II: Document type definition, XML Syntax, XML Schemas, Document Object model, Presenting XML, Using XML Processors

JDBC OBJECTS- JDBC Driver Types, JDBC Packages, Database Connection, Statement Objects, Result Set.

Unit III: JDBC and Embedded SQL - Tables, Inserting Data into Tables, Selecting Data from a Table, Meta Data Updating Table, Deleting data from Table, Joining Table, Calculating Data, Grouping and Ordering Data, Sub quires,View.

Introduction to Servlet, Servlet Life Cycles Servlet Basics, Tomcat Web Server, Configuring Apache Tomcat, Handling Client Request and Response, Handling Cookies, Session Tracking

Unit IV: Introduction to JSP, Benefits of JSP, Basic Syntax, Invoking Java code with JSP Scripting Elements, JSP Page Directive, Including Files in JSP Pages,
Introduction to Java Beans, Using JAVA Bean Components in JSP Documents, MVC Architecture.

Text Books:

1. Web Programming, building internet applications, 2nd Ed., Chris Bates, Wiley Dreamtech
2. The complete Reference HTML and DHTML, Thomas A. Powey
3. The complete Reference J2ME, James Keogh
4. Core Servlets and Java Server Pages, Marty Hall Larry Brown, Second Edition

Reference Books:

1. Internet , World Wide Web , How to program, Dietel , Nieto, PHI/PEA
2. Web Tehnologies, Godbole, kahate, 2nd Ed., TMH

MCS2.5 :Elective II: Mobile Computing

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to Mobile Computing, Overview of Mobile Technologies, Limitations, The Ubiquitous Network, Architecture for Mobile Computing, Three-Tier Architecture, Design Considerations for Mobile Computing, Mobile Computing Through Internet, Mobile Devises and Mobile-Enabled Applications.

Introduction To Wireless Networking,Various Generations of Wireless Networks, Wireless LANs, Advantages and Disadvantages of WLANs, Fixed Network Transmission Hierarchy, Differences in Wireless and Fixed Telephone Networks, Traffic Routing in Wireless Networks, WAN Link Connection Technologies, Cellular Networks.

Unit II: WLAN Topologies,WLAN Standard IEEE 802.11, Comparison Of IEEE 802.11a, B, G and N Standards, Wireless PANs, Hiper LAN, Wireless Local Loop, ATM, Virtual Private Networks, Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to The Internet.

Emerging Technologies: Introduction - Bluetooth - Radio Frequency Identification (RFID), WIMAX -Mobile IP - Ipv6 - Java Card, TCP/IP in the Mobile Setting, GSM and GPS

Unit III: **Data Management Issues**, Data Replication For Mobile Computers, Adaptive Clustering for Mobile Wireless Networks, File System, Disconnected Operations, Data Services in GPRS -Applications for GPRS - Limitations - Billing and Charging.

Communications Asymmetry, Classification of New Data Delivery Mechanisms, Push-Based Mechanisms, Pull-Based Mechanisms, Hybrid Mechanisms, Selective Tuning (Indexing) Techniques. CDMA, GSM , Wireless Data, 3GNetworks and Applications

Unit IV: Introduction to Mobile IP, Introduction To Wireless Application Protocol, Application LayerMMS - GPRS Applications, Short Message Service (SMS): Mobile Computing Over SMS - SMS - Value Added Services Through SMS -Accessing the SMS Bearer.

Text Books:

1. Mobile Computing - Technology Applications And Service Creation, Asoke K Talukder and RoopaR.Yavagal, TMH 2006.
2. Mobile Cellular Communication, GottapuSasibhushana Rao,, Pearson Education, First Edition, 2013.

Reference Books:

1. Principles Of Computing, Uwe Hansmann, LotherMerk, Martin S.Nicklous, Thomas Staber, 2nd Ed., Springer International Edition.
2. Mobile Communications, J.Schiller, Addison-Wesley, 2003
3. StojmenovicAndCacute, "Handbook Of Wireless Networks And Mobile Computing", Wiley, 2002.

MCS2.5: Elective II :Wireless Sensor Networks

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction: The vision of Ambient Intelligence, Application examples, Types of applications, Challenges for Wireless Sensor Networks(WSNs), Sensor networks vs Enabling Technologies for WSNs, **Single node architecture:** Hardware components, Energy consumption of sensor nodes, Some examples of sensor nodes, Operating systems and execution environments

Network architecture: Sensor network scenarios, Optimization goals and figures of merit, Design principles for WSNs,

Unit II: Physical layer and transceiver design considerations in WSNs:

MAC Protocols: Fundamentals of (wireless) MAC protocols, Low duty cycle protocols and wakeup concepts, Contention-based protocols, Schedule-based protocols, The IEEE 802.15.4 MAC protocol, How about IEEE 802.11 and Bluetooth

Link layer protocols: Fundamentals: tasks and requirements, Error control, Framing, Link management

Unit III: Naming and addressing: Fundamentals, Address and name management in wireless sensor networks, Assignment of MAC addresses, Content-based and geographic addressing

Routing protocols: The many faces of forwarding and routing, Energy-efficient unicast, Broadcast and multicast, Geographic routing.

Unit IV: Data-centric and content-based networking : Introduction, Data-centric routing, Data aggregation, Data-centric storage

Transport layer and Quality of Service: The transport layer and QoS in wireless sensor networks, Coverage and deployment, Reliable data transport, Single packet delivery, Block delivery, Congestion control and rate control

TEXT BOOK:

1. Protocols and Architectures for Wireless Sensor Networks, Holger Karl, Andreas Willig., John Wiley & Sons Ltd, 2005
2. Network Management Fundamentals, AlexenderClemn CISCI Press2007

MCS2.5: Elective II: Soft Computing

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Soft Computing: Introduction to Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Different Tools and Techniques, Usefulness and Applications.

Fuzzy Sets and Fuzzy Logic: Introduction, Fuzzy Sets Versus Crisp Sets, Operations on Fuzzy Sets, Extension Principle, Fuzzy Relations and Relation Equations, Fuzzy Numbers, Linguistic Variables, Fuzzy Logic, Linguistic Hedges, Applications,

Unit II: Interference in fuzzy logic: fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Fuzzy Controllers, Fuzzy Pattern Recognition, Fuzzy Image Processing, Fuzzy Database.

Artificial Neural Network: Introduction, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, re-current networks. Various learning techniques, perception and convergence rule, Auto-associative and hetro-associative memory , Hebb's Learning, Adaline, Perceptron

Unit III: Multilayer Feed Forward Network, Back Propagation Algorithms, Different Issues Regarding Convergence of Multilayer Perceptron, Competitive Learning, Self-Organizing, Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic Techniques: Genetic Algorithm (GA), Genetic Representations, (Encoding) Initialization and Selection, Different Operators of GA, Analysis of Selection Operations, Hypothesis of Building Blocks, Schema Theorem and Convergence of Genetic Algorithm, Simulated Annealing and Stochastic Models, Boltzmann Machine, Applications.

Unit IV: Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables and Applications.

Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, S. Rajsekaran and G.A. VijayalakshmiPai, Prentice Hall of India.
2. Rough Sets, Z.Pawlak, Kluwer Academic Publisher, 1991.
3. Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

References:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
2. Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR. Addison-Wesley
3. Learning and Soft Computing, V. Kecman, MIT Press, 2001
4. Fuzzy Sets and Fuzzy Logic, Klir& Yuan, PHI, 1997

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MCS2.6: Advanced JAVA Programming Lab

Instruction: 3 Periods/week **Credits: 2**

External: 50 Marks, Internal: 50 Marks **External Exam: 3 Hrs**

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1. **Java Program to Demonstrate Basic Concepts in Java**
2. **Program to demonstrate Multi threading using priorities**
3. **Program to demonstrate to demonstrate Files & string manipulators**
4. **Program to demonstrate Applet Program using Various Controls and perform Font animation**
5. **Program to demonstrate Menus, sub Menus, Popup Menus, Shortcut Keys, Check Boxes and Separators**
6. **Two Programs to demonstrate JDBC**
7. **Two Programs to demonstrate Servlets**
8. **Two Programs to demonstrate JSP**
9. **Two Programs to demonstrate Java Beans**
10. **Two Programs to demonstrate RMI**

MCS2.7 : Relational Data Base Management Systems Lab

Instruction: 3 Periods/week **Credits: 2**

External: 50 Marks, Internal: 50 Marks **External Exam: 3 Hrs**

1. **Accessing the Database**: The first laboratory exercise is to connect to a database, populate it with data, and run very simple SQL queries. (Data Definition, Table Creation, Constraints, Insert, Select Commands, Update & Delete Commands.)
2. **Basic SQL:** This lab covers simple SQL queries. (Inbuilt functions in RDBMS.)
3. **Intermediate SQL:** This lab covers more complex SQL queries. (Nested Queries & Join Queries, Control structures)
4. **Advanced SQL:** This lab covers even more complex SQL queries. (Procedures and Functions, .PL/SQL, Cursors and Triggers)
5. **Database Access from a Programming Language:** This lab introduces you to database access from a programming language such as Java or C#. Although phrased using Java/JDBC, the exercise can be done using other languages, OBDC or ADO.NET APIs.
6. **Building Web Applications:** This lab introduces you to construction of Web applications. Although phrased using the Java Servlet API, the exercise can be done using other languages such as C# or PHP.
7. **Project:** Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem and develop Forms, Menu design and Reports.

A. The logical design performs the following tasks:

1. Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.
2. Identify the functional dependencies in each relation
3. Normalize to the highest normal form possible

B. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and MySQL/PostgreSQL on Linux platform.

Sample Term Projects

1. Retailer database
2. Automobile sales database
3. Electronics vendor database
4. Package delivery database
5. Real estate database

References:

1. Database System Concepts, AviSilberschatz , Henry F. Korth , S. Sudarshan ,McGraw-Hill, Sixth Edition, ISBN 0-07-352332-1.
2. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
3. ORACLE Database Log PL/SQL Programming Scott Urman, TMG Hill.
4. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.
5. Oracle PL/SQL Programming, Steven Feuerstein, O'Reilly Publishers.

MCS3.1: Artificial Intelligence

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, The Level of the Model, Criteria For Success. Defining the Problem as a State Space Search, Problem Characteristics , Production Systems, , Production System Characteristics

Search: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A^* Algorithm, Problem Reduction, AO^*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

Unit II: Knowledge Representation: Procedural Vs Declarative Knowledge, Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, Logic Programming Forward Vs Backward Reasoning,

ymbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Syntax & Semantics of FOPL, Normal Forms, Unification &Resolution, Representation Using Rules, Natural Deduction.

Unit III: Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts, CYC; Matching Techniques, Partial Matching, Fuzzy Matching Algorithms and RETE Matching Algorithms.

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Model and Temporal Logics; Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic & Fuzzy Systems.

Unit IV: Experts Systems: Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells,

Natural Language Processing: Role of Knowledge in Language Understanding, Approaches Natural Language Understanding, Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems; Planning, Components of a Planning System, Goal Stack Planning, Hierarchical Planning, Reactive Systems

Text Book:

Artificial Intelligence, Elaine Rich, Mcgraw-Hill Publications

References:

1. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI
2. Artificial Intelligence, George F Luger, Pearson Education Publications
3. Artificial Intelligence, Robert Schalkoff, Mcgraw-Hill Publications
4. Artificial Intelligence And Intelligent Systems, N.P. Padhy, Oxford Publications

MCS3.2: Object Oriented Software Engineering

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to Object Oriented Software Engineering

Nature Of The Software, Types Of Software , Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction To Object Orientation, Concepts Of Data Abstraction, Inheritance & Polymorphism, Software Process Models-Waterfall Model, The Opportunistic Model , The Phased Released Model, The Spiral Model, Evolutionary Model, The Concurrent Engineering Model

Requirements Engineering: Domain Analysis, Problem Definition And Scope, Requirements Definition, Types Of Requirements, Techniques For Gathering And Analyzing Requirements, Requirement Documents, Reviewing, Managing Change In Requirements.

Unit II: Unified Modeling Language & Use Case Modeling: Introduction To UML, Modeling Concepts, Types Of UML Diagrams With Examples; User-Centred Design,Characteristics Of Users, Developing Use Case Models Of Systems, Use Case Diagram, Use Case Descriptions, The Basics Of User Interface Design, Usability Principles, User Interfaces.

Class Design and Class Diagrams:Essentials Of UML Class Diagrams, Associations And Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features Of Class Diagrams, Interaction And Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component And Deployment Diagrams.

Unit III: Software Design And Architecture

The Process Of Design, Principles Leading To Good Design, Techniques For Making Good Design Decisions, Writing A Good Design Document., Pattern Introduction, Design Patterns: The Abstraction-Occurrence Pattern, General Hierarchical Pattern, The Play-Role Pattern, The Singleton Pattern, The Observer Pattern, The Delegation Pattern, The Adaptor Pattern, The Façade Pattern, The Immutable Pattern, The Read-Only Interface Pattern And The Proxy Pattern; Software Architecture Contents Of An Architecture Model, Architectural Patterns: The Multilayer, Client-Server, Broker, Transaction Processing, Pipe & Filter And MVC Architectural Patterns

Unit IV:Software Testing

Overview Of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OO Test Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

Software Project Management

Introduction To Software Project Management, Activities Of Software Project Management, Structure Of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking And Monitoring.

CASE STUDY

1. Simple Chat Instant Messaging System
2. GPS Based Automobile Navigation System
3. Waste Management Inspection Tracking System (WMITS)
4. Geographical Information System

Text Book:

1. Object-Oriented Software Engineering Practical software development using
2. UML and Java by Timothy C. Lethbridge & Robert, LanganiereMcgraw-Hill
3. References
4. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.
5. Software Engineering: A Practitioner's Approach, Roger S Pressman.
6. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A. Sykes, Addison-Wesley Professional.

MCS3.3:Network Security & Cryptography

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction: Introduction to Security, Security Approaches, Principles of Security; Security Services and Mechanism-confidentiality,Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability; Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

Network Security:A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, Introduction to TCP/IPTCP , fire walls, session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks, Virtual Private Networks, Brief Study on Cryptography and Security

Unit II: User Authentication Mechanisms: Introduction, Authentication Basics, Passwords authentication tokens, Certificate based authentications, Biometrics based authentication , Kerberos, X.509 Directory Authentication Service, SSO Approaches

Public Key Infrastructure: Public key cryptography principles and algorithms, digital signatures, digital Certificates, Certificate Authority and key management, Public Key Cryptography Standards, Private Key Management, The PRIX Model, XML,PKI and Security,

Unit III: Symmetric Key Cryptographic Algorithms: Overview of symmetric Key Cryptography Algorithm types and modes; DES, IDEA, RC5, BLOWFISH, AES Algorithms; Differential and Linear Cryptanalysis.

Asymmetric Key Cryptographic Algorithms: Overview of Asymmetric Key cryptography, RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signature, Knap sack Algorithm and other Algorithms.

Unit IV: IP Security and Fire walls: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

Practical Implementation of Cryptography & Security: Cryptographic Solutions using Java, Cryptographic Solutions Using Microsoft, Cryptographic Tool Kit, Security and Operating Systems Pretty Good Privacy (PGP) and S/MIME.

Text Book:

1. Network Security Essentials :Applications and Standards, William Stallings PEA.
2. Cryptography and Network Security, AtulKahate, Tata McGraw Hill

Reference:

1. Hack Proofing your network, Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W.Manzuik, Ryan Permeh, Wiley Dreamtech,
2. Fundamentals of Network Security, Eric Maiwald (Dreamtech press)
3. Network Security - Private Communication in a Public World, Charlie Kaufman, Radia Perlman, Mike Speciner, PEA/PHI.
4. Principles of Information Security, Whitman, Thomson.
5. Cryptography and network Security, Third edition, Stallings, PHI/PEA
6. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
7. Introduction to Cryptography, Buchmann, Springer

MCS3.4 :Elective III : Big Data Analytics

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction:, Velocity, Variety, Veracity; Drivers for Big Data, Sophisticated Consumers, Automation, Monetization, Big DataAnalyticsApplications:Social Media Command Center, Product Knowledge Hub, Infrastructure and Operations Studies, Product Selection, Design and Engineering, Location-Based Services, Online Advertising, Risk Management

Architecture Components: Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting: Search and Count, Context-Sensitive and Domain-Specific Searches, Categories and Ontology, Qualitative Comparisons, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines

Unit II: Advanced Analytics Platform: Real-Time Architecture for Conversations, Orchestration and Synthesis Using Analytics Engines, Entity Resolution, Model Management, .Discovery Using Data at Rest, Integration Strategies

Implementation of Big Data Analytics: Revolutionary, Evolutionary, or Hybrid, Big Data Governance, Integrating Big Data with MDM, Evolving Maturity Levels

Unit III: **Map-Reduce and the New Software Stack**: Distributed File Systems .Physical Organization of Compute Nodes, Large-Scale File-System Organization, Map-Reduce features: Map Tasks, Grouping by Key, Reduce Tasks, Combiners, Map-Reduce Execution, Coping With Node Failures, Algorithms Using Map-Reduce for Matrix multiplication, Relational Algebra operations, Workflow Systems, Recursive Extensions to Map-Reduce,

Communication Cost Models, Complexity Theory for Map-Reduce, Reducer Size and Replication Rate, Graph Model and Mapping Schemas, Lower Bounds on Replication Rate

Unit IV: **Mining Data Streams**: Stream Data Mode l and Management Stream Source, Stream Queries, and issues, Sampling Data in a Stream , Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, Decaying Windows

Link Analysis: PageRanking in web search engines, Efficient Computation of PageRank using Map-Reduce and other approaches, Topic-Sensitive PageRank , Link Spam, Hubs and Authorities

Text Books:

1. Big Data Analytics:Disruptive Technologies for Changing the Game, *Dr. ArvindSathi*,, First Edition October 2012, IBM Corporation
2. Mining of Massive Datasets,AnandRajarama, Jure Leskovec, Jeffrey D. Ullman.E-book, 2013

References:

1. Big Data Imperatives,SoumendraMohanty, MadhuJagadeesh, HarshaSrivatsa, Apress, e-book of 2012

MCS3.4: Elective III :Statistical Quality Assurance Techniques

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction: Definition and Need of quality, Aspects of quality, Quality characteristic, Quality specification, Quality function, Economics of quality. Inspection, Its objectives and types, Inspection versus Quality Control, Statistical Quality Control, its Tools, Advantages, limitations and Applications.

Probability & Statistics: Definition, Laws, Probability Distributions (Normal Binomial, Poisson, Exponential) & related problems. Measures of Central tendency & Dispersion, Concept of Variation, Variable and attribute data, Frequency distribution.

Unit II: Control Charts: Concept of variability, Assignable & chance causes, Concept of specifications and tolerances, Definition and objectives of control charts, Control charts for variables and attributes & related problems, Variable charts vs attribute charts,

Patterns on control charts, Type–I & Type-II Errors, Process capability and its methods of determination.

Unit III: Acceptance Sampling: Definition, Advantages over 100% inspection, Methods of taking samples, Operating characteristics curve & its characteristics. Single, Double and Multiple, Sequential Sampling Plan & Related problems.

Quality Assurance: Need, Principles, Essentials and Advantages of Quality Assurance System, Quality Manual, Field complaints, Quality Audit & its types, Quality Assurance Methods, Quality Control vs Quality Assurance.

Unit IV: Quality systems: Description of ISO:9000 series of standards, ISO:9001–2000 Systems. Description of TQM, Concept of Quality Circles, JIT System, Taguchi's Concept of Quality, Zero Defect Concept, 6s Concept.

Reliability: Definitions of Reliability Failure, Elements of reliability. Quality vs reliability, System Reliability & related problems. Causes of failures, Constant Failure rate, MTBF, Bath Tub Curve

Text Books:

1. EL Grant & RS Leavenworth, "Statistical Quality Control",McGraw Hill & Co.
2. M. Mahajan, "Statistical Quality Control", Dhanpat Rai & Co.
3. O.P. Khanna, "Statistical Quality Control", Dhanpat Rai & Co.
4. R.C. Gupta, "Statistical Quality Control", Khanna Pulishers

Reference Books:

1. AmitavMitra, "Fundamentals of Quality Control", Pearson Education
2. Feigenbaum, "Total Quality Control", McGraw Hill & Co.
3. Suresh Dalela, "Quality Systems", Standard Publishers & Distributors
4. Montgomery DC, "Introduction to Statistical Quality Control", John Wiley & Sons Inc.
5. Stephan B. Vardeman, J Marcus Jobe, "Statistical QA Methods for Engineers", John Wiley & Sons Inc.

MCS3.4 :Elective III : Geo Informatics

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction: DefinitionofGISandRelatedTerminology-EvolutionofGIS-ComponentsofGIS-Approaches to study of GIS Maps and GIS: MapScale-Classesofmaps-ThemappingProcess-Planecoordinatesystemsand Transformations-Geographic Coordinate System of Earth- Map Projection- Establishing a spatialframeworkformappingLocationsonEarth-Geo-referencing-AcquisitionofSpatialData for the terrain-TopographicMapping-Attribute Data for Thematic Mapping

Unit II: Digital Representation of Geographic Data**:** Technical Issues PertainingtoDigitalRepresentationofGeographicData-Database creationandmanagement-Raster GeographicandVectordatarepresentation-Objectoriented GeographicDatarepresentation-RelationshipbetweenDatarepresentationandDataAnalysisin GISDataQualityandDataStandards: Concepts and Definitions of Data Quality-Components of Geographic Data Quality-AssessmentofDataQuality-ManagingSpatialDataErrors-GeographicDataStandards- GeographicDataStandardsAndGISDevelopment

RasterandVector-BasedGIS DataProcessing: Acquiring and Handling Raster Data Processing Cartographic Modeling- CharacteristicsofVector-BasedGISDataProcessing Vector Data Input Functions Non-topological GIS Analysis Functions Feature-Based Topological Functions Layer-Based TopologicalFunctionsVector-BasedOutput Functions ApplicationProgramming

Unit III: Visualization of GeographicInformation and Generation: Cartography in the Context of GIS-Human-ComputerInteractionandGIS- VisualizationofGeographicInformation Principles of Cartographic Design in GIS-Generation of Information Products

Remote Sensing and GIS Integration: Principles of Electromagnetic Remote Sensing System Classifications-Imaging CharacteristicsofRemoteSensingSystems-ExtractionofMetricInformationfromRemotely SensedImages-ExtractionofThematicInformationfromRemotelySensedImages-Integration ofRemoteSensingandGIS

Digital Terrain Modeling: Definitions and Terminology Approaches to Digital Terrain-Data Sampling-Acquisition of Digital Terrain Data-DataProcessing,Analysis,and Visualization-Applicationsof Digital Terrain Models.

Unit IV: Spatial Analysis and Modeling: Descriptive Statistics-Spatial Auto Correlation- Quadratic Counts and Nearest- Neighbor Analysis-Trend Surface Analysis-Gravity Models-NetworkAnalysis-GISModeling

GIS Implementation and Project Management: SoftwareEngineeringasApplied toGIS-GISProjectPlanning-SystemsAnalysis andUserRequirements-GeographicDatabase DesignMethodology-GISApplicationSoftware DesignMethodology-SystemsImplementationandTechnologyRollout-SystemsMaintenance and Technical Support, GIS Issues and Prospects: Issues of Implementing GIS-The Trend of GIS-Development Frontiers of GIS Research.

Text Book:

1. ConceptsandTechniquesofGeographicInformationSystems,byC.P.Lo&AlbertK.W. Yeung, Prentice Hall of India Ltd

Reference Books:

1. AnIntroductiontoGeographicalInformationSystems,byIanHeywood,SarahCornelium& Steve Carver, PearsonEducation
2. IntroductiontoGeographicInformationSystems,byKang-rsungChang,TataMcGrawHill
3. PublishingCompanyLimited

MCS3.4: Elective III: Semantic Web

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to Semantic Web: Introduction, Semantic Web, URI, RDF, Ontologies, Inferences, DAML, Semantic Web Languages, Semantic Annotation, Classification, Information Extraction, Ontology Assignment, XML, Syntax of XML,XML Schema, Semantic Web Applications to E-Commerce, E-Government and E-Banking, Semantic Web in Life Sciences, RIF Applications.

Unit II: Semantic Web Structure: Semantic Web Layers Architecture, Different Layers, Match Making, Multi Information Retrieving, Digital Signature, Semantic Memory, Semantic Web Enabled Service Oriented Architecture(SESA), SESA Services, SESA Middle Ware.
Resource Descriptive Languages RDF: Introduction to RDF, Syntax of RDF, Advanced Feature,Simple Ontologies in RDF Schema, Encoding Special Data Structures, Semantics Model TheoriticSentics for RDFs, Syntactic Reasoning with Deduction Rules Syntactic Limits of RDFs,

Unit III: Web Ontology Languages: OWL Syntax, OWL Species, OWL2 Standards, OWL Formal Semantics, Description Logics, Model Theoretic Semantics of OWL, SWRL, Semantic Web Rules, Languages, Syntax of SWRL, Rules and Safety, Implementation & Applications.
Ontology Engineering: Requirement Analysis, Ontology Knowledge Creation, Ontologies and Rules: Definition of a Rule, Datalog as First order Rule Language, Combining Rules With OWDL, Rule Interchanging Formats RIF, Quality Assurance of Ontologies, Modular Ontologies, Divide and Conquer, Software Tools.
Ontology Query Languages: Semantic Web Query Languages and Implementations, ROPS(RDF OWL Processing Systems),SWOPS(SWRL Ontology Processing System, Bench Marking Results, SPARQL, Query Languages for RDF, Conjunctive Queries for OWLDL.

Unit IV: Semantic Web Mining: Introduction, Concepts in Semantic Web Mining,XML, RDF & Web Data Mining, Ontologies and Web Data Mining,Agents in Web Data Mining, Web Mining and Semantic Web As a Data Base, semantic Interoperability and Web Mining Web Mining Vs Semantic Web Mining
Semantic Web Tools & Applications: Web Data Exchange and Syndication, Semantic WIKI's, Semantic Portals, Semantic Meta Data in Data formats, Semantic Web Services Modeling Ontologies, Semantic Web Service Design Tools, Ontologies for Standardizations WMO and SWMO Applications

Text Book:

1. Foundations of Semantic Web Technologies,Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, CRC Press

References:

2. Web Data Mining and Applications in Business Intelligence and Counter Terrorism, BavaniThuraisingham, CRC Press, June 2003
3. Implementing Semantic Web Services-The SESA Frame Work, D. Fensel;M.Kerrigan; M.Zaremba, Springer
4. Enabling Semantic Web Services- The Web Service Modeling Ontology, Fensel,D; Lausen,H;Pollers,ABruijn,J;Stollberg,M;Spriger
5. A Semantic Web Primer, Paul Groth, Frank van Harmelen, Rinke Hoekstra, The MIT Press, 2012
6. Programming the Semantic Web, Toby Segaran, Colin Evans, Jamie TaylorOreilly Publications, July 2009
7. OWL 2 and SWRL Tutorial, Martin Kuba, Institute of Computer Science, makub@ics.muni.cz
8. O*ntology Query Languages For The Semantic Web*: A *Ntology Query Languages for The Semantic Web*: A Performance Evaluation, ZHIJUN ZHANG, Ph.D Thesis Presented to University of Georgia, 2005, Electronic Version:http://athenaeum.libs.uga.edu/bitstream/handle/ 10724/8545/ zhang_zhijun_200508_ms.pdf?sequence

MCS3.5 : Elective IV : Cloud computing

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Cloud Computing Basics - Cloud Computing Overview, Applications, Intranets and the Cloud, First Movers in the Cloud.The Business Case for Going to the Cloud - Cloud Computing Services, Business Applications, Deleting Your Datacenter, Salesforce.com, Thomson Reuters.
Organization and Cloud Computing - When You Can Use Cloud Computing, Benefits, Limitations, Security Concerns, Regulatory Issues, Cloud Computing with the Titans - Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBMPartnerships.

Unit II: Hardware and Infrastructure - Clients, Security, Network, Services. Accessing the Cloud - Platforms, Web Applications, Web APIs,Web Browsers. Cloud Storage - Overview, Cloud Storage Providers, Standards - Application, Client, Infrastructure, Service.
Software as a Service - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online.

Unit III: Developing Applications - Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management.

Local Clouds and Thin Clients - Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study: McNeilus Steel.

Unit IV: Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

Text Books:

1. Cloud Computing-A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGrawHill.

MCS3.5 :Elective IV : Pervasive Computing

Instruction: 4 Periods/week **Credits: 4**
External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Pervasive Computing : Introduction to Ubiquitous Computing (Popularly known as Pervasive Computing), Evolution of Pervasive Computing, Pervasive Computing Principles : Decentralization, Diversification, Connectivity, Simplicity, Pervasive Computing Characteristics, Pervasive Information Technology
Pervasive Architecture: Background, Scalability and Availability, Pervasive Web Application Architecture, Implementation Issues.

Unit II:**Pervasive Devices :** Device Categories, Device Characteristics, Software Components in the Device, Information Access Devices, Smart Identification, and Embedded Controls, Hand Held Computers, Cellular Phones, Smart Phones, Smart Cards and Smart Appliances
Pervasive Connectivity: Protocols, Security, Network Management, Mobile Internet, WAN: Cellular Basics, Major Digital Cellular Systems, Advanced Cellular Radio Standards, Short Range Wireless Communication: DECT, Bluetooth, Irda, Home Networks.

Unit III: **Pervasive Applications :** Home Services: System View, Communications, Home Automation, Energy and Security Services, Remote Home Health Care Services, Business Services, Healthcare Management, Consumer Services: Interactive Advertisement, Loyalty, Shopping, Payment Services
Pervasive Synchronization: Definition of Synchronization, Models of Synchronization, Challenges In Synchronizing Data, Industry Data Synchronization Standards: Infrared Mobile Communications, WAP, Third Generation Partnership Program, Syncml, Synchronization Solutions

Unit IV: Security Issues in Pervasive Computing : Importance of Security, Cryptographic Patterns And Methods - Light Weight Cryptography -Light Weight Symmetric and Asymmetric Cryptographic Algorithms, Cryptographic Tools - Hash, MAC, Digital Signatures
Mobile Internet and Web Services: WAP Architecture, Wireless Application Environment: Wireless Markup Language, WAP Binary XML Content Format, WML Script, XHTML Mobile Proile, I-Mode, Web Services Architecture: WSDL, ADDI, SOAP, Web Services Security, Web Services For Remote Portals

Text Books:

1. Pervasive Computing: The Mobile World By Uwe Hansmann, LotharMerk
2. Pervasive Computing: Technology And Architecture Of Mobile Internet Applications By Jochen Burkhardt , Horst Henn , Stefan Hepper , Klaus Rindtorff , Thomas Schaeck

MCS3.5: Elective IV :Operations Research

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Overview of Operations Research, Types of ORModels , Phases of Operations Research– ORTechniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, GraphicalSolution;GraphicalSensitivityAnalysis,
StandardFormof LPP, BasicFeasibleSolutions ,UnrestrictedVariables, SimplexAlgorithm, ArtificialVariables, BigM Method, TwoPhase Simplex Method, Degeneracy, AlternativeOptimal, UnboundedSolutions, InfeasibleSolutions, Primal And Dual Problems And Their Relations,DualSimplexMethod

Unit II: Transportation Problem as LPP, Initial Solutions, NorthWestCornerRule, LowestCostMethod, VogelsApproximationMethod, Optimum Solutions of TPP, Degeneracy in Transportation, TransportationAlgorithms ,
AssignmentProblem, Assignment Problem as LPP, HungarianMethod, Travelling Salesman Problem, Solutions Of TSP, Sequencing Problems, N-Jobs Two Machine Problems, N-Jobs K Machines Problems, Two-Jobs M- Machine Problems, Crew Scheduling Problems

Unit III: Network Representation of A Project, CPMandPERT , Critical Path Calculations, Time – Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.
Replacement Problems-Individual And Group Replacement Policy, Reliability & System Failure Problems, Inventory-Factors Effecting Inventory-EOQ, Inventory Problems With and Without Shortages, Inventory Problems With Price Breakups, Multi Item Deterministic Problems. Probabilistic Inventory Problems

Unit IV: Non Linear Programming, DynamicProgramming, RecursiveNatureofDynamicProgramming, ForwardandBackwardRecursion, Solutions of LPP As Dynamic Programming Technique, IntegerProgramming, BranchandBoundAlgorithms, CuttingPlaneAlgorithm,
Introduction To Simulation, Simulation Models, Event Type Simulations, Generation of Random Numbers, Monte-Carle Simulation, Simulation Of Networks;TwoPersonZeroSumGames, MixedStrategyGamesandTheirAlgorithms.

TextBooks:

1. OperationsResearch, KantiSwaroop, P.K. Gupta, Man Mohan, Sulthan Chand& Sons Education
2. PublishersOperationsResearch–AnIntroduction,HandyATaha–PearsonEducation.

References:

1. OperationsResearchPanneerSelvanPrenticeHallOfIndia.
2. Operations Research By S.D Sharma
3. Introduction To Operations Research, F.S. Hiller, G.J. Liberman, TMH
4. Operations Research, Richard Bronson, Schaum's Series, Mcgrawhill

MCS3.5: Elective IV :Parallel Computing

Instruction: 4 Periods/week **Credits: 4**

External: 75 Marks, Internal: 25 Marks **External Exam: 3 Hrs**

Unit I: Introduction to Parallel Computing: Parallel Programming and Parallel Computing, Overview of Parallel Archtectures and Parallel Programming Models, MIMD and SPMD Models, Problems Unique to Parallel Programming,
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 Shu E Network, Torus and Butterfly Network.
Performance Analysis: Introduction, Execution Time, Speedup, Linear AndSuperlinear Speedup, Efficacy And Efficiency, Amdahls Law and Amdahl Effect, Gustafson-Barsiss Law, Minsky's Conjecture, The Karp-Flatt Metric, The Iso-Efficiency Metric, Iso-Efficiency Relation, Cost and Scalability.

Unit III: Parallel Computational Models: Flynns Taxonomy, PRAM, EREW, CREW, ERCW, CRCW, Simulating CRCW, CREW And EREW, PRAM Algorithms.
Introduction To Parallel Algorithms: Parallel Programming Models, PVM, MPI Paradigms,

Unit IV: Parallel Programming Languages: ,Brents Theorem, Simple Parallel Programs in MPI Environments, Parallel Algorithms On Network, Addition Of Matrices, Multiplication Of Matrices.

Text Books:

1. Computer Architecture and Parallel Processing, Hwang and Briggs, McGraw Hill.
2. Parallel Programming inC with MPI and Open MP, Michael J.Quinn, McGrawHill , 2004

Reference Books:

1. Introduction to Distributed and Parallel Computing, Crichlow, PHI.
2. Designing Efficient Algorithms for Parallel Computers, M.J.Quinn, McGraw-Hill.
3. Introduction to Parallel Processing, Shashi Kumar M et al., PHI New Delhi.
4. Elements of Parallel Computing, V.Rajaraman, Prentice-Hall of India.
5. The Design and Analysis of Parallel Algorithms, S.G.Akl, PHI.

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MCS3.6:Object Oriented Software Engineering Lab

Instruction: 3 Periods/week **Credits: 2**

External: 50 Marks, Internal: 50 Marks **External Exam: 3 Hrs**

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1. ThepurposeoftheSoftwareEngineeringLabcourseistofamiliarizethestudentswithmodern softwareengineeringmethodsandtools,**RationalProducts**.Thecourseisrealizedasaproject-like assignmentthatcan,inprinciple,byateamofthree/fourstudentsworkingfulltime.Typically,the assignmentshavebeencompletedduringthesemesterrequiringapproximately60-80hoursfrom eachprojectteam.
2. ThegoaloftheSoftwareEngineeringProjectistohaveawalkthroughfromtherequirements,design toimplementingandtesting.Anemphasisisputonproperdocumentation.Extensivehardware expertiseisnotnecessary,soproportionateattentioncanbegiventothedesignmethodology.
3. Despiteitsapparentsimplicity,theproblemallowsplentyofalternativesolutionsandshouldbea motivatingandeducatingexercise.Demonstrationofaproperlyfunctioningsystemandsufficient documentationisproofofacompletedassignment
4. Termprojectsareprojectsthatagroupstudentormighttakethroughfrominitialspecificationto implementation.Theprojectdeliverablesinclude

Projects

- Documentationincluding
- Aproblemstatement
- Arequirementsdocument
  - ARequirementsAnalysisDocument.
  - ASystemRequirementsSpecification.
  - ASoftwareRequirementsSpecification.
- Adesigndocument
- ASoftwareDesignDescriptionandaSystemDesignDocument.
- Atestspecification.
- Manuals/guidesfor
- Usersandassociatedhelpframes
- Programmers
- Administrators(installationinstructions)

- Aprojectplanandschedulesettingoutmilestones,resourceusageandestimatedcosts.
- Aqualityplansettingoutqualityassuranceprocedures
- Animplementation.

References

1. Project-basedsoftwareengineering:AnObject-orientedapproach,EvelynStiller,CathieLeBlanc,PearsonEducation
2. VisualModellingwithRationalRose2002andUML,TerryQuatrini,PearsonEdusction
3. UML2Toolkit,Hans-ErikEriksson,etc;Wiley

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MCS3.7: Network Programming & Web Programming Lab

Instruction: 3 Periods/week **Credits: 2**
External: 50 Marks, Internal: 50 Marks **External Exam: 3 Hrs**

Part I Networks Lab Experiments

1. Identifying well known ports on a Remote System:Bytryingtolistentothe variouswell known ports by openingclientconnections. Ifthe exceptiondoesnotoccur,thentheremoteportisactiveelsetheremoteportisinactive.
2. Writing a Chat application:
   i).One-One:Byopeningsocketconnectionanddisplayingwhatiswrittenbyonepartytothe other.
   ii).Many-Many(Broadcast):Eachclientopensasocketconnectiontothechatserverandwrites to the socket. Whatever is written by one partycanbeseenby all other parties.
3. Data retrieval from a Remote database:
   AttheremotedatabaseaserverlistensforclientconnectionsThisserveracceptsSQLqueries fromtheclient,executesitonthedatabaseandsendstheresponse to the client.
4. MailClient:
5. i).POPClient:Givestheservername,usernameandpasswordretrievethemailsandallow manipulation of mail box using POP commands.
   ii).SMTPClient:Givestheservername,sende-mailtotherecipientusingSMTPcommands-
6. Simulation of Telnet: Provideauserinterfacetocontactwell-knownports,sothatclient-serverinteractioncanbeseen bytheuser.
7. Simple file transfer between two systems (without protocols):
   Byopeningsocketconnectiontoourserverononesystemandsendingafilefromonesystemto another.
8. TFTP- Client:TodevelopaTFTPclientforfiletransfer. (Unix Network programming- Stevens.)
9. HTTP-Server: Develop a HTTP server to implement the following commands. GET,POST,HEAD,DELETE.The servermust handle multiple clients.

Part II WebProgramming Lab Experiments

1. Design of the Web pages using various features of HTML and DHTML
2. Client server programming using servlets, ASP and JSP on the server side and java script on the client side
3. Web enabling of databases
4. MultimediaeffectsonwebpagesdesignusingFlash.

References

1. JavaNetworkProgramming, Harol, Orielly Publications
2. An Introduction to Computer Networking, Kenneth C. Mansfield Jr and James L. Antonakos, Pearson Education Asia
3. InternetandWebTechnologiesbyRajKamal,TataMcGraw-Hill
4. Programming the World Wide Web by Robert W. Sebesta, Pearson Education

MCS 3.8: Seminar on Advanced Topics

Instruction: 3 Periods/week **Credits: 3**
Internal: 100 Marks

Purpose:
To enable a student to be familiar with Communication skills
Student is Expected to Learn

a. How to Make a Presentation
i. Verbal
ii. Non Verbal
iii. LCD based Power Point

b. How to write a report
i. Abstract
ii. Body
iii. Conclusions
iv. Executive Summary

c. Group Discussion
i. Share the work with a group
ii. Modularization of the work
iii. Shareware Development

d. Communication
i. Horizontal
ii. Vertical

Students Will be Given a Topic Of Importance and are Expected
A. To Present the Topic Verbally in 45minutes + Question Answering
B. To Present the Topic as a Report in 50 Pages

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GENERALRULES

1. The University reserves the right of altering the regulations as and when necessary.
2. The regulations altered will be applicable to all the candidates on the rolls irrespective of the fact that the regulations at the time of admission of the student to the programme are different.
3. The Academic Regulations should be read as a whole for purpose of any Interpretation Whenever there is a dispute regarding interpretation of regulations, the decision of the Vice-Chancellor is final.
4. With regard to the conduct of the end-semester examination in any of the practical courses of the programme, the University shall appoint one examiner from the concerneddepartment of the University, in addition to the teacher who handled the laboratory work during the semester.
5. In respect of all theory examinations, the paper setting shall be done by an external paper setter having a minimum of five years of teaching experience. The panel of paper setters for each course is to be prepared by the Board of Studies of the department concerned and approved by the AdikaviNannaya University.
6. The theory papers of end-semester examination will be evaluated as per the University norms
7. Project work shall be evaluated by two examiners at the semester end examination. One examiner shall be internal and the other be external examiner from the concerned department of the University.
8. Pattern of Evaluation

   Theory: 75% is End Examination
   25% is internal Examination

   Practical: 50% is End Examination
   50% is internal Examination
9. Model Question Paper

   Section A: Answer All Questions. Each Question carries 15 Marks
   Total 4 Questions with internal choice, One from each unit

   Section B: Answer Five Questions out of 8 Questions. Each Question carries 3 Marks
   Two Questions from each Unit