North Maharashtra University, Jalgaon

Syllabus for
M.Sc. (Computer Science)
[Affiliated Colleges]

Faculty of Science and Technology

With Effect from Academic Year 2017-18

Degree Name: Master in Science (Computer Science)
[M. Sc. (Computer Science)]

Duration: 02 years' Full Time course (Semester Pattern, 04 semesters)

Examination Pattern:
60%(External Assessment) +40%(Internal Assessment) with separate head of passing for each assessment

Evaluation Mode: CGPA

Lecture: Clock hour (60 minutes)

North Maharashtra University,Jalgaon

Syllabus for M.Sc. (Computer Science)– 2017

SEM – I

CS-101   Advanced C++ Programming
CS-102   Automata Theory and Computability
CS-103   Advanced Operating System
CS-104   Digital Image Processing
CS-105- LAB - I   Lab on Advanced OS and Digital Image Processing
CS -106-LAB - II   Lab on Advanced C++ Programming

SEM – II

CS-201   Advanced DBMS
CS-202   Machine Intelligence
CS-203   Compiler Construction
CS-204   Design and Analysis of Algorithms
CS-205- LAB - III   Lab on DAA and MI
CS -206-LAB - IV   Lab on Advanced DBMS

SEM –III

CS-301   Software Engineering
CS-302   Optimization of Algorithm
CS-303   Advanced Java Programming
CS-304   Windows, WCF and WPF Programming
CS-305-LAB – VLab on Windows, WCF and WPF Programming
CS -306-LAB –VILab on Advanced Java Programming

SEM – IV

CS-401   Natural Language Processing
CS-402   Advanced Network Programming
CS-403   Data Warehousing and Data Mining
CS-404- LAB – VII Lab on Network programming and Data Mining
CS -405 Mini Project (200 marks)

Career Opportunities

The career opportunities after M.Sc. (Computer Science) are quite huge. Many majornational and multinational firms take in aspirants who have accomplished theirgraduation in these fields. The top IT firms such as Microsoft, Google, Yahoo, Rediff,Wipro, TCS, Infosys, Accenture, Cap Gemini etc. offer aspirants very attractivepackages. Jobs for professionals in these fields can also be got with managementconsultancy organizations, Government organizations, Banks, EducationalInstitutions, Research Organizations and other organizations that use computers andcomputer-aided systems are but not limited to:

- Programmer or Software Engineer
- Computer Engineer
- Web Designer
- Hardware Designer/Engineer
- Systems Engineer
- System integrator
- System Administration
- Technical Support
- Support Engineer
- Technical Writer
- Consultant
- Management
- Administration
- IT Sales and Marketing
- IT Officer
- Computer Scientist
- Professor
- Research Staff Member
- Systems Analyst
- Logic Designer
- Computer Scientist

Semester-I

CS-101: Advanced C++ Programming

Unit-1 Inheritance and Polymorphism: [L:6, M:8]

Class Derivation, Access Control, Base Class Initialization, Initializing Class Type Members,Polymorphism and Virtual Functions, Pointer Conversion, Virtual Destructors, AbstractClasses and Pure Virtual Functions

Unit-2 Advanced Polymorphism and Inheritance: [L:4, M:8]

Orthodox Canonical Form, Public, Private and Protected Inheritance, Composition vs.Inheritance, Templates vs. Inheritance, Interface Encapsulation

Unit-3 Exception Handling: [L: 6, M: 8]

C++ Exception Mechanism, Exceptions Compared to Other Error Handling Techniques,throw, try and catch, Exception Context and Stack Unwinding, Uncaught Exceptions,
Automatic Cleanup in Exception Handling

Unit-4 Runtime Type Information: [L:4, M:6]

Runtime Type Information (RTTI) Mechanism, type_info Class and typeid Operator, TypeSafe Pointer Conversion, New C++ Cast Syntax

Unit-5 Inheritance Hierarchies and Multiple Inheritance: [L: 6, M:8]

Smalltalk Style Class Hierarchies, Collection Classes in Object-Based Hierarchies,Independent Class Hierarchies in C++, Multiple Inheritance, Resolving Ambiguities,and DuplicateSub objects Virtual Base Classes, RTTI in Multiple Inheritance

Unit-6 Applications of C++ Concepts: [L:4, M:4]

Object Validation, Smart Pointers, Reference Counting, Generic Smart Pointers

Unit-7 An Overview of Templates: [L:6, M:10]

Templates, Overloading functions, Template functions, Specializing a template function,Disambiguation under specialization, Template classes, An array template class, Instantiatinga template class object, Rules for templates, Non member function with a template argumentFriends of template classes, Templates with multiple type parameters, Non type parametersfor template classes, Comments regarding templates

Unit-8 Introduction to Standard Template Library: [L:4, M:8]

Why STL, Sequential, Container Adapter, Associative Container, Iterator, Algorithms.

Unit-9 STL Sequential Container: [L:6, M:8]

Sequential Container:-vector, deque listContainer Adapter: Stack, Queue, Proiority Queue

Unit-10 Associative Containers: [L:6, M:8]

Set, Multiset, Map, Multimap

Unit-11 Generic Algorithms: [L:4, M:8]

Non modifying algorithms, mutating algorithms, sorting algorithms.

Unit-12 STL Iterators: [L:4, M:6]

Introduction,Input iterators, Output iterators, Forward iterators, Backward iterators.

References:

1. A. I. Stevens , "C++ Programming", 7th Edition,ISBN: 9788126503988, Wiley India Pvt Ltd
2. Paul J. Deitel, Harvey M. Deitel ,"C++ How to Program" , 7th Edition, 2010,ISBN: 9780136117261,Prentice Hall.
3. William H. Murray, Chris H. Pappas,"Data Structures with STL" ,1st Edition, 2001, ISBN: 9780130289278,Prentice Hall PTR.

4. Graham Glass, Brett L. Schuchert, "The STL Primer", 1st Ed. 1996, ISBN: 9780134549767Prentice Hall.
5. BjarneStroustrup ,"The C++ Programming Language", 3rdEdition, 1997, ISBN:9780321563842,Addison Wesley Longman, Inc.

CS-102: Automata Theory and Computability
Unit-1 Finite Automata and Regular Languages: [L:10, M:15]

Introduction : States and Automata, Finite Automata as Language Acceptors, Deterministic and Non deterministic Finite Automata, Properties of Finite Automata : Equivalence of finite Automata, transitions, Moore and Mealy machine models, Regular expressions : Definition and examples, Regular expressions and finite automata, Regular expressions from DFA.

Unit-2 Regular sets and context free grammar: [L:10, M:15]
Pumping lemma for regular sets, application of pumping lemma, closure properties of regular sets. Context free grammar, Derivation tree: Leftmost, rightmost, ambiguous grammar, Simplification of context freegrammar: Construction of reduced grammar, elimination of null production and elimination of unit production. Normalforms: Chomsky Normal Form, Griebach Normal Form.

Unit-3 Pushdown Automata: [L:8,M:15]
Acceptance by empty store and final state, equivalence between pushdown automata and context free grammar, Closure properties of CFL, Deterministic PDA.

Unit-4 Turing Machine: [L:12, M:15]
Techniques for TM construction : Generalized and restricted versions equivalent to the basic model,Godel numbering, universal TM, recursive enumerable sets and recursive sets, computable functions, time-space complexity measures, context sensitive languages and linear bounded automata(LBA), multitapeturing machine

Unit-5 Decidability: [L:4, M:5]
Post correspondence problem, decidability of membership, emptiness and equivalence problems of languages.

Unit-6 Computability: [L:8, M:10]
Primitive Recursive functions: Initial function, Primitive recursive functions over N, primitive recursive functions {a,b}. Recursive functions.

Unit-7 Complexity measures: [L:4, M:5]
Time and tape complexity measures of Turing machines, random access machines, the classes P and NP, NP completeness.

Unit-8 Advanced Topics: [L:2, M:5]
Regulated rewriting L Systems, Grammar systems

Unit-9 New paradigms of computing: [L:2, M:5]
DNA Computing, Membrane Computing

References:
1. K. Krithivasan and R. Rama, "Introduction to Formal Automata Theory and Computation",,2009, ISBN: 9788131723562, Pearson Education.
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory Languages and Computation", 2nd Edition, 2001,ISBN: 9780201441246, Pearson Education Asia.
3. Bernard M. Moret, "The Theory of Computation", 2nd Edition, 2008, ISBN: 9788131708705, Pearson Education.

4. K.L.P.Mishra, N. Chandrasekaran,"Theory of Computer Science: Automata, Languages and Computation", 3rdEdition, 2007, ISBN-10: 8120329686, Prentice-Hall of India.

CS-103: Advanced Operating System

Unit-1 Overviewof UNIX Operating System: **[L:10, M:20]**

Architecture of UNIX/LINUX Operating System, Introduction to Kernal, Introduction to shell programming and Unix commands.

Unit-2 File Subsystem: **[L:20, M:30]**

Nodes, structure of regular file, Conversion of a path name to an Inode, Super block, Inode assignment to a new file, Allocation of disk blocks.
System calls for File system:
Algorithms for : Open – Read – Write – Adjusting the position of file I/O lseek –Close, File creation – Changing directory, root, owner, mode, stat and fstat, Pipes – Dup, Mounting and unmounting file systems - Link – unlink.

Unit -3 Processes   **[L:10, M:10]**

Process states and transitions, the context of a process, Savingthe context of a process, Manipulation of the process address space - Sleep.

Unit- 4 Process Control   **[L:10,M:20]**

Process creation, Signals, Process termination, awaiting process termination, Invoking other programs – user id of a process – Changing the size of a process, Shell – System boot and the INIT process– Process Scheduling and time.

Unit -5 Memory Management   **[L:10, M:10]**

Memory Management Policies: Swapping – Demand paging, Driver Interface – Disk Drivers – Terminal Drivers, Streams, Inter process communication.

References:

1. Maurice J. Bach, "The Design of the Unix Operating System",ISBN : 9780132017992, Prentice Hall.
2.B. Goodheart, J. Cox, "The Magic Garden Explained",1994, ISBN: 9780130981387, Prentice Hall of India.
3. S. J. Leffler, M.K. Mckusick, M. J. .Karels and J. S. Quarterman.,"The Design andImplementation of the 4.3 BSD Unix Operating System",1st Edition, 1996, ISBN: 9780132317924, Addison-Wesley Professional.
4. J. Hart, "Windows System Programming", 4th Edition, 2008, ISBN: 9780321658272,PearsonEducation.
5. A. Robbins, "Linux Programming by Example: The Fundamentals",2nd Edition,2008, ISBN: 9788131704196, Pearson Education.

CS-104: Digital Image Processing

Unit-1 Introduction   [M:15, L:8]

Introduction to DIP, Application of Digital Image Processing, Fundamental Stepsin Digital Image Processing, Components of an Image Processing System, Image data types,image file formats(GIF,BMP,TIFF,JPEG).

Unit-2 ImageProcessingFundamental   [M:10, L:8]

Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling andQuantization. Some Basic Relationships between Pixels. Linear and Nonlinear Operations.

Unit-3 Image Enhancement   [M:15, L:8]

Background.Some Basic Gray Level Transformations.HistogramProcessing.EnhancementUsing Arithmetic/Logic Operations.Basics of Spatial Filtering.Smoothing SpatialFilters.Sharpening Spatial Filters.Combining Spatial Enhancement Methods. Introduction tothe Fourier Transform and the Frequency Domain. Smoothing Frequency- DomainFilters. Sharpening Frequency Domain Filters. HomomorphicFiltering.Implementation.

Unit-4 Image Restoration and Transforms   [M:15, L:10]

A Model of the Image Degradation/Restoration Process.NoiseModels.Restoration in thePresence of Noise Only-Spatial Filtering.Periodic Noise Reduction by Frequency DomainFiltering.Linear, Position-Invariant Degradations.Estimating the DegradationFunction.InverseFiltering.Minimum Mean Square Error (Wiener) Filtering.ConstrainedLeast Squares Filtering. Geometric Mean Filter.GeometricTransformations. Discrete Fouriertransform, Walsh transform (WT), Hadamard transform, Cosine transform, Haar transform,Wavelet transform

Unit-5 Color Image Processing   [M:10, L:8]

Color Fundamentals. Color Models. Pseudocolor Image Processing. Basics of Full-ColorImage Processing. Color Transformations. Smoothing and Sharpening Concept of Image,Audio and Video Compression

Unit-6 Morphological Image Processing & Segmentation   [M:15, L:10]

Detection of Discontinuities, Edge linking & Boundary Detection, Thresholding, Regionbased segmentation Laplacian of Gaussian, Derivative of Gaussian, Canny EdgeDetection, Morphological operation: Dilation erosion, Opening & Closing, BasicMorphological Algorithm, Image representation schemes

Unit-7 MATLAB Image Processing   [M:10, L:8]

Introduction to matrix operations, introduction to image processing tool boxImage read & write, filters (spatial, frequency domain), Image Restoration andReconstruction, morphological operations, edge detection and linking, segmentation.

References:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 2nd Edition, 2002, ISBN: 9780201180756, Prentice Hall.
2. JayaramanS , "Digital Image Processing", 1st Edition, 2009, ISBN: 9780070144798, TMH(McGraw Hill Education) publication.
3. A.K. Jain,"Fundamentals of Image processing", 1st Edition, 1995, Prentice Hall of India Publication.

4.S. Sridhar, "Digital Image Processing", 1st Edition, 2011, ISBN:9780198070788, OxfordUniversity Press.
5.Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing using MATLAB", 1st Edition, 2006, ISBN: 9788177588989, Dorling Kindersley Pvt Ltd.

CS-105-Lab-I Lab on Advance OS & Image Processing

Part I: Advanced OS

1. Use of Unix/Linux – User Commands – Editors - Shell programming

2. C/C++ programming on Unix/Linux – use of make, version control

3. Use of system calls – files – processes – I/O – IPC

4. Experiments using C of mini unix systems (such as Minix) – File system – Processes – Memory Management – Drivers

5. Unix / Linux sources – build, run kernel – small modifications

Part II: DIP

1. Display of Grayscale Images, Color images.

2. Arithmetic Operation on Images

3. Histogram Equalization

4. Conversion between color spaces.

5. Max-min Non-linear Filtering.

6. Median Non-Linear Filter

7. 2-D DFT and DCT.

8. Filtering in frequency domain.

9. Edge detection.

10. Segmentation using Thresholding.

CS-106-Lab-II Lab on Advanced C++ Programming

1. Write a program to demonstrate encapsulation using of class, Write a program to demonstrate use of all types of Inheritance

2. Write a program to demonstrate use of polymorphism

3. Write a program to demonstrate use of function overloading

4. Write a program to demonstrate use of operator overloading

5. Write a program to demonstrate use of array of objects

6. Write a program to demonstrate use of pointers

7. Write a program to demonstrate use of pointer to members of class

8. Write a program to demonstrate use of Exception handling.

9. Write a program to demonstrate use of function templates and class templates

10. Write a program to demonstrate use of containers, iterators, adaptors,allocators,specializedcontainers, associative containers.

Semester-II

CS- 201 Advanced DBMS

Unit-1 Database System Architectures   **[L:08, M:12]**

Centralized and Client-Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems

Unit-2 Parallel Databases   **[L:08, M:12]**

Introduction, I/O Parallelism, Inter and Intra Query Parallelism, Inter and Intra operation Parallelism

Unit-3 Distributed Database Concepts   **[L:08, M:12]**

Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control, Distributed Query Processing – Three Tier Client Server Architecture.

Unit-3 Object and Object Relational Databases   **[L:12, M:18]**

Concepts for Object Databases, Object Identity, Object structure and Type Constructors, Encapsulation of Operations, Methods and Persistence, Type and Class Hierarchies and Inheritance, Complex Objects, Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational featuresinSQL/Oracle

Unit-4 1XML Databases   **[L:08, M:12]**

XML Data Model, XML Documents, DTD and XML Schema, XML Querying,Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

Unit-5 Mobile Databases   **[L:08, M:12]**

Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes

Unit-6 Multimedia Database   **[L:08, M:12]**

Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

References:
1. AviSilberschatz, Henry F. Korth,S. Sudarshan, "Database System Concept", 4th Edition,2001, ISBN: 0072283637, McGraw-Hill publications.
2. RamezElmasri, ShamkantNavathe, "Fundamental of Database Systems",5thEdition, 2009,ISBN: 9780321369574,Pearson Education.
3. Alexis Leon, Mathews Leon, "Database Systems concept", 2002, ISBN: 9788125911654, Leon Vikas.

CS-202 Machine Intelligence

Unit-1 Introduction   [M: 04, L:2]

What is Machine Intelligence?The AI Problems, What is an AI Technique, Criteria for Success, AI Task domains.

Unit-2 Problems, Problem Spaces, and Search   [M:10, L:6]

Defining the Problem as a State Space Search, Production systems, Problem Characteristics,Production System Characteristics, Issues in the Design of Search Programs, Uninformed Search Techniques: DFS and BFS

Unit-3 Heuristic Search Techniques   [M:08, L:5]

Generate-and- Test, Hill Climbing, Best-First Search, A* Search, AO* Search

Unit-4 Knowledge Representation   [M:06, L: 4]

Knowledge Representation Issues, Representations and Mappings, Approaches to knowledgeRepresentation, Issues in Knowledge Representation, The Frame Problem.

Unit-5 Using Predicate Logic   [M:10, L:8]

Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

Unit-6 Weak Slot-and-Filler Structures   [M:06, L: 5]

Semantic Nets, Frames.

Unit-7 Strong Slot-and Filler Structures   [M:06, L: 5]

Conceptual Dependency, Scripts.

Unit-8 Learning   [M:04, L: 3]

What is learning?, Rote Learning, Learning by taking advice ,Learning in problem solving, Learning from examples, Explanation based learning

Unit-9 Planning & Understanding   [M:10, L: 6]

Introduction, An example Domain – the block world, Components of the planning system,What is understanding?, What makes understanding hard, Understanding as constraints satisfaction

Unit-10 Neural networks   [M: 10, L: 6]

Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis FunctionNetworks,ReinforcementLearning,Unsupervised Learning

Unit-11 Fuzzy logic   [M: 10, L: 6]

Fuzzy Sets, Operations on Fuzzy Sets,Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning,Fuzzy Inference Systems, Fuzzy Expert Systems,Fuzzy Decision Making.

Unit-12 Genetic algorithms   [M: 06, L: 4]

Introduction to Genetic Algorithms (GA),Applications of GA in Machine Learning,Significance of the Genetic Operators

References:

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", 2nd Edition, 1991, ISBN: 9780071008945, Tata McGrawHill.

2. Stuart Jonathan Russell, Peter Norvig, "Artificial Intelligence – A modern approach", illustrated, 2010, ISBN:9780136042594, Prentice Hall.

CS-203 Compiler Construction

Unit-1 Introduction to Compilers [M:10, L:8]

The structure of a compiler, Phases of Compilation: the Analysis – Synthesis Model.Applications of Compiler, CompilerConstruction Tools.

Unit-2 Lexical Analysis [M:15, L:12]

A simple approach to the design of lexical analyzers, Role of lexical analyzer ,tokens,patterns,lexeme,lexical errors ,Specification of tokens, Recognition of tokens, lexical analyzer generator LEX, Regular expressions, Finite automata, From regular expressions to finite automata, Minimizing the number of states of a DFA.

Unit-3 Syntax Analysis [M:25, L:14]

Context-free grammars, Derivations and Parse trees, Ambiguous grammar, Role of parser, typesof Parsers: Top down Parsing, Problems in top down parsing, recursive parsing, problems in recursive parsing, predictive parsing, error recovery in predictive parsing.(LL(1)), Bottom –up parsing, Shift-reduce parsing, Actions in Shift reduce parser, Operator-precedence parsing, its advantages and disadvantages, error recovery in operator precedence parser, LR parsers: Simple LR, LR (1), LALR parser.

Unit-4 Intermediate Code generation [M:10, L:8]

Need of Intermediate code generation, three address code, Quadruples, triples, indirect triples and blocks

Unit 5 Code optimization [M:15, L:10]

Need of code optimization, classification of code optimization techniques, and optimization within basic blocks:Folding, Redundant operation elimination. Withinloop: Strength reduction, Dead code elimination, Moving operation within block, out of block.

Unit 6 Symbol Table Organization [M:15, L:8]

Methods of organizing symbol table: Unsorted, sorted symbol table, Binary Search, hashing technique, its advantages and disadvantages, Collision resolution techniques: Rehashing, Chaining.

References:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compiler Principle, Techniques and Tools", 2nd Edition illustrated,ISBN: 9781292024349, Pearson Addison Wesley.
2. William A. Barret, John D. Couch, "Compiler Construction Theory and Practice", Computer Science Series, 1979, ISBN: 978-0574213358, Asian Student Edition.
3. Dhamdhere D. M. , "Compiler Construction Principle and Practice", 2002, ISBN: 9780333904060, McMillan India.
4. David Gries, "Compiler Construction for Digital Computers", 1st Edition, 1971,ISBN: 9780471327769, Wiley.
5. David Galles, "Modern Compiler Design", 2nd Edition , 2009, ISBN: 9788131709412, Pearson Education.

CS -204 Designs and Analysis of Algorithm

Unit - 1 Introduction   **[M: 15, L: 14]**
Algorithm definition,Analysis of Algorithms, Principles of Algorithm, Some stylistic issues, Euclid's algorithm, Recursion - Removal of Recursion (GCD, Factorial), Asymptotic complexity, Heaps (Insert, Adjust),Finding Maximum and Minimum

Unit - 2 Divide and Conquer   **[M: 15, L: 8]**
Introduction, Control Abstraction for Divide and Conquer, Binary Search, Sorting(Merge, Quick), Matrix Multiplication

Unit- 3 Greedy Algorithms   **[M: 15, L: 12]**
Introduction, Control Abstraction for Greedy Algorithms, Single source shortest path,
Minimum cost spanning tree(Kruskal, Prims), Fractional knapsack, Huffman Coding

Unit- 4 Dynamic Programming   **[M: 15, L: 14]**
Introduction, Control Abstraction for Dynamic Programming, All pair shortest path, Knapsack (0/1) ,Matrix chain multiplication , Longest common subsequence, DFS and BFS

Unit - 5 Backtracking   **[M: 15, L: 6]**
GeneralMethod,8-Queen'sproblem, Sum of subset problem, Graph coloring problem,
Hamiltonian cycle

Unit - 6 Problem Classifications   **[M: 15, L: 6]**
Nondeterministic Algorithm, The class of P,NP, NP-hard and NP-Complete problem,
Significance of cook's theorem

References:

1. Ellis Horowitz, SatrajSahni, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", 2010, ISBN: 8175152575, Galgothia publications.
2. AnanyLevitin, "Introduction to the design and analysis of Algorithms",2003, ISBN:9788178089843, Pearson Education,
3. Parag H. Dave, Himanshu B. Dave, "Design and Analysis of Algorithms", 1st Edition, 2008, ISBN: 8177585959, Pearson Education..
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein ,"Introduction to Algorithms",3rd Edition, 2010, ISBN:9788120340077, Prentice Hall of India.
5. Dieter Jungnickel, "Graph,Network and Algorithms",2nd Edition, 2005, ISBN:3540219056, Springer.
6. Alfred V. Aho, John E.Hopcroft,&Jeffrey D.Ullman, "The Design and Analysis of Computer Algorithms", 4thEdition, 2009, ISBN: 9788131702055, Pearson Education.

CS-205-Lab-III- Lab on DAA and MI

Note: Following practicals should be implemented in C/C++.

Part I: Machine Intelligence

1. Implementation of uninformed search techniques like,

    i) a. Breadth first Search

    ii) b. Depth First Search

2. Implementation of informed (Heuristic) search techniques like

    i)   a. Best first Search

    ii) b. Branch and Bound Search.

    iii) c. A* Search

    iv) d. Hill Climbing search

    v)   e. AO* Search

3. Implementation of Water Jug problem.

4. Implementation of Missionaries and Cannibals problem.

5. Implementation of Tic-Tac-Toe game.

6. Implementation of Tower of Hanoi Problem.

7. Implementation of 8 queen problem.

Part II:Design &Analysis of Algorithms

1. Write a program to implement removal of recursion for

    i)   Finding maximum from array

    ii) Binomial coefficient $B(n,m)= B(n-1, m-1)+B(n-1,m)$, $B(n,n)=B(n,0)=1$

    iii) Searching element from array

2. Write a program for creating max./min. heap using

    i)   INSERT

    ii) ADJUST/HEAPIFY

3. Write a program to find minimum and maximum form a given array.

4. Write a program for searching element form given array using binary search for n=1000, 2000, 3000 find exact time of execution.

5. Write a program for sorting given array in ascending/descending order with n=1000,2000,3000 find exact time of execution using

    i)   Heap sort

    ii) Merge sort

iii) Quick sort

6. Write a program for matrix multiplication using Strassen's matrix multiplication.

7. Write a program to find solution of Knapsack instant.

8. Write a program to find minimum spanning tree using prim's/kruskal's algorithm.

9. Write a program to find shortest path using single source shortest path.

10. Write a program to find shortest path using all pair path.

CS-206-Lab-IV Lab on Advanced DBMS

(Perform all the following practical's using MS SQL Server 2008 through T-SQL)

1. Write down Stored Procedure for inserting , updating values in the table

2. Write down stored procedure to accept input values as a parameter and update values of the tables

3. Write down DML trigger to raise the error while inserting duplicate value in the table

4. Write down DML trigger to raise the error violating Check Constraints

5. Write down DML trigger to raise the error when user deletes more than 5 records from table

6. Create index and measure the performance of query on the table

7. Compare results before and after indexing by considering any sample table

8. Write down stored procedure for selecting first five records and copy that five records in another table

9. Write down function which prints higher salaried person from table by inputing his emp-id and name

10. Write down function which selects part name(substring, like surname,firstname or middle name and copy that part in another table's column)

Semester-III

CS 301- Software Engineering

Unit – 1 Introduction to Software Engineering   **[L:8, M:10]**
The nature of software, Defining software, Software Application Domain, Legacy Software,
Software Engineering, Software Process

Unit -2 Software Process Models   **[L:8, M:10]**
Incremental Process Model, Concurrent Process Model, Specialized Process
Model

Unit -3 Requirement Specifications   **[L:8, M:15]**
Requirements Engineering, Establishing the ground work, Eliciting Requirements, Developing
Use cases, Building the requirements model, validating requirements.

Unit – 4 Design Concepts   **[L:12, M:20]**

Design Process, Concepts, Design Models, Architectural Design- Software architecture,
Architectural Design, User Interface Design – User Interface Analysis and Design, Pattern based
Design – Design Pattern

Unit- 5 Testing   **[L:8, M:10]**

Levels of testing – Functional, Structural, Test Plan, Test case specification, **Types of** testing –
Unit testing, Integration Testing, Function Testing, System testing, Performance testing,
Accepting testing.

Unit- 6 Quality Management   **[L:8, M:15]**

What is quality? , Software quality- Gravin's quality dimension, McCall's quality factor, ISO
9126 quality factors, Targeted quality factor, Review Technique- Formal Technical Review

Unit – 7 SoftwareConfigurationManagement (SCM) and Project Scheduling   **[L:8, M:10]**

Software Configuration Items, SCM Repository, SCM Process, Scheduling Timeline charts,
tracking the schedule

References:

1. Roger. S. Pressman , "A Practitioner's Approach", 7th Edition, 2010, ISBN:
   9780071267823, McGraw Hill International Publication.
2. K. K. Agrawal, Yogesh Singh, "Software Engineering",3rdEdition, 2008, ISBN:
   9788122423600, New age International Publishers.
3. RajibMall , "Fundamentals of Software Engineering",4th Edition, 2014, ISBN:
   9788120348981, Prentice-Hall of India Publication.

CS-302 Optimization Algorithms

Unit-1 Overview of Operations Research   **[L:2, M:6]**
Introduction, Quantitative Techniques and their field of applications, Classification of Quantitative Techniques, Limitations of Quantitative Techniques

Unit-2 Linear Programming   **[L:12, M:18]**
Introduction – Graphical Solution; Graphical Sensitivity Analysis– The Standard Form OfLinear Programming Problems – Basic Feasible Solutions -Unrestricted Variables – SimplexAlgorithm – Artificial Variables – Big M And Two Phase Method –Degeneracy – Alternative, Optimal – Unbounded Solutions – Infeasible Solutions

Unit-3 Dual Problems   **[L:6, M:12]**
Relation between Primal and Dual Problems – Dual Simplex Method

Unit-4 Transportation Model   **[L:12, M:18]**
Starting Solutions. North West Corner Rule - Lowest Cost Method–Vogels approximation Method – MODI Method, Stepping Stone Method, Transportation Algorithms – AssignmentProblem –Hungarian Method.

Unit-5 Game Theory   **[L:8, M:12]**
Introduction, Two-Person Zero-Sum Games, Some Basic Terms, the MaxminiMinimaxPrinciple, Games Without Saddle Points-Mixed Strategies, Graphic Solution of 2 * Nand M*2 Games, Dominance Property

Unit-6 Network Models   **[L:8, M:12]**
Definitions – CPM and PERT Network Minimization, Shortest Route Problem,Critical Path Calculations, PERT Calculation, Float Analysis

Unit-7 Sequencing Models   **[L:6, M:6]**
Processing N Jobs through 2 Machines, N Jobs through 3 Machines, TwoJobs through M Machines.

Unit-8 Simulation Models   **[L:6, M:6]**
Introduction: Application, Advantage & Disadvantages, Monte-Carlo method,Types of simulation models,Components of the discrete simulation.

References:

1. Handy A Taha, "Operations Research – An Introduction", 9th Edition, 2011, ISBN: 9780131391994, Pearson Education.
2. Prem Kumar Gupta, D. S. Hira, "Operations Research", 7th Edition, 2014, ISBN: 9788121902816, S. Chand & Company LTD.
3. R. PanneerSelvam, "Operations Research", 2nd Edition, 2016, ISBN: 9788120329287, Prentice Hall of India.
4. L.C. Jhamb, "Quantitative Techniques for Managerial Decisions: Vol. I",3rd Edition, ISBN: 9788186314623, Everest Publishing House.

CS-303-Advanced Java Programming

Unit-1 Java Basics Review   **[M:15, L:12]**

Java streaming ,Networking , Event handling , Multithreading, Byte code Interpretation , Customizing application , Data Structures ,Collection classes.

Unit-2 Distributed Computing   **[M:15, L:12]**

Custom sockets ,Remote Method Invocation , Object Activation, Object serialization, Distributed garbage collection, RMI - IIOP , CORBA - Interface definition language, JINI overview.

Unit-3 Java Beans and Swing   **[M:18, L:12]**

Bean concepts ,Events in bean box , Bean customization , Persistence , Application, Deployment using swing , Advanced swing techniques , JAR file handling.

Unit-4 Java Enterprise Applications   **[M:17, L:12]**

JNI , Servlets ,Life cycle of Servlets, Handling HTTP Request and Response, Java Server Pages, JDBC, Session beans, Entity beans, Programming anddeploying enterprise Java Beans, Java transactions

Unit-5 Related Java Techniques   **[M:25, L:12]**

Java Struts, Java Media Frame work, 3D graphics, Internationalization, Case study, Deploying n-tier application, E- commerce applications.

References:

1. Paul J. Deitel, Harvey M. Deitel, "Java How to program ",8th Edition, 2010, ISBN: 9780136053064, Pearson Prentice Hall.
2. Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", 5th Edition, 2001, ISBN: 0130894680, Sun Microsystems Press.
3. Stephen Asbury, Scott R. Weiner, "Developing Java Enterprise Applications",1stEdition, 1999, ISBN: 978-0471327561, Wiley.
4. RajkumarBuyya, S. ThamaraiSelvi , Xingchen Chu, "Object Oriented Programmingwith JAVA: : Essentials and Applications" ,2009, ISBN: 9780070678835, TataMcGraw Hill Education.

CS-304: Windows, WCF and WPF Programming

Unit 1: Windows Programming   **[L:18, M:30]**
Windows environment – a simple windows program – windows and messages – creating the window – displaying the window – message loop – the window procedure – message processing – text output – painting and repainting – Mouse-Keyboard-introduction to GDI – device context – basic drawing – child window controls.
Unit 2: Windows Communication Foundation [WCF]   **[L:22, M:30]**
Windows Communication Foundation Overview, Windows Communication Foundation Concepts, Understanding Windows Communication Foundation, Addresses,Understanding and Programming WCF Binding, Understanding and Programming WCF Contracts, Clients, Services, Security.
Unit 3: Windows Presentation Foundation [WPF]   **[L:20, M:30]**
Overview of Windows Presentation Foundation, WPF and .Net Programming, Anatomy of EPF-

Enabled Application, Building a Rich UI with Microsoft Expression Blend, Custom Controls, Security.

References:

1. Charles Petzold, "Windows Programming",4th   illustrated Edition, , 1996, ISBN: 9781556156762, Microsoft Press
2. Scott Klein, "Professional WCF Programming .Net Development with Windows Communication Foundation",2007, ISBN: 9780470089842,Wiley Publishing Inc.
3. Chris Andrade, Shawn Livermore, Mike Meyers, Scott Van Vilet, "Professional WPF Programming .Net Development with Windows Presentation Foundation", 2007, ISBN: 9780470041802 , Wiley Publishing Inc.

CS-305-Lab-V: Lab on Windows, WCF and WPF Programming

Part I: Windows Programming

1. Write a window program to demonstrate line drawing with left mouse button. The color & width of the line should change with every new line.

2. Write a Window Program that displays a small rectangle with every left mouse button.DoubleClicking on existing rectangle should erase the rectangle.

3. Write a Window Program to display size of window and no. of left clicks; no. of rightclicks and no. of double clicks. The data should be display at the center of the window. Sizeshould be updated when user resizes the window object.

4. Write a Window Program to create filled rectangle and circle on alternate left click. Newfigure should not erase the previous one.

5. Write a Window Program to create various brushes and change the background color using Timer.

6. Write a Windows Program to Create Pen for FreeHand Drawing.

7. Write a Window program to create a window object. Drag the left mouse buttons &displayrectangle for which dragged line is a diagonal. Also demonstrate mouse capturing.

8. Write a window program to display the characters entered by user from the keyboard. [Consider only alphabets and numbers only.]

Part II: WCF and WPF Programming

1. Create a simple WCF application with appropriate client and host it in various environments IIS, Windows Service, Windows Application.

2. Create a simple WCF application for arithmetic operations. Use Service Contract, NetTcpBinding and TCP address

3. Create a simple WCF application of string Concatenation. Use Service Contract, NetTcpBinding and TCP address

4. Create a simple WCF application of Fibonacci's series. Use Service Contract, NetTcpBinding and TCP address

5. Create an appropriate application using Windows Presentation Foundation.

CS-306-Lab-VI: Advanced Java Programming

1. Write a java program that demonstrates

    a. FileInputStream and FileOutputStream.

    b. FileReader and FileWriter.

    c. BufferedReader&BufferedWriter.

    d. DataInputStream and DataOutputStream.

2. Implement the Java program for echo server and echo client to demonstrate networking inJava using Sockets.

3. Create a simple java bean and demonstrate it using Bean Box.

4. Create a Java bean that demonstrates

    a. Indexed Property.

    b. Bound Property.

    c. Constrained Property.

    d. Event Handling and communication between two beans.

5. Write a Java program that demonstrates user define packages.

6. Write a Java program that demonstrates JDBC.

7. Write a Java program that demonstrates JSP.

8. Write a Java program that demonstrates different types of EJB.

9. Write a Java program to demonstrate the use of Swing Classes/Components.

10. Write a Java program to demonstrate java Struts.

11. Write a Java program(s) that demonstrates the use of collection classes listed below

    a) Stack   b) Queue   c) Array   d) Vector   e) Map

    f) Set   g)Treeset   h) List   i) Linked list   j) HashMap

    k) HashSet   l) LinkedHashMap   m) LinkedHashSet

Semester-IV

CS-401-Natural Language Processing

Unit-1   **[06 L 10 M]**
Introduction to NLP: Brief History, Study of Language and Linguistic background, syntactical elements of language, grammar and sentence structure, NL tasks: Segmentation, Chunking, tagging, and Parsing. Concept of Ambiguity in language, need of Resolving ambiguity, Examples of Named Entity Recognition and Word sense disambiguation in English.

Unit-2   **[06 L 10 M]**
Application and Research Areas of NLP: Speech to Text conversion, Story understanding, Question Answer System, Machine Translation (Examples of English to Marathi or Hindi), Text summarization, text classification, Sentiment Analysis; Text Entailment; Cross Lingual Information Retrieval (CLIR).

Unit-3   **[08 L 15 M]**
Mathematical Foundation: Elementary Probability Theory: Probability, conditional/joint probability and independence, Bayes Theorem, Machine Learning: Definition, Types,Techniques, Naïve Bayes, Classification, Clustering, Algorithms kNN, K-means,fuzzy C-means, numberical data, Categorial Data, Similarly measures: Cosine similarity, Jaccard's Distance, Ecludian Distance etc.

Unit-4   **[13L 20 M]**
Linguistic Essentials and Grammars
Part of Speech: Word categorization, word forms and POS tagging , English Grammar and POS tags : noun, verb, adjective, determiners, adverbs, prepositions, particles, Phrases Structure: Noun Phrase, Verb Phrase, Prepositional Phrases, Phrase Structure: Penn tree bank, Tree, bracketed representations, ambiguity in phrase structure formation, Semantics & Pragmatics, **Parsing:** Shallow Parsing; Named Entities; Parsing Algorithms: Top-Down, Bottom-up parsing, Comparison of both approaches; Context Free Grammar; Transition Networks: Finite State Machine, Recursive Transition Network.
Chomsky Normal Form, CKY algorithm, The Earley Algorithm, dependency parsing;

Unit 5   **[12 L 15 M]**
Words and Morphology: Fundamental terminology of English Morphology, Minimum Edit Distance, Morphological Diversity of Indian Languages; Morphology Paradigms: inflectional, derivational morphology, Cliticization, Human Brain in Morphology, Construction of Finite State Lexicons, Finite State Transducers and Morphological Parsing; Lexicon Free FST: Porter Stemmer, Sentence Segmentation

Unit-6   **[8 L 10 M]**
N-Gram Models: Word Counting, Simple N-Gram model, Training Corpus, Information Theory, Cross Entropy, Sequence Classifier: Machine learning using Markov Chain, Hidden Markov Model, Verterbi Algorithm, Forward-Backward Model, Maximum Entropy Models.

Unit-7   **[7 L 10 M]**
Semantics and Meaning: Lexical Knowledge Networks, Thesaurus, Wordnet Theory; Indian Language Wordnets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; Word Similarity: Distributional Method, Term Vector Similarity, Application: Information Retrieval.

References:
1. James Allen,"Natural Language Understanding", 2nd Edition, 1995, ISBN: 9780805303346, Benjamin/Cummings Publishing Company.

2. Eugene Charniack,"Statistical Language Learning", 1st Edition, 1993, ISBN: 0262032163, MIT Press.
3. Dan Jurafsky, James H. Martin, "Speech And Language Processing", 2nd Edition, 2008, ISBN: 0131873210, Prentice Hall.
4. Christopher D. Manning, HinrichSchütze, "Foundations of Statistical Natural Language Processing", 2nd Edition, 1999, ISBN: 0262133601, MIT Press.
5. Aksharbharti, Vineetchaitanya, Rajeev Sangal, "Natural Language Processing: A Paninian Perspective", 1996, ISBN: 9788120309210, PHI Learning.

CS-402 Advance Network Programming

Unit-1. Network fundamentals   [M:20 ,L:10]
Project model IEEE 802, Network topologies Network infrastructure, Network Protocols UDP, TCP, Introduction to TCP/IP Architecture of the TCP/IP model.

Unit-2. Client server Programming and Application   [M:30, L:25]
The client server model and software design, the socket interface, concurrent processing in client-server software, program interface to protocol algorithms & issues in client Software design, example client software, algorithms & issues in server software design Iterative connectionless server, iterative connection oriented server, single process Concurrent server concurrent connection oriented server, multiprotocol server , multi-service server concurrency in client external data representation remote procedure call concept, RPCgenconcept.

Unit-3. Network Interface Layer   [M:20, L:15]
Overview of network interface layer media access control standards, mapping the Physical address to the IP address. Internet Layer: Purpose of the internet layer, classes of lpv4 addresses, basics of routing, IP datagram ICMP, IGMP Transport Layer Types of data transfer connection-less data transfer, connection-oriented data transfer

Unit-4. Mobile Ad-Hoc Network   [M:20, L:10]
Overview of Wireless Ad-Hoc Network- MANET and WSN, Routing in Ad-Hoc Network, Routing Protocols for Ad-Hoc Wireless Network (Proactive, Reactive and Hybrid) Clustering Protocols

References:

1. Douglas E. Corner, David Stevens, "Intranetworking with TCP/IP volume III Client Server Programming and Applications", 2nd Edition, 1994, ISBN: 8178084880, Prentice Hallof India.
2. Douglas E. Corner,David Stevens, "Internetworking with TCP/IP volume I, Principles protocols & Architecture", 3rd Edition, 2015, ISBN: 8131706230, PHI.
3. Douglas E. Corner, David Stevens,"Internetworking with TCP/IP volume II Design Implementation and internals", 3rd Edition, 2003, ISBN: 8120309278, Prentice Hall India Learning Private Limited.
4. TCP/IP Bible, 1st Ed., Scringer LaSalle, Parihar Gupta, Hungry Minds IDG Looks India (P) Ltd.
5. SudipMisra, Isaac Woungang, "Guide to Ad-hoc Network", 2009, ISBN: 9781848003286, Springer.

6. Stefano Basagni, Marco Conti, Silvia Giordano , Ivan Stojmenović , "Mobile Ad-Hoc Network", 2004, ISBN: 0471373133, Willy Publication.

CS-403: Data Warehousing & Mining

1. Data Warehousing for business analysis   **[L: 12 M: 18]**
Introduction to Data warehouse, Data warehousing Components – Mapping the Data Warehouseto a Multiprocessor Architecture –Introduction, Horizontal partitioning, Vertical Partitioning., DBMS Schemas for Decision Support : Multidimensional Data Model, Star Schema, STAR join and STAR index, Snowflake Schema, Straflake Schema, Metadata : Definition, Metadata Interchange, Initiative, Metadata Repository, Metadata Management, Data marts, Applications –Online Analytical Processing (OLAP) :Introduction to OLTP, OLAP, MOLAP, ROLAP, Difference between MOLAP &ROLAP, Decision support system, Operational versus Analytical Processing

2. Data Mining and Data Preprocessing   **[L: 08 M: 12]**

Data MiningConcepts and Functionalities - Classification of Data Mining Systems –Basic Data Mining
Task,Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration andTransformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

3. Association Rule Mining   **[L: 8 M: 12]**
Efficient and Scalable Frequent Item set Mining Methods, Mining Various Kinds of Association Rules, Association Mining to Correlation Analysis, Constraint-BasedAssociation Mining.

4. Classification and Prediction   **[L: 12 M: 18]**
Issues Regarding Classification and Prediction, Classification by Decision Tree Introduction, Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods, Model Section.

5. Cluster Analysis   **[L: 12 M: 18]**
Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods,Clustering High-Dimensional Data –Constraint-Based Cluster Analysis – Outlier Analysis.

6. Advanced Techniques   **[L: 8 M: 12]**
Spatial data mining: Spatial OLAP, Mining spatial association and co-location patterns, Text Mining, Web Mining – Mining web page layout structure, mining web link structures to identify authorative web pages, Introduction to Big data analysis (Concept only).

References:

1. Jiawei Han and MichelineKamber,"DataMining Concepts and Techniques", 2ndEdition, 2008, ISBN: 9380931913, Elsevier.
2. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics",1st Edition, 2006, ISBN: 8177587854, Pearson Education.
3. Ian H. Witten, EibeFrank, Mark A. Hall, Christopher J. Pal, "Data Mining: Practical Machine Learning Tools and Techniques", 4th Edition, 2011, ISBN: 9780128042915, Elsevier.
4. David Hand, HeikkiMannila and P. Smyth, "Principles of Data Mining", 1st Edition, 2004, ISBN: 8120324579, Prentice Hall of India.

CS404-Lab-VII: Lab on Network Programming and Data Mining

Part I: Lab course on Network Programming

Preferred Platform Linux C / Windows VC++, JAVA

1. Implement TCP and UDP Client-Server programs for following services:

   i)   Printing the Host ID, local port, also the client should indicate connection status

   ii) Echo Service

   iii) Day Time Service

   iv) Chargen Service

   v)   Mathematical Operation on numbers

   vi) Checking number for prime, palindrome etc.

   vii) Calculating factorial

   viii) Calculating Fibonacci series

   ix) Case conversion in given string

2. Implement Client-Server programs for demonstrating working of Concurrent Connection Oriented Servers using single process.

3. Implement Client-Server programs for demonstrating working of Concurrent Connection Oriented Servers using multiple processes.

4. Implement Telnet Server program for providing different types of Telnet Services.

5. Demonstrate and implement the file transfer using FTP.

6. Develop a simple web server capable of accepting request from standard client like IE, Netscape, Opera etc (use standard protocol HTTP).

Part II: Lab course on data mining

1. Demonstration of preprocessing on any sample data set with WEKA.

2. Demonstration of association rule process on data set using apriori algorithm.

3. Demonstration of classification rule process on data set using decision tree analysis (J48 algorithm).

4. Demonstration of clustering rule process on dataset using simple K-means.

5. Create your own data set using WEKA and cluster the data using K-means.

[Note: Use WEKA software for all above practical assignment.

       -For assignment no. 1 to 4 use sample database available in WEKA.

       -Web Reference: www.cs.waikato

CS-405-Mini Project

Mini project Guidelines

1. Project will be of 200 marks.

2. One project per student

3. Project title must be unique.

4. Duration of project completion will be full semester.

5. Project should be completed under the guidance of allocated guide by HOD.

6. All project work should be completed in the college laboratory under the supervisionof guide.

7. For project report the specifications are – Font size 12, Name – Times New Roman,Spacing

1.5 with header and footer.

8. Project report should be with spiral binding having maximum 90-100 pages only.

9. Project report should be submitted with two hard copies.

10. Evaluation of project will be done as per university rules.