

Department of Computer Sciences
NORTH MAHARASHTRA UNIVERSITY, JALGAON – 425 001

COURSE STRUCTURE WITH CREDIT

M.Sc. (Computer Science)

	Course	Marks	Hour/week	Credit	Total
Semester-I	CS-101	100	04	04	28
	CS-102	100	04	04	
	CS-103	100	04	04	
	CS-104	100	04	04	
	CS-105	100	04	04	
	CS LAB-I	100	06	04	
	CS LAB-II	100	06	04	
Semester-II	CS-201	100	04	04	29
	CS-202	100	04	04	
	CS-203	100	04	04	
	CS-204	100	04	04	
	CS-205	100	04	04	
	CS LAB-III	100	06	04	
	CS LAB-IV	100	06	04	
	Seminar	25	01	01	
Semester-III	CS-301	100	04	04	31
	CS-302	100	04	04	
	CS-303	100	04	04	
	CS-304	100	04	04	
	CS-305	100	04	04	
	CS LAB-V	100	06	04	
	CS LAB-VI	100	06	04	
	Softskill Development Course	75	02	03	
Semester-IV	Industrial Training/Project				12

NORTH MAHARASHTRA UNIVERSITY, JALGAON
Department of Computer Science

Proposed SYLLABUS for M. Sc. (Computer Science)
(With effect from June-2010)

Semester-I

CS-101 Advanced C++ Programming
CS-102 Automata Theory and Computability
CS-103 Machine Intelligence
CS-104 Advanced Operating Systems
CS-105 Network Programming
CS-Lab-I Lab on Advanced OS & Network Programming
CS-Lab-II Lab on C++ Programming and Machine Intelligence

Semester-II

CS-201 Advanced Java Programming
CS-202 Advanced DBMS
CS-203 Compiler Construction
CS-204 Design & Analysis of Algorithms
CS-205 Internet Computing
CS-206 Seminar
CS-Lab-III Lab on DAA and ADBMS
CS-Lab-IV Lab on Advanced JAVA Programming and Internet Computing

Semester-III

CS-301 Optimization Algorithms
CS-302 Data Warehousing & Mining
CS-303 Current Computing Trends
CS-304 Windows and Visual C++ Programming
CS-305 Software Engineering
CS-306 Soft Skills Development
CS-Lab-V Lab on Windows Programming and VC++
CS-Lab-VI Lab on Current Computing Trends

Semester- IV

CS-401 Full Time Industrial Training

Semester-I

CS-101 Advanced C++ Programming

- 1. Inheritance and Polymorphism:** [6]
Class Derivation, Access Control, Base Class Initialization, Initializing Class Type Members, Polymorphism and Virtual Functions, Pointer Conversion, Virtual Destructors, Abstract Classes and Pure Virtual Functions
- 2. Advanced Polymorphism and Inheritance:** [4]
Orthodox Canonical Form, Public, Private and Protected Inheritance, Composition vs. Inheritance, Templates vs. Inheritance, Interface Encapsulation
- 3. Exception Handling:** [6]
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
- 4. Runtime Type Information:** [4]
Runtime Type Information (RTTI) Mechanism, type_info Class and typeid Operator, Type Safe Pointer Conversion, New C++ Cast Syntax
- 5. Inheritance Hierarchies and Multiple Inheritance:** [6]
Smalltalk Style Class Hierarchies, Collection Classes in Object-Based Hierarchies, Independent Class Hierarchies in C++, Multiple Inheritance, Resolving Ambiguities, Duplicate Subobjects Virtual Base Classes, RTTI in Multiple Inheritance
- 6. Applications of C++ Concepts:** [4]
Object Validation, Smart Pointers, Reference Counting, Generic Smart Pointers
- 7. An Overview of Templates:** [6]
Templates, Overloading functions, Template functions, Specializing a template function, Disambiguation under specialization, Template classes, An array template class, Instantiating a template class object, Rules for templates, Non member function with a template argument Friends of template classes, Templates with multiple type parameters, Non type parameters for template classes, Comments regarding templates
- 8. Overview of the Standard Template Library:** [4]
Perspective, History and evolution, New features in C++, The Standard Template Library, Design goals, Header files, STL components, Containers, Algorithms, Iterators
- 9. Examples from STL:** [4]
Example: vectors, lists, Example: maps

Example: sets,
Example: multiset,
Example: find with a vector,
Example: find with a list,
Example: merge, Iterators, Function objects, Adaptors

10. STL Containers: [4]
Vector, Deque, List, The beauty of STL, Associative Containers, Set, Multiset, Map, Multimap

11. STL Iterators: [2]
Input iterators, Output iterators, Forward iterators, Backward iterators.

BOOKS:

1. C++ Programming 7Th Ed. Wiely Publications By Al Stevens
2. C++ how to program , Pearson Education By Paul J. Deitel, Harvey M. Deitel
3. Data structures with STL Prentice Hall PTR, By William H. Murray, Chris H. Pappas
4. The STL primer Prentice Hall PTR, By Graham Glass, Brett L. Schuchert

CS-102 Automata Theory and Computability

1. Introduction to Finite Automata: [10]

Alphabets and languages- Finite Representation of Languages. Deterministic Finite Automata – Non- deterministic Finite Automata – Equivalence of Deterministic and Non-Finite Automata – Properties of the Languages Accepted by Finite Automata – Finite Automata and Regular Expressions – Proofs those Languages Are and Are Not Regular.

2. Context free languages: [10]

Context –Free Grammar – Regular Languages and Context-Free Grammar – Pushdown Automata – Pushdown Automata and Context-Free Grammar – Properties of Context-Free Languages – Closure Properties – Periodicity Properties – Determinism and Parsing – Deterministic Pushdown Automata and Context – Free Languages – Top- down Parsing– Bottom – Up parsing.

3. Turing machines: [8]

The Definition of Turing Machine – Computing with Turing Machines –Combining Turing Machines – Some Examples of More Powerful Turing Machines.

4. Church’ Thesis : [8]

Church’s Thesis – The Primitive Recursive functions – Godelization – The m-Recursive Functions – Turing – Computability of the m-Recursive functions – Universal Turing Machines.

5. Uncomputability: [8]

The Halting Problem – Turing-Enumerability, Turing –Acceptability, and Turing - Decidability – Unsolved problems about Turing machines and m-Recursive Functions - Post’s correspondence problem.

6. Computational complexity: [6]

Time-bounded Turing Machines – Rate of Growth of functions – Time-Bounded simulations – The Classes P and NP – NP-Completeness –Some NP-complete Problems – Integer Programming – The Traveling Salesman Problem.

BOOKS:

1. Elements of The Theory Of Computation, Harry R Lewis, Cristos h. Papadimitriou, Pearson Education / Prentice-Hall of India Private Limited.
2. Introduction to Automata Theory, Languages, and Computation, Hopcroft. J.E and J.D.Ullman. Addison-Wesley, Reading, Mass. 1979.
3. The Theory of Computation, B. M. Moret, Pearson, 2009.

CS-103 Machine Intelligence

1. Introduction: [2]

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

2. Problems, Problem Spaces, and Search: [4]

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, Additional Problems.

3. Heuristic Search Techniques: [4]

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

4. Knowledge Representation: [2]

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

5. Using Predicate Logic: [8]

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

6. Weak Slot-and-Filler Structures: [3]

Semantic Nets, Frames.

7. Strong Slot-and Filler Structures: [4]

Conceptual Dependency, Scripts.

8. Introduction to Soft Computing: [4]

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

9. Genetic algorithms [6]

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning, Approach to Knowledge Acquisition.

10. Neural networks [7]

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

11. Fuzzy logic [7]

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

BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Tata McGrawHill.

2. Artificial Intelligence – A modern approach , Stuart Russel, Peter Norwig, Pearson Education.

CS-104 Advanced Operating Systems

1. Overview: [10]

General Overview of the System : History – System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel : Architecture of the UNIX operating system – Introduction to system concepts. The Buffer Cache: Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer – Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

2. File Subsystem: [10]

Internal representation of files: Inodes – Structure of a regular file – Directories – Conversion of a path name to an Inode – Super block – Inode assignment to a new file – Allocation of disk blocks.

4. System Calls for the File System: [10]

Open – Read – Write – File and record locking – Adjusting the position of file I/O – Lseek – Close – File creation – Creation of special files – Changing directory, root, owner, mode – stat and fstat – Pipes – Dup – Mounting and unmounting file systems – link – unlink.

4. Processes: [10]

Process states and transitions – Layout of system memory – The context of a process – Saving the context of a process – Manipulation of the process address space - Sleep. Process Control : 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.

5. Memory Management and I/O: [10]

Memory Management Policies: Swapping – Demand paging. The I/O Subsystem : Driver Interface – Disk Drivers – Terminal Drivers– Streams – Inter process communication.

BOOKS:

1. Maurice J. Bach, “The Design of the Unix Operating System”, Pearson Education.
2. B. Goodheart, J. Cox, “The Magic Garden Explained”, Prentice Hall of India.

3. S. J. Leffler, M. K. Mckusick, M. J. Karels and J. S. Quarterman., “The Design and Implementation of the 4.3 BSD Unix Operating System”, Addison Wesley.
4. J. Hart, Windows System Programming, Pearson Education, 2008.
5. A. Robbins, Linux Programming by Example: The Fundamentals, Pearson Education, 2008.

CS-105 Network Programming

1. Understanding Network fundamentals: [10]

What is network? Components of a Network, Types of networks configuration, Reference model, Types of area network, Project model IEEE 802, Network topologies Network infrastructure, Introduction to TCP/IP Architecture of the TCP/IP model.

2. Client server Programming and Application: [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, RPCgen concept, network file system (NFS) concepts DNS , TELNET DHCP, Electronic mail (822, SMTP, MIME), discussion on the topic “the feature of TCP/IP”.

3. Network Interface Layer: [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 ipv4 addresses, basics of routing, IP datagram ICMP, IGMP Transport Layer Types of data transfer connection-less data transfer, connection-oriented data transfer

BOOKS:

1. Douglas E. Comer, David Stevens, Internetworking with TCP/IP volume III Client Server Programming and Applications ISBN-81-7808-488-0 PHI.
2. Douglas E. Comer, Internetworking with TCP/IP volume I, Principles protocols & Architecture, (3rd edition), ISBN-81-203-1053-5, PHI.
3. Douglas E. Comer, David Stevens, Internetworking with TCP/IP volume II Design Implementation, and internals, (3rd edition), ISBN-81-203-0927-8, PHI.

4. Scringer LaSalle, Parihar Gupta TCP/IP Bible. (1st edition), Hungry Minds IDG Looks India (P) Ltd.

CS-Lab-I Lab on Advanced OS & Network Programming

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

Network Programming:

Preferred Platform Linux C/Windows

1. Implement TCP and UDP Client-Server programs for following services:
Printing the Host ID, local port, also the client should indicate connection status
Echo Service
Day Time Service
Chargen Service
Mathematical Operation on numbers
Checking number for prime, palindrome etc.
Calculating factorial
Calculating Fibonacci series
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 the Chat Client and Server program. The Server should be concurrent such as to provide intercommunication between multiple clients.
7. Develop a simple web server capable of accepting request from standard client like IE, Netscape, Opera etc (use standard protocol HTTP).

CS-Lab-II: Lab on Advanced C++ Programming and Machine Intelligence

The syllabus of this Practical Course (CS LAB-II: Lab on Advanced C++ Programming and Machine Intelligence) will be prepared before the beginning of the First Semester by the Instructor based on the content of CS-101 and CS-103 Theory courses.

Semester-II

CS-201 Advanced Java Programming

1. Java Basics Review: [8]

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

2. Distributed Computing: [10]

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

3. Java Beans and Swing: [12]

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

4. Java Enterprise Applications: [12]

JNI - Servlets - Java Server Pages - JDBC - Session beans - Entity beans - Programming and deploying enterprise Java Beans - Java transactions.

5. Related Java Techniques: [10]

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

BOOKS:

1. Deitel & Deitel , "Java How to program" , Prentice Hall.
2. Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", Sun Microsystems Press.
3. Stephen Asbury, Scott R. Weiner, Wiley, "Developing Java Enterprise Applications".
4. Object Oriented Programming with JAVA, Buyya, Selvi, Chu, TMH, 2010.

CS-202 Advanced DBMS

1. Parallel and Distributed Databases

[10]

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.

2. Object and Object Relational Databases

[10]

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

3. XML Databases

[10]

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

4. Mobile Databases

[10]

Mobile Databases: 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

5. Multimedia Databases

[10]

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

BOOKS:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.

4. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

CS-203: Compiler Construction

Chapter – 1: Introduction to Compilation

Compiler Basics, Issues in Compilation, Phases of Compilation: the Analysis – Synthesis Model, Compiler Construction Tools.

Chapter - 2: Designing a Lexical Analyzer

Role of Lexical Analysis, Input Buffering, Specification of Tokens, Recognition of Tokens, Finite automata, Conversion from regular expression to NFA, Deterministic finite automata, Conversion from NFA to DFA, Minimization of DFA, Creating Lexical Analyzer with LEX.

Chapter – 3: Designing Syntax Analyzer

Role of Syntax Analyzer, Classification of parsers, **Top-Down Parsing:** Introduction, Problems in top-down parsing, Recursive Parsing, Problems in Recursive Procedures, Predictive Parsing, Error Handling in Predictive Parsers, **Bottom Up Parsing:** Shift Reduce Parser, Actions of shift reduce parser, Construction of parse tree, Operator Precedence Parsing, Components of operator precedence parsers, Parsing action, Construction of operator precedence parsers, Error reporting and recovery in operator precedence Parsers, Advantages and disadvantages of operator precedence Parsing. LR Parsing: Simple LR parser, LR(1) parser, LALR parser.

Chapter – 4: Intermediate Code Generation

Need For Intermediate Code Generation, Intermediate Forms: Polish Notation, Quadruples, Triples, Indirect Triples & Bloks.

Chapter – 5: Code Optimization

Introduction, need for code optimization, Classification of code optimization techniques: Optimization techniques that work on machine code, Optimization techniques that work on intermediate forms of source code i.e. Optimization with in Basic Blocks: Folding, Redundant operation elimination, Optimization with in Loop: Strength Reduction, Dead code elimination, Moving operation within block out of block.

Chapter – 6: Symbol Table Organization

Introduction, Methods of organizing a symbol table: Unsorted, sorted symbol tables, binary search, hashing, its advantages, disadvantages, Collision, collision resolution techniques: Rehashing, Chaining.

BOOKS:

1. Aho A.V., R. Sethi and J.D. Ullman, "Compiler Principle, Techniques and Tools", Addison Wesley.
2. Barret, Couch, "Compiler Construction Theory and Practice", Computer Science series, Asian Student Edition.
3. Dhamdhare D.M, "Compiler Construction Principle and Practice", McMillan India.
4. Gres D., "Compiler Construction for Digital Computer", Wiley.
5. David Galles, Modern Compiler Design, Pearson Education, 2009.

CS-204: Design & Analysis of Algorithms

1. Introduction [8]

Euclid's algorithm, Problem, Instance, RAM model, RAM model 2, Asymptotic complexity, Some stylistic issues, Analysis of Algorithms, Principles of Algorithm Design, Finding Maximum and Minimum

2. Divide and conquer [8]

Introduction, Binary Search, Sorting, Median Finding

3. Dynamic Programming [10]

Combinatorial Search:

Dynamic programming 1: Knapsack

DP 2: Longest common subsequence

DP 3: Matrix chain multiplication or Optimal search trees

DP 4: A machine scheduling problem

4. Greedy Algorithms [10]

Introduction, Set of Intervals, Fractional Knapsack, Huffman Coding

5. NP-Completeness [14]

Matching , Introduction to NP-Complete, Search/Decision, SAT, Independent_Set 3VC, Exact Cover, Multi Set, Subset Sum & Partition, Hamiltonian Circuit

BOOKS:

1. Fundamentals of Computer Algorithms, Horowitz and Sahni, Galgothia publications.
2. Introduction to the design and analysis of Algorithms, Anany Levitin : Pearson Education,
3. Design and Analysis of Algorithms, P. Dave, H. Dave, Pearson Education, 2008.
4. Introduction to Algorithms, Cormen, Leiserson and Rivest : Prentice Hall of India.

CS-205: Internet Computing

The syllabus of this course (CS-205: Internet Computing) will be prepared before the beginning of the Second Semester by the committee by considering the market requirement, student's feedback and latest technological trends.

CS-206 Seminar

1. The seminar shall be conducted as per the following depending on the applicability of the subject - Every week there shall be a period for seminar wherein the students have to select the topic, carry out literature survey and prepare seminar report.
2. No grade will be given for the seminar. However, the completion of the credit for the seminar shall be compulsory.

CS-Lab-III: Lab on DAA and ADBMS

DAA:

1. Write a program for creating max./min. heap using
 - INSERT
 - ADJUST/HEAPIFY
2. Write a program to implement union and find operation.
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
 - Heap sort
 - Merge sort
 - 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 shortest path using single source shortest path.
9. Write a program to find shortest path using all pair path.
10. Write a program to implement breadth first and depth first traversal.

11. Write a program to implement topological sort.
- 12 Write a program to implement breadth first and depth first traversal.
13. Write a program to find all solutions for 8-queen problem using backtracking.

ADBMS:

1. Creating database tables and using data types.
 - Create table
 - Modify table
 - Drop table
2. Practical Based on Data Manipulation.
 - Adding data with Insert
 - Modify data with Update
 - Deleting records with Delete
3. Practical Based on Implementing the Constraints.
 - NULL and NOT NULL,
 - Primary Key Constraint
 - Foreign Key Constraint
 - Unique Constraint
 - Check Constraint
 - Default Constraint
4. Practical for Retrieving Data Using following clauses.
 - Simple select clause
 - Accessing specific data with Where
 - Ordered By
 - Distinct
 - Group By
5. Practical Based on Aggregate Functions.
 - AVG
 - COUNT
 - MAX
 - MIN,
 - SUM
 - CUBE
6. Practical Based on implementing all String functions.
7. Practical Based on implementing Date and Time functions.
8. Practical Based on implementing use of UNION, ITERSECTION, SET, DIFFERENCE.
9. Implement Nested Queries & all types of JOIN operation.
10. Practical Based on performing different operations on a view.
11. Practical Based on implementing use of Procedures.
12. Practical. Based on implementing use of Triggers

13. Make Database connectivity with front and tools like VB, VC++, D2K.

CS-Lab-IV: Lab on Advanced JAVA Programming & Internet Computing

The syllabus of this Practical Course (CS LAB-IV: Lab on Advanced JAVA Programming and Internet Computing) will be prepared before the beginning of the Second Semester by the Instructor based on the content of CS-201 and CS-205 Theory courses.

Semester-III

CS-301: Optimization Algorithms

1. **Overview of operations Research:** [2]
OR models – OR Techniques
2. **Linear Programming:** [8]
Introduction – Graphical solution; Graphical sensitivity analysis– The standard form of linear programming problems – Basic feasible solutions -unrestricted variables – simplex algorithm – artificial variables – Big M and two phase method – Degeneracy - alternative optima – unbounded solutions – infeasible solutions.
3. **Dual problems:** [8]
Relation between primal and dual problems – Dual simplex method
4. **Transportation model:** [8]
Starting solutions. North West corner Rule - lowest cost method–Vogels approximation method – Transportation algorithms –Assignment problem –Hungarian Method.
5. **Network Models :** [6]
Definitions – CPM and PERT – Their Algorithms Integer Programming : Branch and Bound Algorithms cutting plan algorithm.
6. **Dynamic Programming:** [6]
Recursive nature of dynamic programming – Forward and Backward Recursion
7. **Deterministic Inventory Models :** [6]
Static EOQ Models – Dynamic EOQ models.
8. **Game theory:** [6]
Two person Zero Sum Games – Mixed strategy games and their algorithms.

BOOKS:

1. Operations Research – An Introduction, Handy A Taha – Pearson Education.
[Chapter 1,2,3,4,5 and 6.1, 6.2, 6.7, 9,10, 11, 14]
2. Operations Research, Panneer Selvan, Prentice Hall of India.

CS-302: Data Warehousing & Mining

1. **Data Warehousing and Business Analysis:** [8]
Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.
2. **Data Mining:** [8]
Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.
[
3. **Association Rule Mining:** [8]
Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.
4. **Classification and Prediction:** [8]
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:** [9]
Types of Data in Cluster Analysis – A 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. **Mining Object, Spatial, Multimedia, Text and Web Data:** [9]
Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

BOOKS:

1. Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill

Edition, Tenth Reprint 2007.

3. K.P. Soman, Shyam Diwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.
6. P. Tan, M. Steinbach, V. Kumar, Introduction to Data Mining, Pearson Education, 2009.

CS-303: Current Computing Trends

The syllabus of this course (CS-303: Current Computing Trends) will be prepared before the beginning of the Third Semester by the committee by considering the market requirement, student’s feedback and latest technological trends.

CS-304: Windows and Visual C++ Programming

1. Windows Programming: [8]

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 – introduction to GDI – device context – basic drawing – child window controls.

2. Visual C++ Programming – Introduction: [10]

Application Framework – MFC library – Visual C++ Components – Event Handling – Mapping modes – colors – fonts – modal and modeless dialog – windows common controls – bitmaps.

3. The Document and View Architecture: [10]

Menus – Keyboard accelerators – rich edit control – toolbars – status bars – reusable frame window base class – separating document from its view – reading and writing SDI and MDI documents – splitter window and multiple views – creating DLLs – dialog based applications.

4. Active X and Object Linking and Embedding (OLE): [10]

ActiveX controls Vs. Ordinary Windows Controls – Installing ActiveX controls – Calendar Control – ActiveX control container programming – create ActiveX control at runtime –

Component Object Model (COM) – containment and aggregation Vs. inheritance – OLE drag and drop – OLE embedded component and containers – sample applications.

5. Advanced Concepts:

[12]

Database Management with Microsoft ODBC – Structured Query Language – MFC ODBC classes – sample database applications – filter and sort strings – DAO concepts – displaying database records in scrolling view – Threading – VC++ Networking issues – Winsock – WinInet – building a web client – Internet Information Server – ISAPI server extension – chat application – playing and multimedia (sound and video) files.

BOOKS:

1. Charles Petzold, “Windows Programming”, Microsoft press, 1996 (Unit I – Chapter 1-9)
2. David J.Kruglinski, George Shepherd and Scot Wingo, “Programming Visual C++”, Microsoft press, Fifth Ed., 2006 (Unit II – V)
3. Steve Holtzner, “Visual C++ 6 Programming”, Wiley Dreamtech India Pvt. Ltd., 2003.

CS-305 Software Engineering

1. Introduction:

[2]

What is Software Engineering.

2. Software Development Life-cycle:

[6]

Requirements analysis, software design, coding, testing, maintenance, etc.

3. Software Requirements Specification:

[6]

Waterfall model, prototyping, interactive enhancement, spiral model. Role of Management in software development. Role of metrics and measurement.

4. Software Requirement Specification:

[6]

Problem analysis, requirement specification, validation, metrics, monitoring and control.

5. System Design:

[6]

Problem partitioning, abstraction, top-down and bottom-up design, Structured approach. Functional versus object-oriented approach, design specification and verification metrics, monitoring and control.

6. Coding:

[6]

Top-down and bottom-up, structured programming, information hiding, programming style, and internal documentation. Verification, Metrics, monitoring and control.

7. Testing: [6]
Levels of testing functional testing, structural testing, test plane, test cases specification, reliability assessment.

8. Software Project Management: [6]
Cost estimation, Project scheduling, Staffing, Software configuration management, Quality assurance, Project Monitoring, Risk management, etc.

9. Web Engineering: [6]
The attribute of Web based application, The WebE Process, Framework for WebE Design and Testing for Web based application.

BOOKS:

1. Software Engineering : A Practitioner's Approach, Roger S Pressman 7th Edition McGraw Hill International Publication.
2. The Complete Reference : Web Design, Thomas A Powell. McGraw Hill International Publication.

CS-306 Soft Skills Development

1. **Communicative English** [4]
2. **Group Discussions** [4]
3. **How to prepare a good Resume?** [3]
4. **Analytical/Logical Skill Development** [8]
5. **Interview Techniques** [6]

(If the Resource Person is from the industry then he/she may decide the course content as the requirement).

No grade will be given for the Soft Skills Development course. However, the completion of the credit for the CS-306 course shall be compulsory.

BOOKS:

1. Cornerstone Developing Soft Skills, Fourth Ed., R. Sherfield, R. Montgomery, P. Moody, Pearson Education, 2010.

CS Lab-V Lab on Windows Programming and VC++

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. Double Clicking on existing rectangle should erase the rectangle.
3. Write a Window Program to display size of window and no. of left clicks; no. of right clicks and no. of double clicks. The data should be display at the center of the window. Size should be updated when user resizes the window object.
4. Write a Window Program to create filled rectangle and circle. on alternate left click. New figure should not erase the previous one. If user clicks inside any figure a mistake box is display.
5. Write a Window Program to create various brushes and change the background color to brushes on left mouse click.
6. Write a Window program to create a window object. Drag the left mouse buttons & display rectangle for which dragged line is a diagonal. Also demonstrate mouse capturing.
7. Write a window program to Move a ball horizontally inside the client area using timer. At each time lapse the ball should move left of the window and when it touches the left boundary of the window it should go to, the right of the window. and so on .
8. Write a window program to display the characters entered by user from the keyboard. [Consider only alphabets and numbers only.

MFC Programming:

1. Create a SDI application to display size of window & total number of Left clicks, right clicks and double clicks in the center of the client area.
2. Create a SDI application that displays a dialog box with two field's viz. User name, Password and two push buttons. The dialog box is invoked as the user starts the application. After user pressed on 'OIL' button display the contents of username and password in the client area& the, password should be in the farm of sequences Of *.
3. Create a SDI application, which invokes a dialog box from a menu option. The dialog box has three scroll bars called red scroll, blue scroll, green scroll and a multiline edit box. As the user scrolls through these scroll bars the background color of the edit box changes.
4. Create a SDI application that displays a dialog box with five fields: Name, Age (Spinner control.), Qualification it has three check boxes-for MCA. M.Sc., M.Sc.-IT, Radio buttons for Sex & drop down combo box for Designation. As the user fills this information in this dialog box & pressed the 'OK' button. The information is display on the client area. The dialog should be invoked through a Menu option.
5. Create A SDI Application that invokes a dialog box from a menu called Dialog. The dialog has a track bar slider control, progress bar control and spinner control. As the slides through slider control the progress bar and spinner control should set the status. Display the value of current position set in trace bar.

6. Create a SDI application and implement modeless dialog box; data of one dialog box should be display in another dialog box when ok button of first dialog is press.

Note: - Both dialogs should be visible at same time.

7. Create a SDI application to create a dialog box with Multi column list control & display the student information in different columns. Student information: name, seat no, and class, rank should be considered.

8. Demonstrate splitter window, take Form view and simple view. The data entered in form should be displayed in the sample view.

9. Create an SDI application that contains an edit box; two buttons viz. Add, Remove & a list box. Whenever user enters a string in the edit box & presses the Add button data should be added to the List box & remove the data if :

i). It is present in the list.

ii). Press remove button at runtime.

10. Write a Program that capture Home, Page Up, Page Down, End & all arrows keys as user presses these keys. Program should display appropriate message in the client window.

11. Write a Window Program to draw sine wave.

12. Create a SDI application and create a dialog box with Single Column list box & a tree control. List contains family name and tree control contains family, hierarchy. As the user selects a family name from list a particular family in the tree control.

13. Create SDI application to Demonstrate Bitmaps. Also change the background color and icon of your application

14. Create a SDI application. Create a access database with a single table of your choice. Fill at least five six records in it. Display the contents of table in the multi column list view.

15. Create a SDI application with the following menu options. Display the selected menu item in the client area. Menu item should have check marks on it when selected.

Cricket----- Football

One run -----Corner

Four run-----Goal

Sixer-----Penalty Kick

CS Lab-VI Lab on Current Computing Trends

The syllabus of this Practical Course (CS LAB-VI: Lab on Current Computing Trends) will be prepared before the beginning of the Third Semester by the Instructor based on the content of CS-303 Theory course.

Semester- IV

CS-401 Full Time Industrial Training

Twelve credits shall be awarded to the Industrial Training/Project course, which will commence in IV Semester and the final work and report will be completed at the end of IV Semester for M.Sc. (Computer Science). The marks and the credits will be allotted at the end of IV for M.Sc. (CS).