NORTH MAHARASHTRA UNIVERSITY, JALGAON – 425 001

School of Computer Sciences

M.C.A.

COURSE STRUCTURE WITH CREDIT

	Course	Marks	Hour/week	Credit	Total
Semester-I	CA-101	100	04	04	28
	CA-102	100	04	04	
	CA-103	100	04	04	
	CA-104	100	04	04	
	CA-105	100	04	04	
	CA LAB-I	100	06	04	
	CA LAB-II	100	06	04	
Semester-II	CA-201	100	04	04	31
	CA-202	100	04	04	
	CA-203	100	04	04	
	CA-204	100	04	04	
	CA-205	100	04	04	
	CA LAB-III	100	06	04	
	CA LAB-IV	100	06	04	
	CA-206 (Softskill Development Course)	75	02	03	
Semester-III	CA-301	100	04	04	28
	CA-302	100	04	04	
	CA-303	100	04	04	
	CA-304	100	04	04	
	CA-305	100	04	04	
	CA LAB-V	100	06	04	
	CA LAB-VI	100	06	04	

Semester-IV	CA-401	100	04	04	28
	CA-402	100	04	04	
	CA-403	100	04	04	
	CA-404	100	04	04	
	CA-405	100	04	04	
	CA LAB-VII	100	06	04	
	CA LAB-VIII	100	06	04	
Semester-V	CA-501	100	04	04	29
	CA-502	100	04	04	
	CA-503	100	04	04	
	CA-504	100	04	04	
	CA-505	100	04	04	
	CA LAB-IX	100	06	04	
	CA LAB-X	100	06	04	
	CA-506 (Seminar)	25	01	01	
Semester-VI	CA-601 (Industrial Training/Project)	300			12

NORTH MAHARASHTRA UNIVERSITY, JALGAON
School of Computer Sciences

Proposed SYLLABUS for Master of Computer Application (MCA)
(With Effect from June-2013)

Semester- I

CA-101 Computer Organization & Architecture
CA-102 Linux Operating System
CA-103 Discrete Mathematical Structures
CA-104 C++ Programming
CA-105 System Programming
CA-Lab-I Lab on C++ Programming
CA-Lab-II Lab on Linux Operating System

Semester- II

CA-201 Object Oriented Analysis and Design (OOAD)
CA-202 Data Structures and Algorithms
CA-203 Operating Systems
CA-204 Database Management System (DBMS)
CA-205 Computer Networks
CA-206 Soft Skills Development
CA-Lab-III Lab on Data Structures
CA-Lab-IV Lab on DBMS

Semester- III

CA-301 Accounting and Management Control
CA-302 Design and Analysis of Algorithms
CA-303 Automata Theory and Computability
CA-304 Artificial Intelligence
CA-305 Java Programming
CA-Lab-V Lab on Design and Analysis of Algorithm
CA-Lab-VI Lab on JAVA Programming

Semester-IV

CA-401 Cloud Computing
CA-402 Internet Computing
CA-403 Current Computing Trends-I
CA-404 Computer Graphics and Digital Image Processing
CA-405 Optimization Algorithms
CA-Lab-VII Lab on Computer Graphics and DIP
CA-Lab-VIII Lab on Internet Computing and Current Computing Trends-I

Semester –V

CA-501 Compiler Construction
CA-502 Software Engineering
CA-503 Natural Language Processing
CA-504 Programming with Windows Technologies
CA-505 Current Computing Trends-II
CA-506 Seminar
CA-Lab-IX Lab on Windows Technologies
CA-Lab-X Lab on Current Computing Trends-II & NLP

Semester-VI

CA-601 Full time Industrial Training

Semester- I
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CA-101: Computer Organization & Architecture

1. Digital Logic Circuits and Components: [6]
Digital Computers - Logic gates - Boolean Algebra - Map Simplifications. Combinational Circuits: Half-Adder, Full-Adder, decoders, Encoders, Multiplexers. Sequential Circuits: Flip flops, Registers, Shift Registers, Binary Counters - Memory Unit.

2. Data Representation : [4]
Data Types - Complements - Fixed Point Representation - Floating Point Representation - Other Binary Codes - Error detection Codes

3. Processor Organisation : [8]
General Register Organisation - ALU - Instruction codes - Instruction Formats - Stack Organisation - Addressing modes

4. Control Unit : [8]
Register transfer and micro operations, Timing and Control, Control Memory, micro programming, Hard wired control

5. 8085 Microprocessor : [8]
Internal Architecture, Instruction Set, Assembly Language programming

6. Input/Output Organisation : [8]
I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access.

7. Memory Organisation: [8]
Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory.

BOOKS:

1) Computer System Architecture , M. Morris Mano, Prentice Hall of India Pvt. Ltd., Eastern Economy Edition.

2) Microprocessor Architecture, Programming & Applications with the 8085, Ramesh S Goankar, Penram International Publishing (India) Pvt. Ltd.

3. Computer Systems Design and Architecture, V. Heuring, H. Jorden, T. Venkatesh, Pearson Education, Second Ed., 2009.

4) Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition.

CA-102: Linux Operating System

1.Overview: [6]

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.

2. The Buffer Cache [6]

Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer (algorithm: getblk) – Reading and writing disk blocks (algorithm: breada, bwrite)– Advantages and disadvantages of the buffer cache.

3.File Subsystem: [10]

Internal representation of files: Inodes – Structure of a regular file (algorithm: bmap)– Directories – Conversion of a path name to an Inode (algorithm: namei) – Super block – Inode assignment to a new file (algorithm: ialloc) – 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 (algorithm: mount, umount) – link – unlink.

5.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 (algorithm: 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- algorithm, scheduling parameters, examples of process scheduling, controlling process priorities, fair scheduler.

6. Memory Management and Inter process Communication: [8]

Memory Management Policies: Swapping – Demand paging. Inter process communication, System V IPC (Messages, Shared Memory, Semaphores), Network Communications, Sockets.

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.

CA-103 Discrete Mathematical Structures

1. **Mathematical reasoning** [12]
Mathematical reasoning; propositions; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; use in program proving; resolution principle; application to PROLOG.

2. **Set Theory** [10]
Paradoxes in set theory; inductive definition of sets and proof by induction; Peano postulates; Relations; representation of relations by graphs; properties of relations; equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets;

3. **Graph Theory** [8]
Elements of graph theory, Euler graph, Hamiltonian path, trees, tree traversals, spanning trees;

4. **Functions** [8]
Functions; mappings; injection and surjections; composition of functions; inverse functions; special functions; pigeonhole principle; recursive function theory;

5. **Groups, Rings, Fields** [6]
Definition and elementary properties of groups, semigroups, monoids, rings, fields, vector spaces and lattices;

6. **Combinatorics** [6]
Elementary combinatorics; counting techniques; recurrence relation; generating functions

Books

1. C. L. Liu, Elements of Discrete Mathematics, second edition 1985, McGraw-Hill Book Company.Reprinted 2000.

2. K. H. Rosen, Discrete Mathematics and applications, fifth edition 2003, Tata McGraw Hill publishing Company.

3. J .L. Mott, A. Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, second edition 1986, Prentice Hall of India.

4. W. K. Grassmann and J. P. Trembnlay, Logic and Discrete Mathematics, A Computer Science Percepctive, Prentice Hall Inc, 1996

CA-104: C++ Programming

1. Introduction: **[4]**
What is object-oriented programming? Why Do We Need Object-Oriented Programming characteristics of Object-Oriented Languages. C++ and C.

2. C++ Programming Basics: **[4]**
Output Using cout. Directives. Input With cin. Type bool. The setw Manipulator. Type Conversions.

3. Functions: **[4]**
Returning values From Factions. Reference Arguments, Overloaded Function, Inline Function. Default Arguments. Returning By Reference.

4. Object and Classes: **[6]**
Making sense of core object concepts (Encapsulation Abstraction, Polymorphism, Classes, Massages Association, Intercaces) Implementation of Class in C++, C++ Objects as Physical Object, C++ Object as Data Types Constructor. Object as Function Arguments. The Default Copy Constructor, Returning Object From Function. Structures and Classes. Classes Objects and Memory Static Class Data. Const Data.Const and Classes.

5. Arrays and String: **[4]**
Arrays Fundamentals. Arrays as Class Member Data. Arrays Of Object. String. The Standard C++ String Class.

6. Operator Overloading: **[4]**
Overloading Unary Operators. Overloading. Binary Operators. Data Conversion. Pitfalls of Operators Overloading and Conversion. Keywords Explicit and Mutable

7. Inheritance: **[6]**
Concept of Inheritance, Derived Class And Base Class, Derived Class Constructors, Overriding Member Function, Inheritance In The English Distance Class, Class Hierarchies, Inheritance And Graphics Shapes, Public And Private Inheritance, Levels Of Inheritance, Multiple Inheritance, Ambiguity In Multiply Inheritance, Aggregation: Classes Within Classes, Inheritance And program Development.

8. Pointer: **[4]**
Addresses And pointer, The Address-Of Operator &, Pointer And Arrays, Pointer And Faction, Pointer And C- Types String, Memory Management: New And Delete, Pointers To Objects, Debugging pointers.

9. Virtual Function: **[4]**
Virtual Function, Friend Function, Static Function, Assignment and Copy Initialization, This Pointer, Dynamic Type Information.

10. Streams and Files: **[4]**

Streams Classes. Stream Errors. Disk File I/O with Streams, File Pointers, ErrorHandling In File I/O File I/O With Member Function, Overloading the Extraction And Insertion Operators Memory As A Stream Object, Command line Arguments, and Printer Out put.

11. Templates And Exceptions: [4]

Function Templates, Class Templates Exceptions.

12. The Standard Template Library: [4]

Introduction Algorithms, Sequence Containers, Iteators, Specialized Iteators, Associative Containers, Storing User- Defined Object, Function Objects.

BOOKS:

1. Object Oriented Programming with ANSI and Turbo C++, A. N. Kamthane, Pearson Education, 2009.

2. Object Oriented Programming in-C++ By Robert Lafore Techmedia Publication.

3. The Complete Reference c- - By Herbert Sehlidt Tata Megraw-hill publication.

4. Object Oriented Programming in C++ Saurav Sahay Oxford University Press.

5. OOPS C++ Big C++ Cay Horstmann Wiley Publication

CA-105: System Programming

1. **Background:** [4]

   Introduction to grammars, languages, finite state machines.

2. **Introduction to Systems Programming:** [6]

   Introduction to Assembly Language Programming - Introduction to Instruction Formats, Data formats - Role of Base Register, Index Register.

3. **Assembler:** [10]

   Introduction to Assembler, databases used in assembler design, Design of Assembler - Single Pass & Double Pass.

4. **Macro Processor:** [10]

   Introduction to Macros, various types of Macros, Design of Macro Processor - Single Pass & Double Pass.

5. **Loaders:** [6]

   Introduction to Loaders, functions of a loader, types of Loaders, databases used in Loaders, Design of Loaders - Absolute & DLL.

6. **Compilers:**   **[10]**
   Introduction to compilers: a brief discussion on various phases of compilers. Applications of FSM and grammars in compiler design

7. **Software Tools:**   **[4]**
   Introduction to Software Tools, Text editors, Interpreters, Program Generators, Debug Monitors.

BOOKS:

1. Systems Programming, Donovan, Tata Mc Graw Hill

2. System Programming, Dhamdhere (IInd Revised Edition), Tata Mc Graw Hill

3. System Software, Leland. L. Beck, Pearson Education.

4. System Programming with C and Unix, Adam Hoover, Pearson Education, 2010

CA-Lab-I Lab on C++ Programming

1 Write a program to demonstrate encapsulation using of class
2 Write a program to demonstrate use of constructor, constructor overloading and destructor
3 Write a program to demonstrate use of array manipulations
4 Write a program to demonstrate use of string manipulations
5 Write a program to demonstrate use of function overloading
6 Write a program to demonstrate use of operator overloading
7 Write a program to demonstrate use of friend class
8 Write a program to demonstrate use of friend function
9 Write a program to demonstrate use of recursive function
10 Write a program to demonstrate use of array of objects
11 Write a program to demonstrate use of pointers
12 Write a program to demonstrate use of pointer arithmetic
13 Write a program to demonstrate use of operator overloading
14 Write a program to demonstrate use of all types of inheritance
15 Write a program to demonstrate use of function templates
16 Write a program to demonstrate use of class templates
17 Write a program to demonstrate use of formatted I/O operation
18 Write a program to demonstrate use of unformatted I/O operation

CA-Lab-II Lab on Linux Operating System

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

Semester- II

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CA-201: Object Oriented Analysis and Design (OOAD)

1. Introduction: **[8]**
An overview – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Metaclasses – Object oriented system development life cycle.

2. Methodology and UML: **[10]**
Introduction – Survey – Rumbugh, Booch, Jacobson methods – Patterns – Frameworks – Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Usecase diagrams – Dynamic modeling – Model organization – Extensibility.

3. Object Oriented Analysis: **[12]**
Identifying Usecase – Business object analysis – Usecase driven object oriented analysis – Usecase model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility

4. Object Oriented Design: **[12]**
Design process – Axions – Colollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface

5. Software Quality: **[8]**
Quality assurance – Testing strategies – Object orientation testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction testing

BOOKS:

1. Ali Bahrami, "Object Oriented System Development", McGraw Hill International Edition, 1999.

2. Booch, Jacobson, Rumbaugh, Object Oriented Analysis and Design with Applications, Third Ed., Pearson Education, 2010.

CA-202: Data Structures and Algorithms

1. Introduction to Data Structures:
[8] Abstract Data Types, Review of arrays and strings, structures and pointers concepts in C/C++, Recursion and its efficiency.

2. Linear Data Structures
[8]
Stacks: operations and applications (Infix, Postfix and prefix expression handling), Queues: operations and applications, Circular Queues: operations and applications, Concept of Double ended Queue and Priority Queue, Linked representation of stack and queue.

3. Linked Lists: [8]
Operations and Applications of Linear linked list, Circular linked list and Doubly linked list.

4. Trees: [9]
Binary Trees, Binary Tree: Representations, Operations (insert/delete), Traversal (inorder, preorder, postorder), Threaded Binary Tree.
Trees and their Applications, Search Trees: AVL Tree (single and double rotations), B-Trees

5. Graphs and Their Applications: [8]
Representation (Matrix/Adjacency) and Traversal (Depth First Search/Breadth First Search), Spanning Trees, Minimal Spanning Tree (Prim's and Kruskals's algorithm), Shortest Paths and All Pair Shortest Path, Dijkstra's, Floyd-Warshall Algorithms.

6. Hash Table, Searching and Sorting: [9]
Hash Table: Hash Function, Collision and its Resolution, Separate Chaining, Open Addressing (linear probing, quadratic probing, double hashing), Rehashing, Extendible Hashing **Searching:** Linear Search and Binary Search (array/binary tree). **Sorting:** General Background, Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Quicksort, Mergesort, Heapsort and Radix Sort.

BOOKS:

1. Data Structures using 'C' by Tenenbaum, Langsam, Augenstein. Pearson Education.
2. Data Structures Using 'C' by Bala Guruswamy, TMH
3. Data Structures Using 'C' by Mark Allen Weiss, Pearson Education
4. Fundamentals of Data Structures in C++, Horowitz, Sahni, Mehta, GALGOTIA Publication.

CA-203 Operating Systems

1. Introduction [4]
Introduction and history of Operating systems, structure and operations; processes and files;

2. Process management: [9]
Interprocess communication, process scheduling and algorithms, critical sections, threads, multithreading;

3. Memory Management [9]
Contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study;

4. Deadlock [6]
Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms, mutual exclusion, semaphores, wait and signal procedures;

5. Device Management [6]
Devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies;

6. File Management [8]
File concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication;

7. Case Studies-I [4]
UNIX and Linux operating systems as a case study;

8. Case Studies-II [4]
Case studies of Mobile OS.

Books:
1. A. Silberschatz & P.B. Galvin, 'Operating System Concepts and Principles', Wiley India, 8th ed., 2009.

2. A. Tanenbaum, 'Modern Operating Systems', Prentice Hall India, 2003.

3. W. Stallings, 'Operating Systems: Internals and design Principles', Pearson Ed., LPE, 6th Ed., 2009.

4. M.J. Bach, 'Design of Unix Operating system', Prentice Hall, 1986.

CA-204 Database Management System (DBMS)

1. Introductory Concepts   [4]

Databases and Information Systems, Database Types, An example usage context, Database system concepts and architecture.

2. Semantic Database Design   [4]

High-level conceptual modeling, ER Modeling concepts, ER Diagrams, Cardinality constraints, Higher-order relationships, Enhanced ER Model (EER), Weak-entity types, Subclasses and inheritance, Specialization and Generalization, Modeling of UNION types using categories

3. Relational Model, Languages and Systems   [8]

Relational algebra: Relational model concepts, Relational integrity constraints, Update operations on relations, Relational algebra model, ER to relational mapping

SQL: Data definition in SQL, Queries and update statements, Views, Integrity constraints, Specifying indexes, Embedded SQL.

IBM DB2 case study: Architecture of DB2, Data definition and manipulation in DB2.

EER to Relational mapping.

4. Database design using the relational model   [6]

Functional dependencies: Keys in a relational model, Concept of functional dependencies, Normal forms based on primary keys, Boyce-Codd Normal Forms Further Dependencies: Multi-values dependencies and fourth normal form, Join dependencies and fifth normal form, Inclusion dependencies, other dependencies and normal forms

5. Storage and Indexing Structures   [6]

Storage structures: Secondary storage devices, Buffering of blocks, File Organization, Heaps, Sorted Files, Hashing and overflow handling techniques, Dynamic hashing, Extensible hashing, Other file organizations

Indexing methods: Basic terminology, Primary indexes, Clustering index, Secondary index, Multilevel indexes, ISAM, B-trees, B+ trees, inserting and searching algorithms for B+ trees, Other indexing methods.

6. Transaction Processing and Concurrency Control   [8]

Transaction Fundamentals: OLTP environments, Concurrency issues, need for transactions, Necessary properties of transactions (ACID properties), Transaction states, serializability, Serial

schedules, Conflict serializability, View serializability, Recoverable and non-recoverable schedules, Cascading rollbacks, Cascadeless schedules.

Concurrency control: Serialized and non-serialized schedules, Testing for serializability, Locking, Lock compatibility matrix, Locking and serializability, Deadlocks and starvation, Two-phase locking (2PL) protocol, Conservative, strict and rigorous 2PL, 2PL with lock conversions, Timestamp-ordering based protocol, Multi-versioning protocol, Multi-granularity locking, Deadlock prevention protocols, Wait-die and wound-wait schemes, Time-out based schemes, Deadlock recovery, Nested transactions.

7. Database recovery techniques   [4]

Recovery concepts, Deferred updates technique, Immediate update technique, Shadow paging, ARIES recovery algorithm.

8. Query Processing and Optimization   [4]

Translating SQL into relational algebra, Basic query operations, Heuristics in query optimization, Selectivity and cost estimates in query optimization, Semantic query optimization

9. Database Security and Authorization   [2]

Discretionary access control, Mandatory access control and multi-level security, Statistical database security

10. Distributed databases and issues   [4]

Data fragmentation, replication and allocation in distributed databases, Types of distributed database systems Query processing in distributed databases, Concurrency control and recovery in distributed databases.

BOOKS:
1. Elmasri, Navathe. Fundamentals of Database Systems (Third Edition), Pearson Education, 2004.

2. Principles of Database Systems, J. Ullman, GALGOTIA Publications, 2010.

3. S. K. Singh, Database Systems: Concepts, Design and Applications, Pearson Education, 2006.

4. Henry Korth, A. Silberschatz, S.Sudharshan, Database Systems Concepts, Mc GRAW Hill Int. Ed. 2006

CA-205: Computer Networks

1. Introduction: [6]
Network Hardware, Network Software, Preference Models, Network Standardization.

2. Physical Layer: [10]
Theoretical basis for data communication,
Guided Transmission Media, Wireless transmission, .

3. Data Link Layer: [10]
Design issues, Error detection and Correction: Type of errors, detection and correction of errors.
Data Link Control & Protocol: Flow & error control, Stop-And-Wait ARQ, Go-Back-N ARQ,
Select Repeat ARQ, HDLC..

4. The Medium Access Sublayer

Channel Allocation Problem, Multiple Access Protocols, Ethernet (Cabling, Encoding), Wireless
LANs, Bluetooth Architecture, Bluetooth Applications , Data link layer switching: repeaters,
hubs, bridges, switches, routers, gateways.

5. Network Layer: [10]
Design issues, Routing algorithms, Congestion control algorithms, quality of service.

6. Transport Layer: [6]
Transport Service, Elements of Transport protocols.

7. Application Layer: [6]
DNS, Electronic mail, WWW.

BOOKS:

1. Computer Networks, A. S. Tanenbaum, Pearson Education.(Fourth Edition)
2. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata
   McGraw-Hill Publishing Co.

CA-206 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 CA-506 course shall be compulsory.

BOOKS:

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

CA-Lab-III Lab on Data Structures

Implementation of application programs based on the following:
- Arrays
- Records, Structure
- Pointers
- Multidimensional Arrays, Matrices,
- Stacks, Polish Notation
- Queues
- Deques
- Linear Linked List, Circular Linked List, Doubly Linked List

Implementation of programs based on Trees
- Binary Search Tree
- In-order, Pre-order and Post-order Traversals
- Heap Tree
- Balanced Binary Tree (AVL)
- B-Trees

Implementation of programs based on Graphs
- Depth First Traversal
- Breadth First Traversal

- Obtaining Shortest Path (Dijstra and Floyd-Warshall)
- Minimum spanning tree (Kruskal and Prim)

Implementation of programs for Hash Table, Searching and Sorting techniques
- Hash Table
- Linear and Binary Search (array)
- Bubble sort
- Selection sort
- Insertion sort
- Radix sort
- Quick sort
- Merge sort
- Heap sort

CA-Lab-IV Lab on DBMS

DBMS lab

Course Description: This course explores database programming using both native and embedded ANSI-standard Structured Query Language (SQL). Topics include enterprise database management systems, database middleware, data definition language, data manipulation language, data control language, database queries reporting, query optimization, and database views. Student assignments include database creation, query design and programming, and database manipulation via embedded SQL calls from a programming language.

Representative List:

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 recrds 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, INTERSECTION, 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. Practical Based on implementing Cursor.
14. Make a Database connectivity with front end tools like – VB, VC++,D2K.
15. Practical based on creating Data Reports.
16. Design entity relationship models for a business problem and develop a normalized database structure

Semester- III

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CA-301 Accounting and Management Control

1. **Accounting:** **[14]**
Principles, concepts and conventions, double entry systems of accounting, introduction to basic books of accounts of sole proprietary concern, closing of books of accounts and preparation of trial balance. Final accounts, training, Profit and Loss accounts and balance sheet of sole proprietary concern (without adjustment).

2. **Financial management:** **[12]**
Meaning, scope and role, a brief study of functional areas of financial management. Introduction to various FM tools: ratio analysis, fund flow statement, cash flow statement.

3. **Costing:** **[12]**
Importance and basic principles, a brief introduction to methods of costing and elements of cost. Marginal costing, nature, scope and importance, Break-even analysis, its use and limitations, construction of break even chart. Standard costing, nature and scope, computation and analysis of variances with reference to material cost, labour cost and overhead cost, interpretation of the variances.

4. **Introduction to Management Control System:** **[12]**
Goals, strategies, key variables, performance measures, responsibility centers and transfer price, investment center, reporting systems, management by objectives, budgeting and control, strategic and long range planning.

BOOKS:

1. Chandwick, The Essence of Financial Accounting, Prentice Hall of India Pvt. Ltd, New Delhi.

2. Bhattacharya S.K. and Dearden John, Accounting for Management, Prentice Hall of India Pvt. Ltd, New Delhi.

3. Welch, Hilton and Gordon, Budgeting Profit Planning Control, Prentice Hall of India Pvt. Ltd, New Delhi.

4. Homgren, Sundem and Selto, Introduction to Management Accounting, Prentice Hall of India Pvt. Ltd, New Delhi.

CA-302 Design and Analysis of Algorithms

1. Introduction [10]

Euclid's algorithm, Problem, Instance, RAM model, RAM model 2, Asymptotic complexity, Some stylistic issues, Analysis of Algorithms, Principles of Algorithm Design, Heaps and Heap Sort(Insert, Adjust), Set Union and Find, Finding Maximum and Minimum

2. Divide and conquer [8]

Introduction, Binary Search, Maxmin, Sorting(merge,quick), matrix multiplication

3. Greedy Algorithms [08]

Introduction, single source shortest path, Fractional Knapsack, Huffman Coding , Set of Intervals.

4. Dynamic Programming [08]

Dynamic programming 1: All pair shortest path
DP 2: Knapsack(0/1)
DP 3: Matrix chain multiplication
DP 4: Longest common subsequence
DP 5:A machine scheduling problem

5. Backtracking [06]

Backtracking, constraints, recursive backtrack, queen problem.

6. NP-Completeness [10]

Non deterministic algorithms, searching, sorting, Matching ,P Vs NP, Introduction to NP completeness, Reduction,SAT, CLIQUE,.

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

CA-303: Automata Theory and Computability

1. Finite Automata: **[12]**
Sets, relations, functions, graphs, trees, mathematical induction, Finite Automata(FA), definition, description, transition systems, acceptability of a string, NFA, DFA, equivalence of DFA and NFA, Melay Moore model, minimization of automaton, Applications.

2. Formal Languages: **[04]**
Formal languages, Chomsky classification of languages, languages, their relation and automaton.

3. Regular Expressions: **[14]**
Regular expressions, FA and regular expressions, pumping lemma for regular sets, applications of pumping lemma, closure properties of regular sets, regular sets and regular grammars.

4. Context Free Languages: **[10]**
CFLs and derivation trees, ambiguity in Context-Free Grammars (CFGs), simplification of CFGs, Normal Forms for CFGs(CNF and GNF), pumping lemma for CFLs, decision algorithms for CFLs.

5. Push Down Automata: **[6]**
Pushdown Automaton (PDA), informal description, basic definitions, acceptance by a PDA, PDA and CFLs.

6. Turing Machine: **[6]**
Turing Machine, Model, computable languages and function, representation of TMs, Language Acceptability by TMs, Design of TM, Halting Problem of TMs.

BOOKS:

1. Theory of Automata and Formal Languages, Smita Rajpal, GALGOTIA Publications.
2. J.E.Hopcraft, R. Motwani and J.D.Ullman, Introduction to Automata Theory languages & Computation, Pearson Education Asia.
3. K.L.P.Mishra, N. Chandrashekharan, Theory of Computer Science, PHI.
4. Martin John C., Introduction to Language & Theory of computation(TMH).

CA-304: Artificial Intelligence

1. Introduction: [6]
What is Artificial Intelligence?, The AI Problems,The Underlying Assumption, What is an AI Technique, The Level of the Model, Criteria for Success, Some General References, One Final Word.

2. Problems, Problem Spaces, and Search: [6]
Defining the Problem as a State Space Search, Production systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs, Additional Problems.

3. Heuristic Search Techniques: [6]
Generate-and- Test, Hill Climbing, Best-First Search, A*, AO*, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

4. Knowledge Representation: [4]
Knowledge Representation Issues, Representations and Mappings, Approaches to knowledge Representation,Issues in Knowledge Representation, The Frame Problem.

5. Using Predicate Logic: [6]
Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

6. Representing Knowledge Using Rules: [4]
Procedural Versus Declarative knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

7. Statistical Reasoning: [10]
Probability and Baye's Theorem, CertaintyFactors and Rule-Based Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic.

8. Weak Slot-and-Filler Structures: [4]
Semantic Nets, Frames.

9. Strong Slot-and Filler Structures: [4]
Conceptual Dependency, Scripts, CYC.

BOOKS:
1. Artificial Intelligence, Elaine Rich, Kevin Knight, Tata McGraw Hill.

2. Artificial Intelligence – A Modern Approach, Stuart Russel, Peter Norwig, Pearosn Education.

CA-305 Java Programming

1. An Introduction to Java: [4]

Java As a Programming Platform,The Java "White Paper" Buzzwords,Java Applets and the Internet, A Simple Java Program,Comments,Data Types,Variables,Operators,Strings,Input and Output Control Flow

2.Objects and Classes: [6]

Introduction to Object-Oriented Programming, Using Predefined Classes, Defining Your Own Classes, Static Fields and Methods, Method Parameters, Object Construction, Packages

3.Inheritance, Interfaces and Inner Classes: [6]

Classes, Superclasses, and Subclasses, Object: The Cosmic Superclass, Generic Array Lists, Object Wrappers and Autoboxing, Methods with a Variable Number of Parameters, Enumeration Classes, Reflection, Interfaces, Object Cloning, Interfaces and Callbacks, Inner Classes, Proxies.

4.Graphics Programming: [6]

Introducing Swing, Creating a Frame, Positioning a Frame, Displaying Information in a Component, Working with 2D Shapes, Color, Special Fonts for Text, Displaying Images.

5.Event Handling and User Interface Components with Swing: [6]

Basics of Event Handling, Actions, Mouse Events, The AWT Event Hierarchy, Swing and the Model-View-Controller Design Pattern, Introduction to Layout Management, Text Input Choice Components, Menus, Sophisticated Layout Management, Dialog Boxes

6.Deploying Applications and Applets: [6]

JAR Files, Java Web Start, Applets, Storage of Application Preferences

7.Exceptions, Logging and Assertions: [4]

Dealing with Errors, Catching Exceptions, Tips for Using Exceptions, Using Assertions Logging

8.Multithreading [4]

What Are Threads?, Interrupting Threads, Thread States, Thread Properties, Synchronization, Blocking Queues, Thread-Safe Collections, Callables and Futures, Executors, Synchronizers, Threads and Swing

9.Streams, Files and JDBC [4]

Streams, Text Input and Output, Reading and Writing Binary Data, ZIP Archives, Object Streams and Serialization, File Management, New I/O Regular Expressions
The Design of JDBC, JDBC Configuration, Executing SQL Statements , Query Execution Scrollable and Updatable Result Sets, Row Sets, Metadata, Transactions

BOOKS:

1. Horstman Cay, Cornell Gary, Core Java^{TM}2, Vol.1&2, Seventh Edition, Pearson education.
2. Herbert Schildt, The Complete Reference, Seventh Edition, Tata McGraw-Hill.
3. Steven Holzner, JAVA 2 Programming Black Book, Wiley India.
4. Ivor Horton, Beginning Java 2, JDK 5 Ed, Wiley India.

CA-Lab-V Lab on Design and Analysis of Algorithm

1. Write a program to implement removal of recursion for
   - Finding maximum from array
   - Binomial coefficient B(n,m)= B(n-1, m-1)+B(n-1,m), B(n,n)=B(n,0)=1
   - Searching element from array
2. 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 find longest common subsequence.
11. Write a program to implement breadth first and depth first search.
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.

CA-Lab-VI Lab on JAVA Programming

1. Write a program that demonstrate program structure of java.
2. Write a program that demonstrate string operations.
3. Write a program that demonstrate package creation and use in program.
4. Write a program that demonstrate inner class.
5. Write a program that demonstrate inheritance.
6. Write a program that demonstrate 2D shapes on frames.
7. Write a program that demonstrate text and fonts.
8. Write a program that demonstrate event handling for various types of events.
9. Write a program to illustrate multicasting.
10. Write a program to illustrate use of various swing components.
11. Write a program that demonstrate use of dialog box.
12. Write a program to create own dialog box.
13. Write a program to create toolbar, menu & popup menu.
14. Write a program to implement file handlings.
15. Write a program that demonstrate Applet programming.
16. Write a program to implement generic programming.
17. Write a program that demonstrate JDBC on applet/application.
18. Write a program that demonstrate multithreading.

Semester- IV

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CA-401 Cloud Computing

Unit 1: Introduction to Cloud Computing [8]
Roots of Cloud Computing, Layers and Types of Clouds, Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, and Challenges and Opportunities.

Unit 2: Virtualization and Resource Provisioning in Clouds [8]
Introduction and Inspiration, Virtual Machines (VM), VM Provisioning and Manageability, VM Migration Services, VM Provisioning in the Cloud Context, and Future Research Directions.

Unit 3: Cloud Computing Architecture [10]
Cloud Benefits and Challenges, Market-Oriented Cloud Architecture, SLA-oriented Resource Allocation, Global Cloud Exchange; Emerging Cloud Platforms, Federation of Clouds

Unit 4: Programming Enterprise Clouds using Aneka [12]
Introduction, Aneka Architecture, Aneka Deployment, Parallel Programming Models, Thread Programming using Aneka, Task Programming using Aneka, and MapReduce Programming using Aneka, Parallel Algorithms, Parallel Data mining, Parallel Mandelbrot, and Image Processing.

Unit 5: Advanced Topics and Cloud Applications [12]
Integration of Private and Public Clouds, Cloud Best Practices, GrepTheWeb on Amazon Cloud, ECG Data Analysis on Cloud using Aneka, Hosting Massively Multiplayer Games on Cloud, and Content Delivery Networks Using Clouds, and Hosting Twitter and Facebook on Cloud.

Books:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud Computing, Tata McGraw Hill, New Delhi, India, 2013.

2. Cloud Computing: Principles and Paradigms Rajkumar Buyya, James Broberg , Andrzej M. Goscinski, ISBN: 978-0-470-88799-8, Wiley India Publication.

3. Cloud Computing, A Practical Approach Toby Velte, Anthony Velte, Robert Elsenpeter ISBN 0071626948 / 9780071626941 Tata McGraw Hill Publication.

4. Cloud Computing bible, Barrie Sosinsky, Wiley India Pvt Ltd (2011)

CA-402 : Internet Computing

Unit I   **[12]**

Desktop Computing vs. Internet Computing, Internet computing infrastructure, Client side scripting vs. Server Side Scripting technologies, Web Server basics and configuration: IIS, Apache etc., Web site hosting basics, Web Publishing, HTML, introduction to .NET framework, .NET technologies, languages:C#,VB.NET, basics of ASP.NET page framework, Visual studio .NET IDE, Page Life Cycle, PostBack, Viewstate, Page directives, ASP.Net page execution cycle, HTTP Pipeline, HTTP Application, HTTP Request, HTTP Response classes, HTTP Modules and HTTP Handlers, State Management, Role of *Global.asax*, Application configuration using *web.config* file.

Unit II   **[20]**

ASP.NET Control hierarchy, HTML Server Controls, Web Server Controls, User and Server controls, Validation Controls, List bound controls:dropdown lists, list boxes, Repeater, DataList, Data Grid, DataGridView controls, Data binding to List Bound Controls, Templating and Styling of ASP.NET server controls, Anatomy of Master Pages.

Unit III   **[10]**

Web Page Designing principles, CSS anatomy, Anatomy of Master Pages, nesting master pages, Site map file, Web site Navigation controls, properties:TreeView, Sitemap Path, Menu, Personalization through Profiles, Themes/Skins, Web Site security basics: authentication modes:Windows,Forms,passport, authorization, roles/Membership, access rules, login controls.

Unit IV   **[8]**

Database technology: ADO.NET, Anatomy/architecture of ADO.NET, working with Connection, Command, Data Adaptor, DataReader, DataSet, DataTable objects, Editing data in Data Tables, concurrency control.

Books:

1. Professional ASP.NET 1.0, Richard Anderson, Brian Francis, Alex Homer, Rob Howard, David Sussman, Karli Watson ISBN 1-861007-0-3-5.

2. Beginning ASP.NET 2.0, Chris Hart, John Kauffman, Dave Sussman, and Chris Ullman, Wiley Publishing, Inc. ISBN-13: 978-0-7645-8850-1, ISBN-10: 0-7645-8850-8.

3. Beginning ASP.NE T 4: in C# and VB, Imar Spaanjaars, Wiley Publishing, Inc 2010., ISBN: 978-0-470-50221-1

4. Professional Asp .Net 3.5 in C# and VB by Bill Evjen, Scott Hanselman, Devin Rader, by Wiley Publishing Inc. ISBN:978-0-470-18757-9.

5. Programming Microsoft ASP.NET 3.5, Dino Esposito, Microsoft Press, 2008.

CA-403 Current Computing Trends-I

The syllabus of this course (CA-403: Current Computing Trends-I) will be prepared before the beginning of the Fifth Semester by the committee by considering the market requirement, student's feedback and latest technological trends.

CA-404 Computer Graphics and Digital Image Processing

1. Introduction to Computer Graphics: [4]

Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays.

2. Scan conversion – lines, circles and Ellipses; Filling polygons and clipping algorithms: [6]

Scan Converting Lines, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Scan Converting Ellipses, Filling Polygons, edge data structure, Clipping Lines algorithms– Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components.

3. Two-Dimensional Transformations: [6]

Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations.

4. Three-Dimensional Transformations: [10]

Introduction, Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotation, Three-Dimensional Reflection, Three-Dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections. Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid.

5. Plane Curves and Surfaces: **[4]**

Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola, A Procedure for using Conic Sections, The General Conic Equation; Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces.

6. Visible-Surface Determination: **[6]**

Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.

7. Fractal Geometry **[4]**

Fractal generation procedure, Classification of Fractal, Fractal dimension, Fractal construction methods.

8. Introduction to Digital Image Processing & Applications **[4]**
What is an Image? Digital Image Processing. Examples of Use of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

9. Basic Relationship Between Pixels & Sampling and Quantization **[6]**

Elements of Visual Perception. Image Sensing and Acquisition. Image Sampling and Quantization. Some Basic Relationships Between Pixels. Linear and Nonlinear Operations. Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.

BOOKS:

1. J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Second Edition in C, Pearson Education.

2. D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition.
3. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition.
4. F. S. Hill Jr., Computer Graphics using OpenGL, Pearson Education.
5. Gonzalez & Woods, Digital Image Processing, Pearson Education, Second edition.
6. Gonzalez & Woods, Digital Image Processing using MATLAB, Pearson Education

CA-405 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

6. Integer Programming: **[6]**

Branch and Bound Algorithms cutting plan algorithm, Dynamic Programming, 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.
2. Operations Research, Panneer Selvan, Prentice Hall of India

CA-Lab-VII Lab on Computer Graphics and DIP

1. Line drawing algorithm
2. Circle drawing algorithm
3. Ellipse drawing algorithm
4. Polygon filling algorithm
5. Windowing and clipping algorithm (Point, line and polygon clipping)
6. Composite 2-D transformation, (rotation, scaling & reflection)
7. 3-D geometric transformation (rotation, scaling & reflection)
8. 3-D Curve and surface representation i.e. B-spline curves and Surfaces, polynomial curves and surfaces, Bezier curves and Surfaces.
9. Determination of visible surfaces and lines.
10. Display of Grayscale Images, Color images.
11. Conversion between color spaces.
12. Histogram Equalization.
13. Non-linear Filtering.
14. 2-D DFT and DCT.
15. Filtering in frequency domain.
16. DWT of images.
17. Morphological operation
18. Edge detection using Operators and edge linking
19. Segmentation using thresholding, region based, watersheding .

CA-Lab-VIII Lab on Internet Computing and Current Computing Trends-I

Internet Computing:

1. Demonstrate followings in IIS:
2. Creation of Virtual Directory, Home directory, Home page, hosting of website
3. Demonstrate Page Life Cycle of ASP.NET. Use important page events for your demonstration.
4. Write VB.Net/C# console applications to demonstrate: OO concepts: polymorphism, encapsulation, inheritance, interface inheritance, abstract classes/methods, overloading, overriding, collection classes, properties
5. Demonstrate concept of postback and viewstate using web form server controls of ASP.NET
6. Demonstrate various Web form server controls using sample data entry screen form for registering for a service on website. Also use validation controls to validate input data.
7. Demonstrate DropDown List box, CheckButtonList, RadioButtonList controls.
8. Demonstrate Databinding using Hashtable, ArrayList, DataTable data sources.
9. Demonstrate Repeater control with the help of various templates.
10. Demonstrate paging, sorting,filtering of data in asp:DataGrid/DataGridView.
11. Demonstrate editing process in DataGrid and DataList controls. Make use of necessary templates for proper visual appearance.
12. Demonstrate State Management features of ASP.NET using sample shopping cart application.
13. Create sample website for demonstrating use of Profiles/Themes using skin files.
14. Demonstrate Master Pages and website navigation controls(sitemap path, treeview, menu) using SiteMap file.
15. Demonstrate Properties of website navigation controls.

16. Demonstrate Authorization/Authentication using Roles/Membership
17. Demonstrate creation of simple/complex DataReader/DataSet Objects.
18. Demosntrate editing in DataTable objects.

Current Computing Trends-I

   The syllabus of this Practical Course (CA LAB-X: Lab on Current Computing Trends) will be prepared before the beginning of the fourth Semester by the Instructors based on the content of CA-403 Theory courses.

Semester- V

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CA-501: 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. Dhamdhere 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.

CA-502 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.

CA-503 Natural Language Processing

Unit-I [10]

Introduction to NLP, Brief History, Applications: Speech to text, story understanding, QA system, Machine Translation, Text summarization, text classification, sentiment analysis, chatterbox, challenges/Open Problems, Natural Language (NL) Characteristics and NL computing techniques, NL tasks: Segmentation, Chunking, tagging, NER, Parsing, Word Sense Disambiguation, NL Generation, **Web 2.0 Applications** : Sentiment Analysis; Text Entailment; Cross Lingual Information Retrieval (CLIR).

Unit-II [05]

ML basics, algorithms, Naïve Bayes, Bayesian Statistics, HMM, CRF

Unit-III [15]

Word Forms, **POS tagging and Chunking**: Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields, POS tagging techniques, Chunking techniques:CRF.

Unit-IV [10]

Structures : Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; dependency parsing; Hybrid of Rule Based and Probabilistic Parsing: MST, MALT parser; Scope Ambiguity and Attachment Ambiguity resolution.

Unit-V [10]

Meaning : Lexical Knowledge Networks, Wordnet Theory; Indian Language Wordnets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multilinguality; Metaphors; Coreferences.

Books*:*
1. Allen, James, "Natural Language Understanding", Second Edition, Benjamin/Cumming, 1995.
2. Charniack, Eugene, "Statistical Language Learning", MIT Press, 1993.
3. Jurafsky, Dan and Martin, James, "Speech and Language Processing", Second Edition, Prentice Hall, 2008.
4. Manning, Christopher and Heinrich, Schutze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.
5.Akshar Bharti, Vineet Chaitanya, Rajeev Sangal,"Natural Language Processing: An Paninian perspective"

CA-504 Programming with Windows Technologies

1. Windows Programming: [16]

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.

2. Windows Communication Foundation [18]

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.

3. Windows Presentation Foundation [18]

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.

1. Charles Petzold, "Windows Programming", Microsoft press, 1996.
2. Justin Smith,"Inside Windows® Communication Foundation", Microsoft press, ISBN13: 9780735623064.
3. Charles Petzold,"Applications = Code + Markup: A Guide to the Microsoft® Windows® Presentation Foundation" , Microsoft press, ISBN13: 9780735619579, ISBN 10:0-7356-1957-3

CA-505 Current Computing Trends-II

The syllabus of this course (CA-505: Current Computing Trends-II) will be prepared before the beginning of the Fifth Semester by the committee by considering the market requirement, student's feedback and latest technological trends.

CA-506 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.

CA-Lab-IX Lab on Windows Technologies

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.

WCF, WWF,WPF

1. Create a simple WCF application with appropriate client and host it in various environments IIS, Windows Service, Windows Application.
2. Create a Sequential Workflow.
3. Create a Conditional Workflow.
4. Create a State Machine Workflow.
5. Create an application using Windows Presentation Foundation.

CA-Lab-X Lab on Current Computing Trends-II & NLP

Current Computing Trends-II : The syllabus of this Practical Course (CA LAB-X: Lab on Current Computing Trends) will be prepared before the beginning of the Fifth Semester by the Instructors based on the content of CA-505 Theory course

NLP : Detailed lab course would be prepared before commencement of the course. NL tasks using NLTK, Standford NL tools should be used..

Semester- VI

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CA-601 Full Time Industrial Training

Twelve credits shall be awarded to the Industrial Training/Project course, which will commence in VI Semester and the final work and report will be completed at the end of VI Semester for M.C.A. The marks and the credits will be allotted at the end of VI for M.C.A.