Course Structure and Syllabi
Master of Computer applications (MCA)

Academic Programmes
July, 2013
## Semester – I

<table>
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<th>Course Code</th>
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<td>CA-11001</td>
<td>Programming in C</td>
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## MCA Syllabus at JECRC University

### Semester – V<sup>th</sup>

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### Semester – VI\(^{th}\)

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* There will be at least 10 weekly assignments to be submitted by students on the subject “object oriented Analysis and design with UML”. Weekly evaluation will be done by a group of teachers of the department of 10 marks each taking personal viva of the students for a total of 100 marks.

** There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will be an evaluation of the project for 20 credits by a group of experts including one external expert and teachers of the department.
Course Code: CA-11001  
Course Name: Programming in C

**Module-I (12 hours)**
Introduction to computer: Evolution of computer, Computer system, Compiling environment, Time sharing, Client-Server environment, Distributed computing, Programming languages, Writing and editing programs, Compiling, linking and executing programs, System development, Life cycle, Program development.
Number representation in computer: Number systems, Storing of integers and real numbers, Overflow and underflow, exceptions, Flow chart
C language fundamentals: Character set, Key words, Identifiers, data types, Constants and variables, Statements, Expressions, Operators, Precedence and associativity of operators, Side effects, Type conversion, Managing input and output
Control structures: Decision making, branching and looping.

**Module-II (15 hours)**
Arrays: one dimensional, multidimensional array and their applications, Declaration and manipulation of arrays
Strings: String variable, String handling functions, Array of strings
Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.
Storage classes: Auto, Extern, register and static variables

**Module-III (13 hours)**
Pointers: Pointer variable and its importance, pointer arithmetic and scale factor, Compatibility, Dereferencing, L-value and R-value, Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers
Dynamic memory allocation
Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.
File Management: Defining and opening a file, Closing a file, Input/output Operations in files, Random Access to files, Error handling
The Pre-processor directives, command line arguments, Macros.

**Text books:**
Reference books;
Course Code: CA-11002
Course Name: Micro-processors and Assembly Language Programming

Module I: (15 Hours)

Microprocessor History, 8085 Architecture and Register organization, Functional Block Diagram, Bus Organization, 8085 Instruction Set, Instruction classifications, Instruction word size, Instruction format, Addressing modes, Assembly Language programming,

Memory, I/O devices, Addressing memory and I/O devices, Memory mapping, Memory Interfacing, Tri-State Devices, Buffers.

Module II: (13 Hours)
Programming techniques with additional instructions: Looping, Counting, Indexing, Introduction to Advanced Instructions, Instruction cycle, Machine cycle, Timing Diagram, Stack and subroutine, Counter and Time delay, Debugging.

Module III: (12 Hours) Interfacing Chips: 8255A (PPI), 8155 (Multipurpose Programmable Device), Interrupts, 8259A (PIC), Serial I/O and Data communication, Serial Data communication standard (RS 232C) 8257 or 8237A (DMA Controller), 8251A (USART). 16 bit processor 8086: Introduction, Architecture, Pin Diagram, Min & Max Mode, Addressing Modes.

Text Books:
2. D V Hall, “Microprocessor & Interfacing” McGraw Hill Education India

Reference Books:
3. P K Ghosh, P R Sridhar, “0000 to 8085 Introduction to microprocessor to Engineers & Scientists” Prentice-Hall of India.
Course Code: CA-11003  
Course Name: Discrete Mathematics  

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Module-I (15 hours)  
**Logic, Relation & Functions:**
Logic: Propositions and logical Operations, Conditional statements; Predicate Calculus-First order logic, universal and existential quantifiers; Proof Techniques- methods of proof, Mathematical induction, recurrence relations.
Relation and Diagraphs- Properties of relations, composition of relations, closure operation on relations, equivalence relations and partitions, paths in relation and diagraphs, Operations on relations, Transitive closure and Warshall’s Algorithm.
Partial ordered sets (poset), Hasse diagram, External elements of partially ordered sets
Functions, Functions for computer science, Growth of functions, Permutation functions

Module -II (13 hours)  
**Topics in Graph Theory:** Directed and undirected graphs, basic terminology, paths and circuits, Eulerian paths and circuits, Hamiltonian paths and circuits, Transport Network, Graph coloring.
Trees: definition and properties, rooted trees, tree traversals— preorder, inorder, postorder, binary trees, labeled trees, spanning trees, cut sets, Graph traversals — BFS and DFS, Minimum cost spanning trees-Prim’s and Kruskal’s algorithm, Shortest paths in weighted graphs-Dijkstra’s algorithm.

Module-III (12 hours)  
**Algebraic Structures and Applications:** Binary operations, semi-groups and groups, subgroups, cosets, Lagrange’s theorem, Product and quotient semi-groups and groups, Normal subgroup, Homomorphism; coding of binary information and error detection, group codes, decoding and error correction.
Lattices, finite Boolean algebra, functions of Boolean algebra.

**Recommended Text Books:**

**Reference Books:**
MCA Syllabus at JECRC University

Course Code: CA-11004
Course Name: Engineering Economics and Costing

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Module-I (12 hours)
Theory of production and cost, Law of variable proportion, Law of returns to scale,

Module-II (12 hours)

Module- III (12 hours)

Text Books:
2. C. T. Horngreen, “Cost Accounting”, Pearson Education India
4. H.L. Ahuja, “Principle of Economics”, S. Chand & Co
Course Code: CA-11005
Course Name: Lab – I (C Programming Lab) 

Topics:
1. Introduction to OS: Linux/Unix, DOS, and Windows.
2. vi editor basics, common commands on UNIX.
3. File handling, directory structures, file permissions, Creating and editing simple C programme, Compilation and execution.
4. C programming on variables and expressions.
5. Precedence of operators, Type casting.
6. Decision control structures— if and nested if-else.
7. Loop controls— do, while, for and case control structure.
8. Unconditional jumps— break, continue, goto.
9. Modular program development using functions.
10. Arrays and matrix operations—add, subtract, multiply.
11. Recursion
12. Pointers, address operators and pointer arithmetic.
13. Structures and Unions, Accessing their members.
15. Files and file operations, standard streams.
17. Different mathematical operations using <math.h>.
18. Pointers to pointers, arrays, functions, structures and unions.
19. Command line arguments, enums and preprocessors.
Course Code: CA-11006  
Course Name: Lab – II (Assembly Language Programming Lab)  

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Topics:
1. Verification of 8085 Instruction Set.
2. Addition, Subtraction, Multiplication & Division of two 8-bit numbers.
3. Development of code conversion programs:
   a) Binary to Gray
   d) Gray to Binary
   c) ASCII to Binary
   d) Binary to ASCII
4. Identification of the ports and pins of I/O ports of Intel 8255.
5. Generation of Square, Triangular and Sinusoidal waveforms using DAC.
6. Study of Interrupt RST 7.5.
7. Stepper Motor control using 8085 Microprocessor.
Course Code: CA-12001  
Course Name: Data Structures Using C  

Module-I (15 Hours)  
Linked Lists: Singly linked lists, Linked stacks and queues, Operation on polynomial, Linked dictionary, Doubly linked list, Circular linked list, Doubly circular linked lists.

Module-II (12 hours)  
Dynamic storage Management, Garbage collection and compaction, Hashing functions. Hash tables and collision resolution techniques.  
Trees: Binary trees, Terminologies and memory representation, Binary search trees, General trees, Tree traversing, Operations on binary trees, - Expression manipulations, Threaded binary trees, Height balancing trees, Heaps, forest, File structures, Introduction to multi-way search trees, B-tree and B”-trees.

Module-III (10 hours)  
Graphs: Terminologies and representation, Path matrix, graph traversal,- DFS and BFS, shortest path problems, Bi-connected graphs, Topological sort.  
Sorting techniques: Bubble sort, selection sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, Shell sort and address calculation sort, Linear search and binary search.

Text books:  

Reference Books:  
Course Code: CA-12002
Course Name: Computer Organization and System architecture

Module I: (15 Hours)
Introduction: Basic architecture of computer, Functional units, Operational concepts, Bus structures, Von Neumann Concept.
Basic Processing: Instruction code, Instruction set, Instruction sequencing, Instruction cycle, Instruction format, Addressing modes, Micro instruction, Data path, Hardwired controlled unit, Micro programmed controlled unit.
Arithmetic: Design of ALU, Binary arithmetic, Addition and Subtraction of signed number, Multiplication of Positive number, Signed operand multiplication, Division, Floating point number representation and arithmetic.

Module II: (12 Hours) Memory: Memory Hierarchy, RAM, ROM, Cache memory organization, Mapping techniques, Virtual memory, Mapping technique, Associative memory, Memory Interleaving, Secondary Storage, Flash drives.

Module III (13 Hours)
Introduction to Parallel processing: Flynn’s Classification, Pipelining, Array processing, vector processing

Text Books:

Reference Books:
Course Code: CA-12003  
Course Name: Object orientated Programming using C++

**Module-I (12 hrs)**
Introduction to C++: C++ as multi-paradigm language, features supported by C++, syntax, data-type, const and bool qualifiers, variables, strings, operators  
Control Structures, Decision and Loop Control Statements, Modular program design using functions, Top down program design with examples, parameter passing mechanisms, inline functions, recursion, Arrays and pointers, dynamic arrays, structures and unions in C++, Coding Style in C++  
Object Oriented Programming in C++: Abstraction, OOP concepts, software life cycle, Abstraction Mechanisms: Procedural Abstraction and data abstraction; Classes and objects, object creation, access specifier-private, public and protected, constructors, default constructors, copy constructors, destructors, member functions, static members, references; Message communication using objects.

**Module-II (12 hrs)**
**Inheritance:** Is-a Vs. Has-a relationships, simple inheritance—Class hierarchy, derived classes, Multiple inheritance, multileveled and hybrid inheritance, Abstract Base Classes, Composition and aggregation with example, polymorphism—compile time & run time polymorphisms, object slicing, base class initialization, virtual functions and Dynamic Binding.  
Overloading: Function overloading and Operator overloading, ambiguity, Overloading Restriction, friends function, member operators, operator function, I/O operators, Automatic Conversions and Type Casts for Classes, Memory management in C++: new, delete, object copying—deep & shallow copy, this pointer.

**Module-III (12 hrs)**
Exception Handling Mechanisms: Exceptions and exception class, exception declarations, unexpected exceptions, RTTI, Calling abort(), Returning an Error Code, Exception Mechanism, Using Objects as Exceptions  
Templates and Standard Template Library (STL): Generic Programming in C++, Template classes, declaration, Template functions, Template Classes and Friends, Namespaces and separate compilation; String class, Containers, Iterators, Vectors  
Files in C++: Buffers, and the iostream File, redirection, streams and I/O streams classes, File Input and Output, Stream Checking and is_open(), Opening Multiple Files, Command-Line Processing, File Modes.

**Recommended Texts:**
Reference Books:
MCA Syllabus at JECRC University

Course Code: CA-12004
Course Name: Theory of Computation

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Module- I (12 hours)
Introduction of Automata, Computability, and Complexity; Mathematical notations and terminology; Finding proofs and types of proofs.
Finite Automata and regular languages: Formal definitions, Designing finite automata, Deterministic finite automata, Non-deterministic finite automata, Equivalence of NFAs and DFAs, finite automata with ε-transition; regular expressions and languages, Properties of Regular languages, conversion of RE to FA and vice versa.

Module –II (12 hours)
Push down Automata and Context free languages: Context free grammars, Designing context free grammar, Ambiguity in CFG and its removal, Chomsky normal form
Push down Automata: formal definition, graphical notations, Languages accepted by PDA, Equivalence of PDA and CFG, Non-context free languages.

Module-III (12 hours)
Turing Machines and Computability: Formal definition of Turing machines with examples, Graphical notations, Variants of Turing machines, Church-Turing thesis, Hilbert’s problem
Decidability, undecidability and reducibility: Decidable languages; Decidable problems concerning regular languages and context free languages, The halting problem, Post correspondence problems, Undecidable problems, Mapping reducibility, Decidability of logical theories, Turing reducibility.

Recommended Texts:

Reference Books:
Course Code: CA-12005  
Course Name: Lab – III (Data Structure in C Lab)  

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Topics:  
1. Matrix Operations-Add, Multiply, Rank, Det. etc.  
2. Stack & Queue operations using Arrays.  
3. Self-referential structures & single linked list operations.  
4. Implementing Stack and queues using linked lists.  
5. Implementing Polish Notations using Stacks.  
6. Circular and double linked list operations.  
7. Implementing priority queue & dequeue using lists.  
9. Implementing set related operations & Hashing.  
10. Linear & binary search, bubble sort technique.  
11. Insertion sort, selection sort & merge sort techniques.  
12. Quick sort, counting sort and Shell sort techniques.  
13. Radix (bucket) and address calculation sort methods.  
15. Heap sort & AVL tree implementations.  
16. Graph representation with matrix & adjacency lists.
Course Code: CA-12006
Course Name: Lab – IV (C++ Programming Lab.)

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Topics:
1. Implementing classes and creation of objects.
2. Checking Precedence of operators & side effects.
3. Implementing various control structures & loops.
5. Implementing Procedural abstraction with functions.
6. Implementing Constructors and destructors.
7. Implementing Data abstraction & inheritance.
8. Implementing Multiple & hybrid inheritance.
9. Implementing Polymorphism concepts.
10. Implementing Operator overloading & friend’s functions.
11. Working with new & delete, object copying.
12. Implementing Object slicing, this operator.
13. Exception handling mechanisms.
15. Working with STL.
Course Code: CA-12007
Course Name: Seminar

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Course Code: CA-13001  
Course Name: Analysis and Design of Algorithms  

Module-I (13 hours)  
Introduction to analysis and design of algorithm, Growth of functions, Asymptotic notations, Recurrences, Solution of recurrences by substitution, Recurrence tree and the master method. Divide and conquer algorithms (Worst case analysis of merge sort, quick sort and heap sort algorithms), Priority queue, Data structure for disjoint sets (Disjoint set operations, linked list representation, disjoint set forests).

Module-II (13 hours)  
Dynamic programming approach: Matrix chain multiplication, longest common subsequence. Greedy method: Activity solution problem, Greedy verses dynamic programming, Huffman codes. Concept of backtracking, branch & bound design techniques. Graph algorithms: Minimal spanning tree (Kruskal and Prim’s algorithms), Single source shortest paths (Bellman-Ford and Dijkstra’s algorithm), Floyd’s algorithm.

Module-III (14 hours)  

Text book:  
Chapters: 1, 2, 3, 4(excluding 4.4), 6, 7 (7.4.1), 15(15.2, 15.3. 15.4), 16(16.1, 16.2, 16.3), 21(21.1, 21.2, 21.3) 23, 24(24.1, 24.2, 24.3), 26(26.1, 26.2), 30(30.1, 30.2), 32(32.1, 32.2), 34, 35(35.2)

Reference books:  
Course Code: CA-13002
Course Name: Operating Systems

Module-1 (16 hours)

Introduction — Evolution of Operating Systems, Types of operating systems, Operating System Structures, Hardware and software structures needed for an operating system.


Module-2 (14 hours)

Deadlock—Basic cause of deadlock, Conditions for deadlock, resource allocation graph, Wait for graph, Strategies for handling deadlocks, Starvation, Havender’s linear ordering principle, deadlock avoidance & detection, Safe state, Dijkstra’s Banker’s Algorithm.

Memory Management: Main Memory, Static & Dynamic Partition schemes, multiple partitions schemes, Fragmentation, Compaction, Buddy Systems, Partition selection algorithms, deallocation strategy, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory: Demand Paging, Copy-on-Write, Page Replacement Policies, Belady’s Anomaly, Thrashing, Working set model.

Module-3 (10hrs)


Text books:

Reference Books:
Course Code: CA-13003
Course Name: Computer Networks

Module-I (12 hours)

Module-II (16 hours)

Module-III (12 hours)

Text Books:

Reference Books:

MCA Syllabus at JECRC University

Course Code: CA-13004
Course Name: Data Base Systems

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Module 1 (10 hours)


The Relational model: Relational data model concepts, Codd’s 12 rules, Relational model constraints and schemas, Relational Algebra and Relational calculus, Constraints on Relations, Relational database design by ER & EER to Relational Mapping, Database Language SQL & QBE. SQL Programming Techniques: Constraints and Triggers, Views and Indexes, SQL in Server Environment.

Module 2 (16 hours)

Database Design: Data dependency, Armstrong’s Axioms, Functional dependencies and Normalization of Relational Databases, First, Second and Third Normal forms, Boyce-Codd Normal form (BCNF), Relational Database design Algorithms and further dependencies, Denormalization

Storage Strategies and file organizations: Disc Storage, Basic File Structures and Hashing, Indexing structures for files, multi-level indexing using B-trees and B+-trees.

Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Execution, Query Compiler, and Query Optimization Algorithms.

Module 3 (14 hrs)


Outline of: Information Integration, Data Mining, Data Warehousing and OLAP, Database Systems and the Internet, Search Engines, Semi-structured Data Model, XML and Web Databases, Object & Object Relational Databases, Distributed Databases, Deductive Databases, Mobile Databases, Multimedia Databases, GIS.

Text Books:

Reference Books:
Course Code: CA-13005  
Course Name: Lab – V (Operating System & Network Lab.)  

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Topics:  
01. UNIX Structures, UNIX/LINUX Commands, Common Commands practice session.  
02. vi/vim editor basics, creating & managing files with vi/vim.  
03. Working with sed and awk, programming with awk.  
04. Shell scripting, shell variables, data types.  
05. Shell programming-control structures, loops etc.  
06. Creating processes- fork and join, pid, child process.  
07. Implementing Threads, Thread programming.  
08. Inter process communication-Producer & consumer.  
09. Implementing readers and writers problem using c/c++.  
10. Implementing sleeping barber problem using c/c++.  
11. Implementing semaphores using c/c++.  
12. Implementing deadlock mechanism using c/c++.  
13. Implementing bankers algorithm using c/c++.  
14. Simulation program for memory allocation & de-allocation.  
15. Implementing file allocation problem using c/c++.  
16. Socket programming in C: Client and server Sockets.  
17. Connection establishment through TCP/IP Sockets.  
18. Communicating with server w. r. t. clients via sockets  
19. Implementing a File copy program using Sockets.  
20. Creating and Installing Server Software.
Course Code: CA-13006  
Course Name: Lab – VI (Data base Lab)  

Topics:
01. Installation of Oracle or MySQL.  
02. Learning basic DDL and DML commands  
03. Learning basic DCL and TCL commands.  
04. Insertion, Deletion, Updating to a table using SQL commands  
05. Working with dual table.  
06. Data retrieval using Select & where clause.  
07. Oracle inbuilt functions-Date, aggregate, group by etc.  
08. Use of Joins and Sub queries.  
09. Views, sequences and indexes.  
10. Managing users, privileges and roles.  
11. PL/SQL-Data types, control structures.  
12. Creating procedures with PL/ SQL.  
13. Error handling in PL/ SQL.  
14. Cursor Management in PL/ SQL.  
15. Sub program design in PL/ SQL.  
16. Writing Program segments in embedded SQL using C/C++.  
17. Writing Programs on Packages & triggers.  
18. Implementing OO features in Oracle.  
19. Report generation using SQL.  
Course Code: CA-13007
Course Name: Seminar

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Course Code: CA-14001
Course Name: Programming with Java

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Module – 1 (16 hours)
Introduction to Java Programming Language, Data Types and Operations, Structured Programming, Selection Statements, Loops, Methods, Method Abstraction and Stepwise Refinement, Arrays, Object-Oriented Programming: Classes and Objects, Constructors, Implementing & Designing Classes, Use of Keywords: static, final, this, Class Abstraction and Encapsulation, Strings and Text I/O, Inheritance and Polymorphism, use of super keyword, Overriding vs. Overloading, Object: The Cosmic Superclass, Abstract Classes and Interfaces, Packages, Object-Oriented Design and Patterns.

Module – 2 (12 hours)

Module – 3 (12 hours)
Multithreading, Networking, JDBC, Internationalization, Advanced GUI Programming: MVC, JavaBeans and Bean Events, Containers, Layout Managers, and Borders, Menus, Toolbars, Dialogs and Swing Models, JTable and JTree, New Features of Java.

Text Books:

Reference Books:
Course Code: CA-14002
Course Name: Computer Graphics & Multimedia

Module – 1 (14 hours)


Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Inverse Transformations, Other Transformations (Reflection, shear), Transformation between coordinate systems, Affine Transformations.


Module – 2 (14 hours)

Three Dimensional Object Representations: Curved Surfaces, Quadratic Surfaces, Spline Representations, Bezier Spline Curves and Surfaces, B-Spline Curves and Surfaces, Octrees, BSP Trees, Fractal Geometry Methods, Shape Grammars.


Illumination Models: Basic Illumination Models, Displaying light Intensities, Halftone Patterns and Dithering techniques, Polygon-Rendering Methods (Gouroud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations).

Computer Animation, Hierarchical Modeling (introductory idea only).

Module – 3 (12 hours)


Multimedia Data Compression: Lossless Compression Algorithms (Basics of Information Theory, Run length coding, variable length coding, lossless image compression), Lossy Compression Algorithms (distortion measure, quantization, Discrete Cosine transform), Basic Image Compression standard-JPEG, Basic Video Compression standard-MPEG (MPEG-1&2).

Text Books:
Reference Books:

Course Code: CA-14003  
Course Name: Software Engineering

**Module-I (12 hours)**

**Module-II (14 hours)**

**Module-III (14 hours)**

**Text Books:**

**Reference Books:**
Course Code: CA-14004  
Course Name: Compiler Design  

**Module 1 (12 hours)**  

**Module 2 (12 hours)**  

**Module 3 (16 hours)**  

**Text Books:**  

**References Books:**  
Course Code: CA-14005
Course Name: Lab – VII (Programming with Java Lab.)

Topics
01. Introduction, Compiling & executing a java program.
02. Program with data types & variables.
03. Program with decision control structures: if, nested if etc.
04. Program with loop control structures: do, while, for etc.
05. Program with classes and objects.
06. Implementing data abstraction & data hiding.
07. Implementing inheritance.
08. Implementing and polymorphism.
09. Implementing packages.
10. Implementing generics.
11. Program with modern features of java.
12. Implementing interfaces and inner classes
13. Implementing wrapper classes
15. Implementing cloning.
16. Implementing Reflections
17. Working with files.
18. Implementing a Lexical Analyzer
19. Implementing a parser
20. Implementing a code generator
Course Code: CA-14006
Course Name: Lab – VIII (Comp. Graphics & Multimedia Lab.)

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Topics
01. Introduction to OpenGL Programming.
02. Implementing line drawing algorithms.
03. Implementing circle drawing algorithms.
04. Implementing ellipse drawing algorithms.
05. Implementing Line Clipping Algorithms.
06. Implementing Polygon Clipping Algorithms.
07. Implementing 2-d Transformations.
08. Implementing 3-d Transformations.
09. Implementing scan fill, boundary fill algorithms.
10. Implementing seed fill, flood fill algorithm.
11. Writing program on B-Splines, Bezier Curves
13. Writing program on Sierpinski gasket, Koch curve.
14. Writing program on Fractal trees & forest.
15. Writing program on wire frame model & terrain generation.
17. Writing program on Animation & Morphing techniques.
Course Code: CA-15001
Course Name: Artificial Intelligence and Expert system

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Module-1 (15 hours)

Module-2 (13 hours)
Classical planning, Knowledge Representation; Uncertain Knowledge and Reasoning: Probabilistic Reasoning, Learning from Examples, Knowledge in Learning; Natural Language Processing: Language models, Text Classification, information retrieval, information extraction

Module-3 (12 hrs)

Text Books:


   Chapters: 1 and 6.

Reference Books:


Course Code: CA-15002
Course Name: Object Oriented Analysis and Design with UML

Module-I (15 hours)

Module-II (13 hours)
Analysis and Design: Process overview, system Conception, Domain Analysis, System Design, Class design.

Module-III (12 hours)
Implementation: Implementation Modeling, Object Oriented (OO) Languages, Databases, Programming Style.

Text Books:

Reference Books:
Course Code: CA-15003
Course Name: Internet Technology and enterprise Java

Module-I (15 hours)
Internet and Web Technology: Introduction and overview, Internetworking concept and architectural model, classful internet addresses, classless and subnet address extensions (CIDR), Protocol Layering, Mobile IP, Client Server model, World wide web, Voice and Video over IP.


Module-II (15 hours)

Module-III (10 hours)

Recommended Books:

References:

Course Code: CA-15004  
Course Name: Quantitative Techniques-II (Modeling & Simulation)  

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**Module-1 (12 hours)**
Markov Decision Process: Model for Markov decision Process, Linear programming and optimal policies, Policy improvement algorithm, Discounted cost criterion

**Module-2 (12 hours)**
Random numbers, Pseudo random number generation, Using random numbers to evaluate integrals, Generation of discrete random variables: Inverse transform method, generating Poisson and Binomial random variables, the acceptance – rejection technique  
Generating continuous random variable: The inverse transform algorithm, the rejection method, the polar method for generating normal random variables, generating Poisson process.  
Discrete event simulation approach: Simulation via discrete event, the single server queuing system, Queuing system with two servers in series and with two parallel servers, Inventory model.

**Module-3 (12 hrs)**
Variance reduction technique: Use of antithetic variable, use of control variates, variance reduction by conditioning, stratifies sampling, Importance sampling.  
Statistical validation techniques: Goodness of fit tests, Chi-square goodness of fit test for discrete data, Kolmogorov- Smirnov test for continuous data, Goodness of fit test when some parameters are unspecified, two sample problem.

**Text Books**

**Reference Books:**
1. Hamdy A.Taha,”Operations research”, Pearson Education India, New Delhi  
Course Code: CA-15005
Course Name: Distributed Systems

Module-I (12 hours)
Distributed systems: Definition, goals, types of Distributed Systems, Architectures, Key characteristics-resource sharing openness, concurrency, scalability, fault tolerance, transparency; Design issues, naming, communication, software structure, workload allocation, consistency maintenance; User requirement, functionality, Quality of service, reconfigurability; Interprocess communication, building blocks, client server communication; CORBA's Common Data Representation (CDR); Java object serialization; Extensible markup language (XML); Remote object references; Inter-process communication in UNIX; Remote procedure calling; Design issues, interface definition language exception handling; Implementation - interface processing, communication handling; Binding, Case study: sun RPC Vs. Java RMI.

Module-II (12 hours)
Distributed Operating systems: kernel, processes and threads, Naming and protection - Communication and Invocation, virtual memory, Distributed file services - design issues, interfaces, implementation techniques, Case study sun NFS, Name services: Name spaces; Name resolution, Domain Name System, SNS and DNS, Peer-to-Peer Systems. Coordination and Agreement: Time and Global States, Time and co-ordination, Synchronizing physical clocks- logical time and logical clocks, Distributed co-ordination, distributed mutual exclusion, elections, Replication, basic architectural model, consistency and request ordering.

Module-III (12 hours)
Distributed Transactions, Recovery and fault tolerances: Transaction recovery, logging - shadow versions, fault model for transaction; Fault tolerance: characteristics; Hierarchical and group masking of faults; Security, authentication and key distribution, logic of authentication, digital signatures; Web Services: SOAP, XML, CORBA, Distributed object based systems, Distributed file systems, Distributed web-based systems, Distributed co-ordination based systems.

Text Books:

Reference Texts:
Course Code: CA-15006  
Course Name: Parallel Computing

Module-I (12 hours)  
Introduction to Parallel Computing; Motivating Parallelism, Scope of Parallel Computing;  
Parallel Programming; Platforms : Implicit parallelism, Limitation of Memory System  
Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of  
Parallel Platforms, Communication Costs of Parallel Machines, Routing Mechanism for  

Module-II (12 hours)  
Principles of Parallel Algorithm Design : Preliminaries, Decomposition Techniques,  
Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing,  
Methods for containing interaction Overheads, parallel Algorithm Models. Analytical  
Modelling of Parallel Programs : Sources of Overhead in Parallel Programs, Performance  
metrics for parallel systems, the effect of Granularity on Performance, Scalability of  
Parallel Systems, minimum Execution time and minimum cost-optimal Execution Time,  
Asymptotic Analysis of Parallel Programs, other Scalability Metrics.

Module-III (12 hours)  
Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All-to-All  
Broadcast and Reduction, Scatter and Gather, All-to-All Personalized Communication,  
Circular Shift.

Introduction to MPI Principles of Message - Passing Programming, The Building Blocks  
(Send and Receive Operations), MPI (the Message Passing Interface), Collective  
Communication and Computation Operations, Examples of Matrix - Matrix multiplication,  
One dimensional Matrix Vector Multiplication using MPI.

Text Books:
1. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, “Introduction to  
Education (India), New Delhi.

Reference Books:
2. Michael J. Quinn, “Parallel Programming in C with MPI and OpenMP”, 2004,  
McGraw-Hill Education (India), New Delhi.
Education, Inc. New Delhi.
Course Code: CA-15007  
Course Name: Image Processing  

Module-I (12 hours)  
**Introduction:** The digitized image and its properties: Applications of image processing, image function, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

Module-II (12 hours)  
**Image preprocessing:** Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local preprocessing- image smoothening, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multi spectral images, local preprocessing and adaptive neighborhood pre processing; image restoration.  
**Image Segmentation:** Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation-edge image thresholding, edge relaxation, border tracing, border detection.

Module-III (12 hours)  
**Mathematical Morphology:** Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation -particles segmentation and watersheds, particles segmentation.  
**Image textures:** Statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method applications.  
**Image representation and description:** Representation, boundary descriptors, regional descriptors

**Text Books:**

**Reference Book:**
Course Code: CA-15008
Course Name: Web Engineering

Module-I (12 hours)

Module-II (12 hours)

Module-III (12 hours)

Text Books:

Reference Books:
Module-I (12 hours)

Module-II (12 hours)

Module-III (12 hours)
**Data base & Network Security:** Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security; Security in Network; Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-mail.

**Administering Security:** Security Planning, Risk Analysis, Organizational Security policies, Physical Security; The Economics of Cyber security; Privacy in Computing; Legal and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Case studies of Ethics.

**Textbooks:**

**Reference Books:**
Course Code: CA-15010
Course Name: Software Design

Module-I (12 hours)

Module-II (12 hours)

Module-III (12 hours)

Text Books:

Reference Books:
Course Code: CA-15011
Course Name: Bioinformatics

Module-I (12 hours)
*Molecular Biology and Biological Chemistry*: The Genetic Material, Gene structure and Information Content, Protein Structure and Function, The nature of Chemical bonds, Molecular Biology Tools, Genomic Information Content, *Data Searches and Pairwise Alignments*: Dot Plot, Simple Alignments, Gaps, Scoring Matrices, Needleman and Wunsch Algorithm, Global and local Alignments, Database searches, Multiple sequence Alignments, *Substitution Patterns*: Patterns of substitutions within Genes, Estimating Substitution numbers, Variations in evolutionary rates between Genes, Molecular clocks, evolution in Organelles.

Module-II (12 hours)
*Distance based methods of Phylogenetics*: History of Molecular Phylogenies, Phylogenetic trees, Distance matrix methods, Maximum likelihood approaches, Multiple sequence Alignments, *Character Based methods of Phylogenetics*: Parsimony, Inferred ancestral sequences, Strategies for Faster searches, Consensus trees, tree confidence, Comparison of Phylogenetic methods, Molecular Phylogenies.

Module-III (12 hours)

Text Books:

Reference Books:
Course Code: CA-15012
Course Name: Soft Computing

Module-I (10 hours)
Introduction to intelligent systems and soft computing: Introduction, Intelligent systems, Knowledge-based systems, Knowledge representation and processing, soft computing.
Fundamentals of fuzzy logic systems: Introduction, background, fuzzy sets, generalized fuzzy operations, implication, definitions, fuzziness and fuzzy resolution, fuzzy relations, composition and inference, considerations of fuzzy decision making.

Module-II (10 hours)
Classes of neural networks: introduction, multilayer perceptron, radial basis function networks, Kohonen’s self-organizing network, Hopfield network, industrial and commercial applications of ANN.

Module-III (10 hours)

Text Books:

Reference Books:
Course Code: CA-15013
Course Name: Assignment *

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Topics:
01. Developing the Building blocks of UML: things, relationships and diagrams.
02. Generating the Following through UML:
   a) Class diagram
   b) Object diagram
   c) Use case diagram
   d) Sequence diagram
   e) Collaboration diagram
   f) Activity diagram
   g) Statechart diagram
   h) Component diagram
   i) Deployment diagram

03. Design the following systems through UML:
   a) OnlineBookShop Management System
   b) Bank Management System
   c) Library Management System
   d) University Management System
   e) Railway Information System
Course Code: CA-15014
Course Name: Lab – X (Enterprise Web Computing Java Lab.)

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Topics:
01. HTML & XHTML Programming: basic tags, text formatting tags, creating hyperlinks.
02. HTML & XHTML Programming: tables, lists, frames, forms, maps, Creating CSS.
03. JavaScript Programming: Data types, loops, functions.
04. JavaScript Programming: DOM, arrays, forms, frame, GUI design.
05. XML Programming: page creation, making a DTD, Parsing XML files.
06. Creating, installation and running a web server (e.g. Apache Tomcat/ GlassFish).
07. Creating, Compiling and Running a Servlet. Program (both http & generic servlet).
08. Implementing session tracking mechanisms in servlets.
09. Generating Dynamic web content using Servlet basing upon request response model.
10. DHTML programming: GUI designs.
11. Creating a JSF program showing framework based application development.
12. Creating, Compiling and Running a JSP Program.
13. Implementing Session tracking through JSP Program.
15. Creating a simple Java Bean Application programs using BDK. Tools.
16. Deploying of beans, implementing entity beans and session beans of EJB.
17. Creating manifest file, jar file and Deploying a web application.
18. Designing a simple Program using JDBC, beans and JSP implementing MVC Model.
19. Creating a RMI Program showing Marshalling and Unmarshalling Processes.
20. A Web based Capstone project university management system using JSP and Database.
Course Code: CA-16001
Course Name: Project work for 16 weeks**

There will be a 16 weeks project work to be undertaken by the students in any Industry / Institution. At the end of the project there will an evaluation of the project for 20 credits by a group of experts including one external expert, internal supervisor and teachers of the department.

Each student must have an internal supervisor who is a faculty of the department/Institution. Each student must submit the abstract of the project which will be approved by the department on the recommendation of the internal supervisor.

Guidelines: SUMMARY/ABSTRACT
All students must submit a summary/abstract of the project to be undertaken to the internal supervisor for approval, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up should include the followings-

1. Name/Title of the Project
2. Statement about the Problem
3. Why is the particular topic chosen?
4. Objective and scope of the Project
5. Methodology (including a summary of the project)
6. Hardware & Software to be used
7. Testing Technologies used
8. What contribution would the project make?

After the approval, the student is allowed to carry out the project in any organization/Institution. He/She must immediately inform the internal supervisor about the name and contact details of the external supervisor in the organization/Institution. Moreover he must report to the internal supervisor about the progress of his/her work periodically. After the end of 16 weeks, the student is required to submit the project report in the department after getting approved by the internal and external supervisors.

Guidelines for preparation of the final project report
Good quality white executive bond paper of A4 size should be used for typing and duplication with the following specification

Left margin : 3.0cm
Right margin : 2.0cm
Top margin : 2.5cm
Bottom margin : 2.5cm
Page numbers: All text pages as well as the Program source code should be numbered in the bottom center of the pages.
Font size of the normal Text : 12pt Times New Roman
Font size of Paragraph Heading : 14pt Times New Roman
Font Size of chapter Heading : 18pt Times New Roman
Font size of Code :10pt Courier New

**Format of the Project report**

Cover page  
Certificate of the internal supervisor  
Certificate of the external supervisor  
Self certificate  
Acknowledgement  
List of abbreviations, figures, Tables  
Synopsis of the project (3-4 pages)

Main Report  
Objective and scope of the project  
Theoretical background  
Definition of the problem  
System Analysis and design  
System planning  
Methodology adopted  
System implementation  
System maintenance and Evaluation  
Cost benefit Analysis  
Detail life cycle of the project  
Test reports (print out of the reports)  
Print out of the code  
References  
Every student has to submit the followings

(a) One hard copy of the Project report  
(b) Soft copy of the project on CD( to be submitted to the University) on a cover mentioning the name of the project, name of the student, Regd No. , name of the college, Year  
(c) Five copies of the synopsis of the project report

**Evaluation of the Project**

Evaluation of the project will be done by a jury of experts including one external expert, Head of the Department, internal supervisor, two teachers of the department. The evaluation will be done on the basis of the followings

Presentation : 30 Percentile  
Viva-Voce : 20 Percentile  
Project report : 50 Percentile

Number of students in a project should not be more than one. In some cases if the project completion needs more than 16 weeks, then two students may be allowed on the recommendation of the supervisors. However, they should handle different modules of the project.

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