# CURRICULUM DOCUMENT' 2019

**Programme Structures & Syllabi: PhD Course Work, MCA & PGDCA**
(Under UGC-CBCS Scheme)

**DEPARTMENT OF COMPUTER SCIENCE**

FACULTY OF NATURAL SCIENCES

## Jamia Millia Islamia: New Delhi, India

# DEPARTMENT OF COMPUTER SCIENCE

Faculty of Natural Sciences, Jamia Millia Islamia

## HIGHLIGHTS

(Revision'2019 over the Curriculum'2016)

## <PhD Course Work, MCA, PGDCA>

| | | |
|---|---|---|
| A. | **Motivation** | 1. Improvements warranted by rapidly changing academic, social and technological scenario around the world.<br>2. Conformance to different prescriptions from the statuary, regulatory bodies (JRF-NET), and JMI ordinance provisions.<br>3. Keeping abreast with the current and future industrial skill-set requirements, and placement related tests. |
| B. | **Bases and Constraints** | UGC Guideline on Choice Based Credit Based System (CBCS) – with greater autonomy to students on selection of courses – by reinforcing the following:<br>1. Retaining prescribed types as **Core, CBCS, Ability/Skill** enhancement courses.<br>2. Retaining 7 Courses each semester, barring the final Project semester.<br>3. Assuring minimum 20 credits each semester, as per JMI ordinances.<br>4. CBCS courses are be open any PG students - including DCS student.<br>5. One CBCS Elective and Ability/Skill enhance course to be compulsory in each of the semester (1-5). |
| C. | **Abbreviations** | Computer Science: **CS**, Core: C, Elective: E, Ability/Skill: S |
| D. | **Course Codes** | Unique code to be assigned to each of the typical courses at (UG/PG level separately), offered by the Department using the following coding scheme:<br>• General: Subject Code (CS) + Semester Number (1-6) + Level (0-7)+ Course Number(1-7)<br>• Computer Science Core: CSC<br>• Computer Science Elective: CBCSE<br>• Computer Science (CBCS Ability/Skill-Enhancement): CBCSS |
| E. | **Course L-T-P** | 1. Theory Courses: 3-0-0/ 4-0-0<br>2. Lab-Courses: 0-0-4<br>3. CBCS Elective Courses: 4-0-0/3-0-2<br>4. Ability/Skill Enhancement Courses: 2-0-2<br>5. Minor Project: 0-1-4<br>6. Major Project: 0-4-32 |
| F. | **Programmes** | 1. PhD (Course Work)     Page No: 02-03<br>2. MCA     Page No: 04-24<br>3. PGDCA     Page No: 25-32 |
| G. | **Special Considerations** | • Applied discipline and professional nature of programmes.<br>• Balancing academic, technological and industrial imperatives.<br>• National and global connect.<br>• ACM, UGC, AICTE and other central universities curriculum. |
| H. | **Remarks** | 1. Students are encouraged to enroll in courses pertaining to Communication Skills and Management from other Departments, as CBCS elective.<br>2. CBCS courses of minimum 2 credits each that may be chosen from other departments subject to students' requirement and convenience.<br>3. Computational-Lab and project courses shall have independent practical and viva-voce examinations. |

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

# I. PhD Course-Work Structure: 2019

| Course Code | Course Title | L-T-P | Credits |
|---|---|---|---|
| CSC171 | Research Methods in Computer Science | 4-0-0 | 04 |
| CSC172 | Literature Review and Term Paper | 0-1-6 | 04 |
| … | Elective-I: …………………………………… … .. | - | - |
| … | Elective-II: …………………………………… … .. | - | - |
| | | **Total** | **16⁺** |

| NOTES |
|---|
| • Electives of 4/5 credits are to be chosen from the relevant Pre-Ph.D./PG programmes from the Department or from outside, as per the requirement, on the recommendation of concerned supervisor and approval of the HoD. |
| • CSC172 shall be pursued under the guidance of respective supervisor(s) by reviewing a set of at least 20 research papers. |
| • CSC172 students shall produce a well-structured 'Review Report' and a 'Term-Paper', as per the guidelines of the Department,. |

## SYLLABUS

### CSC171: Research Methods in Computer Science (4-0-0)

1. **Research Foundations:** Research Primitives - Overview, Terminology, Prominent Definitions, Characteristics, Purpose, Goals and Objectives, Beneficiaries and Values, Methodology, Method and Skills; Scientific Research- Overview, Scientific Knowledge, Knowledge Acquisition, Science, Pseudoscience, Characteristics and Values, Generic Process; and Scientific Methods - Overview, Principles of Scientific Method, Scientific Attitude and Temper, Elements of Scientific Methods, Scientific Process, Scientific Objectivity, Scientific Misconceptions.

2. **Research Paradigms, Models and Types:** Research Paradigms- Overview, Generic Elements, Positivist, Post-Positivist, Interpretivist, Critical, Pragmatic; Research Models: Overview, Generic Research Process, Sequential, Generalized, Circulatory, Evolutionary, Mixed-Methods; Research Types- Overview, Nature Based Classification, Application Based Classification, Mode Based Classification, Objective Based Classification, Experiment Based Classification, Other Researches.

3. **Reasoning, Argument and Proofs**: Reasoning and Arguments – Overview, Terminology, Logic, Reasoning, Arguments, Common Fallacies; Methods of Proof – Overview, Mathematical Proof, Good Proof, Informal Proof, Formal Proof, Supplementary Proof, Classical Proof Fallacies.

4. **Research in Computer Science:** Computer Science, Focal Areas, Dialectic of research, Models of Argument, Types of Research in CS, Research Methods in Computer Science, Research Paradigms in CS, Grand Challenges for CS Research, Scientific Methods in Computer Science -Modelling, simulation, CBR & eScience.

5. **Research Skills:** Introduction to Literature Review, Research Design, Inferential Statistics, Synopsis Writing, Citation Formats and Style, General Conventions, Issues, Research Ethics, Plagiarism, Copyrights, and Research Tools.

REFERENCES
**Dawson: Projects in Computing and Information Systems. AWL**
Walliman: Your Research Project, Vistar publications
*Relevant Research Papers*

### CSC172(Literature Review & Term Paper): Guidelines

1. It is to be pursued under the strict guidance and monitoring of the designated supervisors.
2. The scope of the review shall be considerable critical review of the typical resources of at least 20 research papers.
3. A Student must submit a well-formatted report including the Heads: Background, Pertinent Typical Resources, Selected Research Papers, Summarization of Papers, Trend Report and Findings.
4. The evaluation of 'report and term paper' shall be conducted by a panel of at least two examiners, comprising an external by viva-voce examination.

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**REGISTRATION**

I, as a student of Ph.D. hereby register to pursue the pre-Ph.D. courses, as per the university prescriptions and as per following details.

Name     : …………………………………..

Enrollment No   : …………………………………..

Semester and Session : ………………………………….

| Course Code | Course Title | L-T-P | Credits |
|---|---|---|---|
| CSC171 | Research Methods in Computer Science | 4-0-0 | 04 |
| CSC172 | Literature Review and Term Paper | 0-1-6 | 04 |
| … | Elective-I: ………………………………… … .. | - | - |
| … | Elective-II: ………………………………… … .. | - | - |
| | | **Total** | … |
| **NOTES** | | | |

1.  Electives (4/5 Credits) are to be chosen from the relevant Pre-Ph.D./PG programmes from the Department or from outside, as per the requirement (on the recommendation of concerned supervisor) and approval of the HoD.

2.  No repetition of any elective shall be allowed, if the candidate has studied it during the PG programme.

3.  Literature Review and Term Paper is to be pursued under the guidance of respective supervisor(s).

Date: ……………………..          (Signature of the Student)

(Supervisor)                (Coordinator)

(Head)

# DEPARTMENT OF COMPUTER SCIENCE
### Faculty of Natural Sciences, Jamia Millia Islamia
## II. MCA Programme Structure: 2019

| SEM | Code | Course Title | L-T-P | Credits | Semester-Summary |
|---|---|---|---|---|---|
| I | CSC111 | Digital Computer Design | 3-0-0 | 3 | Periods/Week: 28 (+1) Credits: 23 |
| | CSC112 | Discrete Mathematical Structures | 3-0-0 | 3 | |
| | CSC113 | Algorithmic Problem Solving | 3-0-0 | 3 | |
| | CSC114 | Programming in C | 3-0-0 | 3 | |
| | CSC115 | Lab-I(C) | 0-0-4 | 2 | |
| | CSC116 | Lab-II(Personal Computing) | 0-0-4 | 2 | |
| | | CBCSE-I | | - | |
| | | CBCSS-I | 2-0-2 | 3 | |
| II | CSC221 | Computer Architecture | 3-0-0 | 3 | Periods/Week: 28 (+1) Credits: 23 |
| | CSC222 | Theory of Computation | 3-0-0 | 3 | |
| | CSC223 | Operating Systems | 3-0-0 | 3 | |
| | CSC224 | Object Oriented Programming in C++ | 3-0-0 | 3 | |
| | CSC225 | Lab-III(C++) | 0-0-4 | 2 | |
| | CSC226 | Lab-IV(Shell Programming) | 0-0-4 | 2 | |
| | | CBCSE-II | | - | |
| | | CBCSS-II | 2-0-2 | 3 | |
| III | CSC331 | Database Management Systems | 3-0-0 | 3 | Periods/Week: 28 (+1) Credits: 23 |
| | CSC332 | Software Engineering | 3-0-0 | 3 | |
| | CSC333 | Data Structures and Program Design | 3-0-0 | 3 | |
| | CSC334 | Analysis and Design of Algorithms | 3-0-0 | 3 | |
| | CSC335 | Lab-V(DS+ADA) | 0-0-4 | 2 | |
| | CSC336 | Lab-VI(Oracle) | 0-0-4 | 2 | |
| | | CBCSE-III | | - | |
| | | CBCSS -III | 2-0-2 | 3 | |
| IV | CSC441 | Artificial Intelligence | 3-0-0 | 3 | Periods/Week: 28 (+1) Credits: 23 |
| | CSC442 | Computer Graphics | 3-0-0 | 3 | |
| | CSC443 | Programming in Java | 3-0-0 | 3 | |
| | CSC444 | Data Communication and Networks | 3-0-0 | 3 | |
| | CSC445 | Lab-VII(Open GL) | 0-0-4 | 2 | |
| | CSC446 | Lab-VIII(Java) | 0-0-4 | 2 | |
| | | CBCSE-IV | | - | |
| | | CBCSS-IV | 2-0-2 | 3 | |
| V | CSC551 | Compiler Design and System Software | 3-0-0 | 3 | Periods/Week: 30(+1) Credits: 23 |
| | CSC552 | Information Security | 3-0-0 | 3 | |
| | CSC553 | Machine Learning and Soft Computing | 3-0-0 | 3 | |
| | CSC554 | Minor Project | 0-1-4 | 3 | |
| | CSC555 | Lab-IX(CD + Security) | 0-0-4 | 2 | |
| | CSC556 | Lab-X (Machine Learning) | 0-0-4 | 2 | |
| | | CBCSE-V | | - | |
| | | CBCSS-V | 2-0-2 | 3 | |
| VI | CSC661 | Major Project | 0-4-32 | 20 | Periods/Week: 36 Credits: 20 |

**MCA Summary: Core-Courses(19), Lab-Courses (10), CBCSE & CBCSS-Courses(5+5), Projects (2) & Credits: 120-135**
***Minimum Valid Credit Requirements for the award of MCA degree=120***

| | | CBCS Courses for PG Students: L-T-P: 4-0-0 /3-0-2 (4 Credits) |
|---|---|---|
| I | CBCSE117 | e-Business Systems, Principle of Management, Organizational Behavior |
| II | CBCSE227 | Systems Analysis and Design, Scientific and Statistical Techniques, Management Information System |
| III | CBCSE337 | Modeling and Simulation, Digital Image Processing, Numerical Optimization,  IT Management |
| IV | CBCSE447 | Data Mining and Warehousing, Software Quality Assurance, Software Project Management. |
| V | CBCSE557 | Advance DBMS, J2EE,  Cyber Security, Distributed Systems, Cryptography, Cloud Computing |

| | | CBCS (Ability/Skill Enhancement) Courses for PG Students: L-T-P: 2-0-2 (3 Credits) |
|---|---|---|
| I | CBCSS118 | MATLAB Computation |
| II | CBCSS228 | Multimedia with Flash |
| III | CBCSS338 | Mobile Applications Development |
| IV | CBCSS448 | Programming in Python |
| V | CBCSS558 | Big Data Analytics with HADOOP |

*NOTE:- Relevant CBCS courses, of minimum 2 credits, may also be chosen from other departments.*

# DEPARTMENT OF COMPUTER SCIENCE

## MCA SYLLABUS-2019: (CORE Courses)

| CSC111: Digital Computer Design |
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1. **Number System and Data Representation:** Binary, Octal, Decimal, and Hexa-Decimal Number Systems; Base Conversions; Binary Arithmetic; Complements: (r-1)'s and r's Complement, Subtraction using Complements; Floating and Fixed-point Representation, Binary Codes for Decimal Digits: BCD Code, Excess-3 Code, 84-2-1 Code, 2421 Code, Reflected Code; Error Detection Code; ASCII, EBCDIC codes.

2. **Boolean Algebra and Logic Gates:** Boolean Algebra-Basic Definitions, Huntington's Postulate, Switching Algebra, Basic Theorems and Properties; Boolean Functions: Basic Definition, Literals, Minimization of Boolean Functions by Algebraic Manipulation, Complement of a Boolean Function; Canonical and Standard Forms: Minterms and Maxterms, Boolean Function as a Sum of the Minterms, Boolean Function as a Product of Maxterms, Conversion Between Canonical Forms, Standard Form of a Boolean Function; Other Logical Operations; Digital Logic Gates: Basic Gates – AND, OR, NOT; Universal Gates – NAND, NOR; Other Gates – XOR, XNOR, AND-OR-INVERT, and OR-AND-INVERT; Implementation of Boolean Functions.

3. **Simplification of Boolean Functions:** Karnaugh Maps Method: Two Variables K-Map; Three, Four and Five Variables K-Maps; Product of Sum Simplification, Don't Care Condition, Simplification of a Boolean Function with Don't Care; Tabulation Method: Determination of Prime-Implicants. Selection of Essential Prime-Implicants.

4. **Combinational Logic:** Design Procedure; Design of Half and Full Adder, Half and Full Subtractor, Code Conversion; Combinational Logic with MSI and LSI: Binary Parallel Adder, Decimal Adder, BCD Adder, Magnitude Comparator, Decoders, Encoder, Multiplexers, De-Multiplexer, ROM, and PLA.

5. **Sequential Logic:** Flip-Flops: RS Flip Flop, Clocked RS, JK Flip Flop, Master Slave JK FF, D Type FF, T Type FF; Analysis of Clocked Sequential Circuits: State Table, State Diagram, State Equations, Flip Flop Input Functions; FF Characteristic Tables; FF Excitation Tables; Design of Sequential Circuits; Counter: Binary Counter, BCD Counter, Design of Counters. Registers: Register with Parallel Load, Shift Registers, Bidirectional Shift Register with Parallel Load, Serial Addition using Shift Registers; Counters: Ripple Counters, Binary Ripple Counters, BCD Ripple Counters, Synchronous Counters, Binary Synchronous Counter, Binary Synchronous Up-Down Counter, Binary Counter with Parallel Load, Timing Sequences and Signals, Johnson Counter

### REFERENCES
**Mano: Digital Logic and Computer Design, PHI**
Rajaraman & Radhakrishnan: An Introduction to Digital Computer Design, PHI.
Donald e Givone: Digital Principles and Design, TMHl

| CSC112: Discrete Mathematical Structures |
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1. **Basic Structures**: Set, Multi-set and Sequences; Type of sets, Set Operations, Power Set, Cartesian Products, Relation, Representation of relation, composition of relations, Functions, Types of Functions, Inverse of a functions, Compositions of functions, function representation, Sequences, Special Integer Sequences, Summations, Algebraic Structures, Groups, Rings etc.

2. **Relations and Partial Orders:** Equivalence Relation, Reflexive, Symmetric and Transitive Closure, Transitive Closure and Warshall's Algorithm; Equivalence Classes and Partitions; Partial Ordering, Lexicographic Order, Hasse Diagram, Maximal and Minimal Elements, Lattices and Topological Sorting.

3. **Logic, Reasoning and Inferences:** Foundations of Logic; Propositions, Conditional Statements, Bi- conditionals, Truth Table, Precedence of Logical Operators, Translating English Sentences, System Specifications, Logic Puzzles, Propositional, Logical Equivalences, De Morgan's Laws, and Construction of New Logical Equivalences; Predicates and Quantifiers – Predicates, Quantifiers, Universal Quantifiers, Quantifiers with Restricted Domains, Precedence, Binding Variables, Logical Equivalences, Negating Quantified Expressions, Translation to English Expressions, Rules of Inferences, valid Arguments, Proof Techniques.

4. **Counting:** Simple and Complex Counting Problems, Inclusion-Exclusion Principle; Tree Diagrams; The Pigeonhole Principle; Permutations, Combinations, Binomial Coefficients, Examples and Applications; Binomial Coefficients, Binomial Theorem, Expression, and other Identities; Permutations and Combinations with Repetition, Permutations with Indistinguishable Objects, Distributing Events into Boxes; Generating Permutations and Combinations.

5. **Graphs:** Graph Models and Terminologies; Types of Graphs; Graph Isomorphism; Euler and Hamiltonian Paths and Circuits; Spanning tree, Number of spanning trees of a graph, Some graph algorithms

### REFERENCES
**Rosen: Discrete Mathematics and its Applications with Combinatorics and Graph Theory, TMH**
Kolman: Discrete Mathematical Structures, PE
Tremblay and Manohar: Discrete Mathematical Structures, TMH

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| **CSC113: Algorithmic Problem Solving** |
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| 1. **Problem Solving Approach**: Introduction to Programs and Algorithms; Problem Solving Aspect (Algorithm Devising); Algorithm Design Aspect (Top-down Design); Algorithm Implementation Essential and desirable Features of an Algorithm; Efficiency of an Algorithm, Analysis of Algorithm , Design of an Algorithm Using Pseudo codes; Algorithm Implementation; Program Verification; Algorithm Efficiency, Analysis and Order: Importance of Developing Efficient Algorithms; Complexity Analysis of Algorithms: Every-Case Time Complexity, Worst-Case Time Complexity, Average-Case Time Complexity, Best-Case Time Complexity. |
| 2. **Basic Algorithms** – Exchanging the Values of Two Variables, Counting, Summation of a Set of Numbers, Factorial Computation, Sine Function Computation, Generation of the Fibonacci Sequence, Reversing the Digits of an Integer, Base Conversion, etc. Flowchart. Flowchart – Symbols and Conventions, Recursive Algorithms. |
| 3. **Factoring Methods:** Finding the square root of number, Smallest Divisor of an integer, Greatest common divisor of two integers, Generating prime numbers, Computing prime factors of an integer, Generation of pseudo random numbers, Raising a number to a large power, Computing the $n$th Fibonacci number. |
| 4. **Array Techniques:** Single and Multidimensional Arrays, Array Order Reversal**,** Array counting, Finding the maximum number in a set, removing duplicate elements from an ordered array, partitioning an array, Finding the $k$th smallest element in an array, Finding monotones subsequence. |
| 5. **Merging, Sorting and Searching:** The Two Array merge**,** Sorting by selection, Sorting by exchange, Sorting by insertion, Sorting by diminishing increment, Sorting by partitioning, Binary search, Hash searching. |
| REFERENCES<br>**Dromey: How to Solve by Computer, PE**<br>Kruse: data structures and Program Design, PHI<br>Deitel & Deitel: C – How to Program, PE |
| **CSC114: Programming in C** |
| 1. **Basic Concepts**: Historical Perspective, Strength of C, Programs and Algorithms; Basic Features of an Algorithm; Algorithm Design Using Pseudo codes; Implementation; Program Verification; Flowchart – Symbols and Conventions. Character Set; Keywords; Identifier, Constants, and Variables; Constant Types – Numeric and Character Constants; Data Types –Character, Integer and Floating Point; Signed, Unsigned, Short, and Long Integers; Data Declaration and Definition, Operator & Expression – Arithmetic, Relational, Logical, Increment, Decrement, Assignment, Conditional, and Bitwise Operators; Precedence & Associability of Operators; Managing Console I/O, Formatted I/O, |
| 2. **Control Structures:** Decision Making (Branching) Structures – If Statement, If-Else Statement, Nested If-Else Statement, Else-If Ladder, Switch Statement, Goto Statement; Looping Structures – While Statement, Do-While Statement, For Statement, Continue and Break Statements. |
| 3. **Functions:** Library Functions; User-Defined Functions; Function Declaration (Prototype) and Function Definition; Function Arguments – Dummy, Actual and Formal Arguments; Local and Global Variables; Function Calls – Call by Value and Call by Reference; Returning Multiple Values from a Function, Recursion and Recursive Functions, Storage Class & Scope of Variables – Automatic Storage, Extern Storage, Static Storage, and Register Storage. |
| 4. **Arrays, Strings and Pointers:** Single Dimensional Arrays; Accessing Array Elements; Initializing an Array; Multidimensional Arrays; Initializing Multidimensional Arrays; Memory Representation; Accessing Multidimensional Array Elements; Array of Characters; String Manipulation Functions; Introduction to Pointers; Pointer Variable Declarations and Initializations; Null Pointer; Constant Pointers; Void Pointer; Pointer Operators; Pointer Arithmetic; Application of Pointers; Dynamic Memory Allocations – malloc, calloc, realloc and free functions; Pointers and Strings. |
| 5. **Structure, Union, Enumeration and Files:** Structure Declaration and Initialization; Accessing Structure Members, Structure Assignments; Array of Structures and Arrays within Structures, Nested Structures; Structure as Function Arguments; Structure Pointer; Unions; Difference between Structure and Union; Bit-Fields; Introduction to File; Text and Binary Files; Defining, Opening and Closing Files; I/O Operations on Files, Command Line Arguments. |
| **Balagruswamy: Programming in ANSI C, TMH**<br>Dromey: How to Solve by Computer, PE<br>Deitel & Deitel: C – How to Program, PE |

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| CSC115: Lab-I(C) |
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| **Implementation of at least ONE specific assignment concerning each of the following:** |

1. DOS and Windows: File handling, directory structures, file permissions.
2. Creating and editing simple C program, Compilation and execution with variables and expressions.
3. Precedence of operators, Type casting, Decision control structures, Loop controls and Case control structure
4. Unconditional jumps— break, continue, goto.
5. Different mathematical operations using <math.h>.
6. Modular program development using functions., Arrays and matrix operations and Recursion
7. Pointers, address operators and pointer arithmetics; Pointers, arrays, and functions, Double referential pointers.
8. Structures and Unions, Accessing their members; Dynamic memory allocation/deallocation.
9. Self-Referential Structures and Bit fields
10. File handling, File operations, Standard streams & Command line arguments, Enumerations and Prepocessors.

| CSC225: Lab-III(C++) |
|---|
| **Implementation of at least ONE specific assignment concerning each of the following:** |

1. Structure and nested structure with methods.
2. Creation of class along with constructors, destructors.
3. Friend function, static data members and member functions
4. Passing objects to a function, returning object from a function and nested classes.
5. Creating array of objects, pointer to objects and pointer to class members.
6. Dynamic memory allocation and deallocation using new and delete, this pointer & reference variable.
7. Function and constructor overloading, operator overloading, copy constructor, default function arguments.
8. Different types of inheritance, virtual functions, abstract class and exception handling.
9. Creation, use and deployment of generic functions
10. File creation and handling using FileStream classes, command line arguments

# DEPARTMENT OF COMPUTER SCIENCE
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### CSC221: Computer Architecture

1. **Register Transfer and Micro Operations:** Microprocessor Architecture, Architecture Tree, Functional Block Diagram of 8085, Register Section, Timing and Control Unit, Addressing Modes (General), Assembly Programming 8085: Addressing Modes of 8085, Instruction Sets, Instruction Format, Data Format, Opcode Format, Writing Assembly Programs, Timing Diagram and Machine Cycle, Register Transfer Language (RTL); Register Transfer; Bus Transfer; Memory Transfers; Arithmetic Microoperations; Logic Microoperations, List of Logic Microoperations, Hardware Implementation, Shift Microoperations; Arithmetic Logic Shift Unit.

2. **Central Processing Unit (CPU):** General Register Organization; Control Word; Stack Organization – Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expression. Instruction Format – Three Address Instructions, Two Address Instructions, One Address Instructions, Zero Address Instructions. Addressing Modes; Program Control - Status Bit Conditions, Conditional Branch Instructions, Subroutine Call; Program Interrupt – Types of Interrupts; RISC and CISC Characteristics.

3. **Computer Arithmetic:** Binary Arithmetic Operations: Addition and Subtraction with Signed Magnitude Data; Multiplication – Algorithms, Booth Multiplication Algorithm; Division Algorithm, Divide Overflow; Floating Point Arithmetic Operations; Decimal Arithmetic Operations – Addition, Subtraction, Multiplication, and Division.

4. **Input-Output Organization:** Peripheral Devices; I/O vs. Memory Bus; Isolated vs. Memory Mapped I/O; Asynchronous Data Transfer, Strobe Control, Handshaking; Mode of Data Transfer; Priority Interrupt, Daisy Chaining Priority, Parallel Priority Interrupt, Priority Encoder, Interrupt Cycle, Software Routines; Direct Memory Access (DMA) Controller, DMA Transfer; Input-Output Processor (IOP) – IBM 370 I/O Channel, Intel 8089 IOP; Serial Communication.

5. **Memory Organization and Pipelining:** Memory Hierarchy; RAM, ROM, Memory Address Map, Memory Connection to CPU; Auxiliary Memory, Magnetic Disks, tape; Associative Memory, Hardware Organization, Match Logic, Read Operation, Write Operation; Cache Memory – Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization; Virtual Memory – Address Space and Memory Space, Address Mapping using Page, Associative Memory Page Table, Page Replacement; Memory Management Hardware, Segmented Page Mapping, Memory Protection; Pipeline, and Vector Processing: Parallel Processing; Pipelining – Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline; Vector Processing – Vector Operations, Matrix Multiplication, Memory Interleaving; Array Processor – Attached Array Processor, SIMD Array Processor.

REFERENCES
**Mano: Computer System Architecture, PHI**
William Stalling: Computer Organization and Architecture, PE
Rajaraman & Radhakrishnan: Computer Organization and Architecture, PHI.

### CSC222: Theory of Computation

1. **Basic Concepts:** Finite Automata, Formal Proofs, Deductive Proofs, Contrapositive, Proof by Contradiction, Proof by Counter Example, Proof by Induction, Concept of Automata Theory, Finite Automata: Deterministic Finite Automata (DFA), Languages of DFA; Non-Deterministic Finite Automata (NFA), Language of NFA, Equivalence of Deterministic and Non-deterministic Automata, Application of Automata: Finding String in Text, Recognizing a Set of Keywords, Finite Automata with Epsilon Transition.

2. **Regular Languages and Regular Grammars:** Regular Expressions, Finite Automata and Regular Expressions, Conversion from DFA to Regular Expression, Conversion from Regular Expression to Automata, Languages Associated with Regular Expressions, Connection between Regular Expressions and Regular languages, Regular Grammar, Properties of Regular Languages, Closure properties of Regular Languages. Identifying Non-regular Languages.

3. **Context Free Languages:** Context Free Grammars, Examples of Context Free Languages, Left most and Right most Derivations, Derivation Trees, Relationship between Derivation and Derivation Trees, Ambiguity in Grammars and Languages, Ambiguous Grammar, Methods for transforming Grammars; An useful Substitution Rule, Removing Useless productions, Removing λ- productions, Removing unit productions, Two important Normal Forms: Chomsky Normal Forms and Greibach Normal Form; Pumping Lemma for CFLs.

4. **Pushdown Automata:** Push Down Automata (PDA), Informal and Formal Definition of a Push Down Automata, Descriptions of a PDA, the Language Accepted by a Push Down Automata, Push Down Automata and Context Free Languages, Context Free Grammar for Push Down Automata; Deterministic Push Down Automata.

5. **Turing Machines:** The Standard Turing Machine, Definition of a Turing Machine, Turing Machine Language Accepters, Other Models of the Turing Machine, Multi-tape Turing Machines, Multidimensional Turing Machines, Nondeterministic Turing Machines, The Universal Turing Machine; Recursive and Recursively Enumerable languages, Some Problems that cannot be Solved by Turing Machines- Computability and Decidability.

REFERENCES
**Linz: Introduction to Formal and Automata, JBL**
Hopcroft: Introduction to Automata Theory, Languages, and Computation, Pearson
Martin: Introduction to Languages and the Theory of Computation, TMH
Mishra: Theory of Computer Science, PHI

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| **CSC223: Operating Systems** |
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1. **OS Primitives:** Definition and Views of operating system, Types of OS, Batch Systems, multi programming, time–sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, System programs, Virtual machines
2. **Process Management:** Process concept, Process scheduling, Cooperating processes, Threads, Inter process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation. The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.
3. **Storage Management:** Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.
4. **Threats and Security:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Network structure security. Windows NT-Design principles, System components, Environmental subsystems, File concept, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management
5. **Shell Programming:** Types of shells, Shell functionality, Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables), Functions & file manipulations, Processing file line by line, Regular Expression & Filters. Advanced Scripting Techniques: Providing command line options to scripts, Shell & sub shells, Exporting variables, Remote shell execution, Dialog boxes, SQL with Shell, Connecting to MySQL using shell, Running SQL queries from a shell script

REFERENCES
**Galvin and Gagne: Operating System Concept, JW**
Stallings: Operating Systems - Internals and Design Principles, PE
Givone: Digital principles and Design, TMH

| **CSC224: Object Oriented Programming in C++** |
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1. **OO Concepts:** Programming Paradigms: Unstructured Programming, Structured Programming, Object Oriented Programming; Abstract Data Type (ADT); Class; Object; Message; Encapsulation; Polymorphism; Inheritance; Pros and Cons of Object-oriented Methodology; cin and cout Objects.
2. **Classes and Objects:** Classes; Friend Functions: Introduction, Benefits and Restrictions, Friends Classes; Inline Functions; Constructor: Introduction, Parameterized Constructor; Destructor and its usages; Static Data Member and Static Member Functions; Creating Object; Passing and Returning Object(s) to/from a Function; Object Assignment; Nested and Local Classes; Arrays of Objects; Pointer to Objects; this Pointer, Pointer to Derived Type; References; Reference vs Pointer; Reference Parameters; Dynamic Memory Allocation: new and delete Operators
3. **Function and Operator overloading:** Function overloading: Introduction, Rules, Overloading Constructors, Copy Constructors; Default Function Arguments vs. Function Overloading. Operator Overloading: Introduction, Operators that cannot be Overloaded, Overloading Operators using Member Function and Friends Functions, Overloading different operators including prefix and postfix form of ++ and -- operators, Shorthand Operators, new, delete, [], (), -> and comma Operators
4. **Inheritance & Virtual function**: Inheritance: Introduction, Types of Inheritances, Base-Class Access Control, Protected Members, Protected Base-class Inheritance, Multiple Inheritance, Problem in Multiple Inheritance, Solution to Multiple Inheritance Problem, Passing Parameters to Base Class Constructors; Virtual functions: Introduction, Calling a Virtual Function using Base Class Reference, Pure Virtual Function, Abstract Class
5. **Generic Function, Exception and File Handling:** Generic Functions: Benefits, Functions with Two Generic Types, Explicitly Overloading a Generic Function, Overloading a Function Template, Restriction, Generic Sort, Generic Class. Exception Handling: Introduction, Using try and catch Blocks, Creating Exception Class, throwing Object. C++ Streams; C++ File Handling: Opening/Closing a File, Reading /Writing a Text File, Random Access, Reading /Writing Object to a File

REFERENCES
**Herbert Schildt: Complete Reference C++, TMHl**
Deitel & Deitel: C++ How to Program, PE
Kamthane: Object Oriented Programming with ANSI and TURBO C++, PE

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

| CSC331: Database Management Systems |
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1. **Basic Concepts:** Data, Database and DBMS; Database vs. Traditional File System Approach; Three Schema Architecture of DBMS and Data Independence; Categories of Database Management Systems: Hierarchical, Network and Relational Database Systems.
2. **Database Models**: Introduction, Categories of Database Models: High-level or Conceptual Data Models, Representational or Implementation Data Models, Low-level or Physical Data Models, Object Data Models. Entity relationship (ER) Model: Basic Concepts and their representations – Entity, Entity Type and Entity Set, Attributes and Keys, Relationships, Relationship Types, and Structural Constraints, Weak Entity, Naming Conventions & Design Issues in ER Model. ER and EER Diagrams.
3. **Relational Database Model:** Structure of Relational Model; Domains, Attributes, Tuples, and Relations; Characteristics of Relations; Relational Constraints – Domain Constraints, Key Constraints, Entity Integrity, and Referential Integrity Constraints; Relational Database Schema; Relational Algebra Operations – Select, Project, Rename, Union, Intersection, Set Difference, Join, and Division Operations; Aggregate Functions and Groupings.
4. **Structured Query Language (SQL):** Schema, Table and Domain Creation; Schema and Table Deletion; Table Modification; Insert, Delete, and Update Statements; SELECT- FROM-WHERE Structure; Renaming Attributes; Nested Queries and Set Comparisons; EXISTS and UNIQUE Functions; Aggregate Functions; Creating and Updating Views. Introduction to PL/SQL.
5. **Functional Dependencies and Normalization:** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Inference Rules for Functional Dependencies; Normalization using Functional Dependencies – First Normal Form (INF), Second Normal Form (2NF), Third Normal Form (3NF), and Boyce-Codd Normal Form (BCNF); Multi- Valued Dependencies and Fourth Normal Form (4NF); Join Dependencies and Fifth Normal Form (5NF); Relation Decomposition and Insufficiency of Normal Forms; Dependency Preserving and Lossless Join Decompositions; Null Values and Dangling Tuples. Transaction Management and Concurrency Control: Transaction Concept; Transaction State; Concurrent Executions; Serializability and Recoverability; Testing for Serializability. Concurrency Control – Lock-Based Protocols and Timestamp-Based Protocols.

REFERENCES
**Navathe: Fundamentals of Database Systems, PE**
Silberschatz, Korth and Sudarshan: Database System Concepts, TMHl
Loney and  Koch: ORACLE 9i – The Complete Reference, TMH.

| CSC332: Software Engineering |
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1. **Software Process:** Software Engineering and Development, Software and its Components; Software characteristics; problem of Size and Complexity; Evolving Role of software; Changing Nature; Legacy Software and Software Myths; Software Engineering – A Layered approach, Process Framework, CMMI; Technology, Product and Process.
2. **Software Process Models:** Prescriptive Models: Waterfall Model; Incremental Process Models , RAD; Evolutionary Models – Prototyping, Spiral, and concurrent Models; The Unified Process – Phases and Work Products; Agile Process Models – Extreme Programming and Adaptive; and Dynamic Software Development – Scrum, Crystal, Feature Driven and Agile Modeling.
3. **SE Principles and Practices:** Software Engineering Practices – Essence and Principles; Communication Practices; Planning Process; Modelling Principles; Construction Practices – Coding principles and Concepts; Testing Principles ; and Deployment; Computer based Systems; System Engineering Hierarchy – System Modelling and Simulation; Business Process Reengineering; Product Engineering; system modelling.
4. **Requirements Engineering and Modelling:** Requirements Engineering Tasks; Requirements Engineering Process; Eliciting Requirements; Developing Use-Cases; Analysis Modelling; Negotiating Requirements; and Validations. Requirements Analysis; Analysis Modelling Approaches; Object Oriented Analysis; Scenario Based and Flow Oriented Modelling.
5. **Design Concepts and Models:** Design concepts and principles**,** Software Design and Software Engineering, Design Context, Process and Quality; Design Concept – Abstraction, architecture, Pattern, modularity, information hiding, functional independence, refinement, design classes; design models – data elements, interface elements, architecture elements; User Interface Design- Process and Models, User Interface Design-The Golden Rules, Component-Level Design.

REFERENCES
**Pressman: Software Engineering – Apractitioners' Approach, TMH.**
Aggarwal & Singh: Software Engineering, New Age International Publishers
Jalote: Software Engineering, Narosa

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

| CSC333: Data Structures and Program Design |
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1. **List and Matrices:** Data Structure, Linear Data Structure, Array, Address Calculation, Single Linked List, Circular Linked List, Doubly Linked List, Circular Doubly Linked List, Applications of Arrays and Linked List, Matrix, Mapping of Matrix elements to One Dimensional (1D) Array, Special Matrices, Triangular, Diagonal, Tri-Diagonal, Representation in Row Major and Column Major Order, Mapping of non-null Elements in 1D Array, Sparse Matrix, Applications of Linked Lists: Bin Sort, Radix Sort, Convex Hull.

2. **Stacks and Queues:** Stack Data Structure, Push & Pop Operations, Representation and Implementation of Stack using Array and Linked List, Applications of Stack: Conversion of Infix to Postfix Expressions, Parenthesis Matching, Towers of Hanoi, Rat in a Maze, Implementation of Recursive Functions, Queue Data Structure, Various Queue Operations, Circular Queue, Representation and implementation of queues using Array and Linked List, Deque, Applications of Queue Railroad Car Rearrangement, Machine Shop Simulation, Image-Component Labeling, Priority Queues: Priority Queue Using Heap; Max and Min Heap; Insertion into Heap; Deletion from a Heap; Applications of Priority Queue: Heap Sort, Huffman Codes..

3. **Trees:** Binary Trees and their Properties; Representation of Binary Trees: Array-Based and Linked Representations; Binary Tree Traversals; Binary Search Trees (BST); Operations on BST: Search, Insertion and Deletion; BST with Duplicates; Indexed BST; Applications of BST: Histogramming, Best- Fit Bin Packing. B-Trees and their Representation; Operations on B-Tree: Search, Insertion and Deletion; B+-Trees; AVL Trees; AVL Tree Representation; Operations on AVL Trees: Search, Insertion and Deletion; Introduction to Red- Black and Splay Trees.

4. **Sorting and Searching**: Insertion Sort, Bubble Sorting, Quick Sort, Merge Sort, Shell sort, Sequential search, binary search, Introduction to Hashing, Hash Table Representation, Hash Functions, Collision and Overflows, Linear Probing, Random Probing, Double Hashing, and Open Hashing.

5. **Graphs and File Structure:** Terminology & Representations, Graphs & Multi- graphs, Directed Graphs, Representations of Graphs, Weighted Graph Representations; Graph Traversal Methods: Breadth-First Search and Depth-First Search; Spanning Tree and Shortest Path Finding Problems, Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons

| REFERENCES |
|---|

**Langsam, Augenstin and Tannenbaum: Data Structures using C and C++, PE**
Sahni: Data Structures, Algorithms and Applications, Galgotia
Lipschutz, Data Structures, TMH

| CSC334: Analysis and Design of Algorithms |
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1. **Algorithms Analysis and ADT:** Importance of Developing Efficient Algorithms; Every- Case Time Complexity, Worst-Case Time Complexity, Average-Case Time Complexity, and Best-Case Time Complexity; Complexity Representation using Order Notations: Big-o (O), Theta (Θ), Big-Omega (Ω), Small-o (o) and Small-Omega (ω) Notations; Properties of Complexity Notations; Limit Approach to Determine Order, Master Theorem. Algorithm Design Techniques (ADT): Divide and Conquer Approach – Divide, Conquer, and Combine Steps; Design and Analysis of Binary Search (Recursive and Non-recursive), Merger Sort, Quicksort, and Strassen's Matrix Multiplication Algorithms.

2. **Dynamic Programming:** Introduction to Dynamic Programming; Difference Between Divide-and- Conquer and Dynamic Programming Approaches; Binomial Coefficient Finding using Dynamic Programming; Dynamic Programming and Optimization Problems: Chained Matrix Multiplication and Longest Common Subsequence Problems; Travelling Salesman Problem.

3. **Greedy Approach**: Introduction to Greedy Approach; Components of Greedy Approach: Selection Procedure, Feasibility Check, and Solution Check; Minimum Spanning Tree Generation: Prim's and Kruskal's Algorithms; Dijkstra's Algorithm for Single-Source Shortest Paths; Scheduling: Single Server and Multi-Server Scheduling, Scheduling with Deadlines; Huffman Code; The Knapsack Problem (Greedy Approach vs Dynamic Programming): 0-1 Knapsack and Fractional Knapsack Problems.

4. **Backtracking:** Introduction to Backtracking; Backtracking Technique: State Space Tree, Promising and Non-Promising Nodes, Pruned State Space Tree; Backtracking Algorithms for n-Queens, Sum-of-Subsets, Graph Coloring, and 0-1 Knapsack Problems

5. **Branch-and-Bound Method and Intractable Problems:** Introduction to Branch-and-Bound Method; Solving 0-1 Knapsack Problem using Branch-and-Bound Method: Breadth-First Search with Branch-and- Bound Pruning, Best-First Search with Branch-and-Bound Pruning; Solving Traveling Salesman Problem using Branch-and-Bound Method. Intractable Problems: NP-hard and NP-complete problems, Some examples of NP hard and NP complete Randomized Algorithm with examples

| REFERENCES |
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**Horowitz and Sahani, Fundamentals of Computer Algorithms, Galgotia**
Aho, "Design and Analysis of Computer Algorithms", PE
Thomas H Cormen "Introduction to Algorithms", PHI

# DEPARTMENT OF COMPUTER SCIENCE

Faculty of Natural Sciences, Jamia Millia Islamia

| CSC336: Lab-VI (Oracle) |
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**Implementation of at least ONE specific assignment concerning each of the following:**
1. SQL statements to create, update, and delete databases and tables
2. SQL statements to insert, update, and delete records from tables
3. SQL statements to create, update, and delete views
4. Simple SQL queries to retrieve information from a database
5. Nested SQL queries to handle complex information retrieval requirements.
6. Managing changes affecting the data using COMMIT, ROLLBACK and SAVEPOINT.
7. Providing security to databases using GRANT and REVOKE commands.
8. SQL queries using order by, group by and having clauses.
9. SQL sub queries, joins, views, nested queries, inner and outer joins.
10. SQL queries using aggregate functions like count, average, sum, etc.
11. PL/SQL blocks using basic data types, branching and looping constructs
12. Database triggers, functions/procedures and packages using PL/SQL

| CSC446: Lab-VIII (Java) |
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**Implementation of at least ONE specific assignment concerning each of the following:**
1. Basic Data Types, Operators, Input and Output, Control Flow, Big Numbers, Vectors and Arrays.
2. Class, Objects, Inheritance, Packages, Generic Array Lists,
3. Dynamic memory allocation using new and delete operators, function and constructor overloading, operator overloading.
4. Object Wrappers and Autoboxing, Varying Parameters, Enumeration Classes, Reflection.
5. String handling - String Comparison, String Concatenation, Substring finding, String tokenization.
6. Exception handling – Exception Catching and Handling, Assertions, Logging, Debugging.
7. Generic functions and classes, Virtual machine, Restrictions, Wildcards.
8. Graphical User Interfaces (GUI), Frame creation and positioning, Displaying images and event handling.
9. Java Database Connectivity (JDBC) using databases like SQL Server, Executing Queries and Viewing Results.
10. Collections and Multithreading, Interrupting Threads, Thread Synchronization, Blocking Queues,etc.
11. Java Applet development, Java Applet launching from web pages, Implementing SAX and DOM XML parser
12. Web app development using Servlet on Tomcat that will collect student information from each of its user and echo the user data back for the user to review. Make sure that your graphics user interface uses select control, text field, text area, radio buttons, and submit button.

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

| CSC441: Artificial Intelligence |
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1. **History and Applications:** Artificial Intelligence, Foundations and History of Artificial Intelligence, Defining AI: Acting Humanly (Turing Test Approach), Thinking Humanly (Cognitive Modeling Approach), Thinking Rationally (laws of thought approach), Acting Rationally (Rational Agent Approach); Foundations of Artificial Intelligence; AI techniques, Expert Systems, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Introduction to Computer vision, Natural Language Possessing, Machine learning, Soft Computing etc.

2. **Problem solving using Search:** Searching for solutions, Uninformed Search Strategies: Breadth-first Search, Depth-first Search, Depth-limited Search, Iterative Deepening depth-first search, Comparing uninformed search strategies; constraint satisfaction problems, Heuristic Search Techniques: Hill Climbing, Simulated Annealing, Best First Search: OR Graphs, Heuristic Functions, A* Algorithm, AND- OR Graphs, AO* Algorithm, Adversarial Search: Zero-sum perfect information Games, Optimal Decisions and Strategies in Games, Mini-max Algorithm, Alpha-beta Pruning, Imperfect Real-time decisions, Games that include chance, State of the art game programs.

3. **Knowledge Representation & Reasoning:** Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Representations and mappings, Approaches to Knowledge Representation, Procedural versus Declarative Knowledge; Predicate Logic: Representing Simple facts, Instance and is-a relationships in Logic, Proposition versus Predicate Logic, Computable Functions and Predicates, Rules of Inferences and Resolution-refutation, Logic Programming and Horn Clauses; Weak Slot-and-Filler Structures: Semantic Nets, Frames; Introduction to Semantic Web and ontologies, Strong Slot-and-Filler Structures: Conceptual Dependency, Scripts.

4. **Programming in PROLOG:** Introduction, How Prolog Works, Backtracking, CUT and FAIL operators, Built-in Goals, Negation, Lists, Syntax and built-in Functions, Basic list manipulation functions in PROLOG, Predicates and Conditionals, Iteration and Recursion, recursive Lists processing, Search in Prolog: Breadth-first, depth-first etc. search for AI problem solving.

5. **Probabilistic/Statistical Reasoning:** Probability and Bayes' Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Inference in Bayesian networks, Markov chains, Non-monotonic Reasoning, Truth Maintenance Systems, probabilistic reasoning over time.

REFERENCES
**Russel and Norvig: Artificial Intelligence–A Modern Approach, PE**
Elaine Rich, Kevin Knight and B. Nair: Artificial Intelligence, TMHl
Ivan Bratko: PROLOG Programming, PE

| CSC442: Computer Graphics |
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1. **Graphics Fundamentals:** Overview and Applications, Video Display Devices; Raster Scan Display; Random Scan Display; Display Device: CRT, DVST; Flat Panel display: Plasma Panel Display, Thin Film Electroluminescent Display, LED Display Device, Liquid Crystal Display Device; Color CRT Display Devices: Beam-Penetration Method, Shadow-Mask Method, Algorithms: Line Drawing Algorithm: Symmetric DDA, Simple DDA, Bresenham Line Drawing Algorithm with Maximum Moment in x-Direction, Bresenham Line Drawing Algorithms; Circle Generating Algorithms; Ellipse Generating Algorithm; Polygon Fill Algorithms.

2. **Two Dimensional Geometric Transformation:** Basic Transformations: Translation, Rotation, Scaling; Matrix Representation; Homogeneous Coordinates; Composite Transformations: Translations, Scalings, General Pivot-Point Rotation, General Fixed-Point Scaling, General Composite Transformations and Computational Efficiency; Other Transformations: Reflection, Reflection about x-axis, Reflection about y-axis, Reflection about a Line Perpendicular to xy-Plane and Passes Through Origin, Reflection about a General Line in xy-Plane, Shearing Operations; Transformation between Cartesian Coordinate Systems.

3. **Two Dimensional Viewing:** Viewing: The viewing Pipeline, Viewing Coordinate Reference Frame, Window to Viewport Coordinate Transformation; Clipping: Point clipping; Line Clipping; Cohen-Sutherland Line Clipping Algorithm, Midpoint Subdivision Line Clipping Algorithm, Liang-Barsky Line Clipping Algorithm, Liang-Barsky Line Clipping Algorithm to Clip a Line Against Non-Rectangular Convex Polygon, Splitting Concave Polygon into Convex Polygons, Liang-Barsky Line Clipping Algorithm to Clip a Line Against Concave Polygon; Polygon Clipping: Sutheland-Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping; Text clipping.

4. **3-D Geometric Transformations and Viewing:** Basic Transformations: Translation, Rotation, Scaling; Other Transformations: Reflections, Shears; Projection: Types of Projections, Perspective Projection Transformation with Center at Origin, Perspective Projection Transformations with center at $C_0$(a, b, c), Orthographic Projection Transformation, Orthographic Projection Transformation, Isometric Projection Transformation; 3-D Line Clipping Algorithms.

5. **3-D Object Representations, Shading, and Hidden Surface Detection:** Curve Line and Surface: Spline Representation, Cubic Spline, Bezier Curve, Beta Spline Curve, Beta Spline Surface, Bezier Surface, Fractal Geometry; Fractal Geometric: Fractal Generation Procedure, Classification of Fractal, Fractal Dimension, Fractal Construction Methods; Shading: Shading Algorithms, Shading Model, Illumination Model; Hidden Surface Detection: Z-Buffer Method, A-Buffer Method, Scan Line Method.

REFERENCES
**Hearn and Baker: Computer Graphics, PE**
David F. Roger, Procedural Element for Computer Graphics, TMH
Roger & Alan: Mathematical Element for Computer Graphics, TMH

| CSC443: Programming in Java |
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1. **Java:** Java White Paper Buzzwords, History of Java, Common Misconceptions, Choosing a Development Environment: Command-Line Tools, Graphical Application, Applets; A Simple Java Program, Comments, Data Types, Variables, Operators, Input and Output, Control Flow, Big Numbers, Arrays, Predefined Classes, User Defined Classes, Static Fields and Methods, Packages, Class Path, Documentation, Comments, Class Design; Inheritance: Super-classes and Subclasses, Types of Inheritance, Polymorphism, Abstract class, Object: The Cosmic Super class, Generic Array Lists, Object Wrappers and Autoboxing, Methods with a Variable Number of Parameters, Enumeration Classes, String Handling, Immutable String, Methods of String Class, StringBuffer, StringBuilder, StringTokenizer

2. **String Handling, Exception Handling and Generic Programming:** String Handling APIs: String, Immutable String, Methods of String Class, StringBuffer, StringBuilder, StringTokenizer. Exceptions: Dealing with Errors, Catching Exceptions, Guidelines for Using Exceptions, Assertions, Logging; Generic Programming: Definition, Generic Methods, Bounds for Type Variables, Generic Code and VM, Restrictions and Limitations, Inheritance Rules for Generic Types, Reflection and Generics.

3. **Java Collections and Multithreading:** Collection Interfaces, Concrete Collections, The Collections Framework, Algorithms, Legacy Collections, Multithreading: Threads, Interrupting Threads, Thread States, Thread Properties, Synchronization, Blocking Queues, Thread-Safe Collections, Callable and Futures, Executors, Synchronizers.

4. **Java GUI Programming and JDBC:** Introduction to Swing, Creating a Frame, Positioning a Frame, Displaying Information in a Component, Displaying Images, Event Handling, Basics of Event Handling, Actions, Mouse Events, The AWT Event Hierarchy; JDBC: Basic JDBC Programming Concepts, JDBC Drivers, Statements, Executing Queries, Result Sets.

5. **Servlets and Applets:** HTML v/s XML, Creating a Form, Structure of XML Document, Parsing XML Documents – DOM and SAX. Java Servlet, Servlet API Overview, Servlet Life Cycle, Servlet Implementation and Configuration, Servlet Exception, Deployment Descriptor, Servlet Deployment, Installing and Configuring Tomcat Server, Requests & Responses, Servlets & JDBC, Working with Cookies, Tracking Sessions, Context and Collaboration.

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REFERENCES
**Horstmann: Big Java: Compatible with Java 5, 6 and 7, WIE**
Kai Qian, Richard Allen, Mia Gan and Robert Brown: Java Web Development Illuminated, JBL.
Jim Keogh: J2EE : The Complete Reference, TMH

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| CSC444: Data Communication and Networks |
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1. **Data Communication and Networking Overview:** Communication Model; Data Communications; Data Transmission and Related Concepts – Guided Media, Unguided Media, Direct Link, Point-to-Point and Multipoint Guided Configuration, Simplex, Half-Duplex, and Full-Duplex Transmission, Frequency, Spectrum, Bandwidth; Time Domain and Frequency Domain Concepts; Analog and Digital Data Transmission; Transmission Impairments – Attenuation and Attenuation Distortion, Delay Distortion, Noise; Channel Capacity.

2. **Computer Networks and Reference Models:** Computer Networks and its Applications; Broadcast and Point-to-Point Networks; Personal Area Networks; Local Area Networks; Metropolitan Area Networks; Wide Area Networks; Wireless Networks; Internetworks; Network Layers, Protocols, and Interfaces; Connection-Oriented and Connectionless Services. OSI Reference Model; TCP/IP Reference Model; Comparison of OSI and TCP/IP Models; Problems with OSI and TCP Models; Internet and its Usage; Internet Architecture; Connection-Oriented Networks – X.25, Frame Relay, and ATM; Ethernet; Wireless LANs – 802.11.

3. **Transmission Media:** Twisted Pair, Coaxial Cable, Optical Fiber; Wireless Transmission – Antennas, Terrestrial Microwave, Satellite Microwave, Broadcast Radio, and Infrared; Wireless Propagation; Line of-Sight Transmission. Communication Satellites – Geostationary Satellites, Medium-Earth Orbit Satellites, Low-Earth Orbit Satellites; Satellites versus Fiber.

4. **Data Link Layer:** Design Issues**;** Error Detection and Correc**ti**on; Error-Correcting Codes; Error-Detecting Codes; Elementary Data Link Protocols **–** Unrestricted Simplex Protocol, Simplex Stop-and-Wait Protocol; Sliding Window Protocols – One-Bit Sliding Window Protocol, Protocol Using Go Back N, A Protocol Using Selective Repeat, Data Link Protocol Examples – High-Level Data Link Control (HDLC), Point-to-Point Protocol (PPP). Medium Access Control Sublayer – Static Channel Allocation in LANs and MANs; Dynamic Channel Allocation in LANs and MANs; Multiple Access Protocol **–** ALOHA (Pure and Slotted), Carrier Sense Multiple Access (CSMA) Protocols (Persistent and Nonpersistent), CSMA with Collision Detection, Collision-Free Protocols, Wireless LAN Protocols, etc.; Ethernet; Wireless LANS – 802.11 Protocol Stack, 802.11 Physical Layer, 802.11 MAC Sublayer Protocol, 802.11 Frame Structure, and Services; Bluetooth Architecture and Applications; Data Link Layer Switching.

5. **The Network and Application Layer:** Design Issues; Routing Algorithms – Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, etc. Congestion Control Algorithms; IP Protocol; IP Addresses; Subnets; Subnet Mask; Internet Control Protocols, Domain Name System (DNS); DNS Name Space; Name Servers, Electronic Mail – Architecture and Services, User Agent, Message Formats, Simple Mail Transfer Protocol (SMTP), POP3; World Wide Web and Hyper Text Transfer Protocol.

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REFERENCES
**Tanenbaum: Computer Networks, PE**
William Stallings: Data and Computer Communications, PE
Behrouz Forouzan: Data Communications and Networking (SIE), TMH

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| CSC551: Compiler Design and System Software |
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1. **System Software:** Assemblers: One and Two pass, Macros and Macroprocessors, Loading, linking, relocation, program relocatability, linkage editing
2. **Compiler Introduction and Lexical Analysis**: Phases of a Compiler, Lexical Analyzer; Lexical Errors; Input Buffering; Recognition of Tokens; Transition Diagram and its Implementation; Use of LEX to generate a Scanner automatically; Syntax Error and its Handling; Ambiguity in CFG; Non-CFG Constructs
3. **Parsing:** Top Down Parsing; Recursive Descent Parsing; Non-recursive Predictive Parsers and Parsing Algorithm; Eliminating Ambiguity; FIRST and FOLLOW; Constructing Predictive Parsing Table; LL(1) Grammar; Error Recovery in Predictive Parsing; Bottom-Up Parsing: Shift-reduce Parsing, Handles, Handle Pruning, Conflicts; LR Parsers: Constructing SLR; CLR and LALR parsing Tables; Using Ambiguous Grammars with LR Parsing; Parser Generators: Yacc
4. **Semantic Analysis and Intermediate Code generation:** Syntax-Directed Definitions; Attributes of Grammar; Synthesized Attributes; Inherited Attributes; Dependency Graphs; Syntax Trees; DAGs for Expressions; S-Attributed and L-Attributed Definitions and their Evaluation; Translation Schemes; The Symbol Table. Memory Organization of Runtime Environments: Fully Static and Stack-based
5. **Intermediate Code and Code generation:** Intermediate Languages - Syntax Trees, Postfix Notation; Three-Address Code and its Implementation; Code Generation: Basic Code Generation Techniques; Generation of Target Code from Intermediate Code; DAG Representation of Basic Blocks; Code Optimization

REFERENCES
**Aho, Ravi Sethi, Jeffry Ullman, Compilers: Principles, Techniques and Tools, PE**
John Donovan: Systems Programming, TMHl
Kenneth Louden: Compiler Construction: Principles and Practice, Thomson

## CSC552: Information Security

1. **Context, CBK and Principles:** IT Security Importance and Opportunities; Multidisciplinary Approach; Contextualizing Information Security; IS Expertise & Business Systems. Security Management Practices: Security Architecture and Models; BCP; Law, Investigations, and Ethics; Physical Security; Operations Security; ACM Systems and Methodology; Cryptography; Telecommunications, Network and Internet Security; and Application Development Security; Twelve Security Principle and CIA triad.
2. **Security Management and BC-DRP: Security Policies:** Programme-Level, Programme-Framework, Issue-Specific and System-Specific Policies; Development and Management of Security Policies: Security Objectives, Operational Security and Policy Implementation; Policy Support Documents Regulations; Standards Taxonomy; Risk Analysis and Management; Responsible for Security? Business Continuity Plan; Disaster Recovery Planning: Identifying Recovery Strategies, Shared-Site Agreements, Alternate Sites, Additional Arrangements, Testing DRP.
3. **Security Architecture and Models: Defining TCB:** Rings of Trust; Protection Mechanisms in a TCB: System Security Assurance Concepts, Goals of Security Testing and Formal Security Testing Models; TCSE: Minimal, Discretionary, Mandatory and Verified Protection; Trusted Network Interpretation and TCSEC; Comparing ITSEC and TCSEC & ITSEC; CTCPEC, FCITS; CI Models: Bell-LaPadula Model, Biba Integrity Model and Advanced Models; PPO: SFR, EAL and The CEL.
4. **Cryptography:** Cryptography Needs and Significance, Terms and Concepts: Cyphertext, Cryptanalysis, Cryptosystem, Message Digest etc; STE and Substitution; Digesting Data; Digital Certificates, Certification and Envelop; Symmetric and Symmetric Cryptography; Root, Private and Public; Digital Cryptography – Hashing Functions, Block Ciphers and Implementation of PPK cryptography.
5. **Operations Security and Access Control Systems:** Operations Security Principles; Operations Security Process Controls; Operations Security Controls in Action; Information Owner, Discretionary Access Control, ACL, MAC, RAC; Principles of Authentication: The Problems with Passwords, Multifactor Authentication, Biometrics, Single Sign-On, Kerberos and Federated Identities; Remote User Access and Authentication.

REFERENCES
**Merkow and Breithaupt: Information Security - Principles and Practices, PE**
Whitman and Mattord: Principles of Information Security, Course Technology
Palmer: Guide to OS Security, Cengage Publications

# DEPARTMENT OF COMPUTER SCIENCE

| SC553: Machine Learning and Soft Computing |
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1. **Machine Learning and applications:** Machine Learning, Applications of ML, Intelligent Systems, Introduction to Computer vision, Natural Language Possessing, Soft Computing etc, Types of Learning: Supervised, Unsupervised, and Reinforcement Learning, Decision Tree learning, Bayesian Learning and Statistical natural language processing

2. **Connectionist Models/ANN:** Foundations for Connectionist Networks, Biological Inspiration; Different Architectures and Output Functions: Feed-forward, Feedback, Recurrent Networks, Step, Sigmoid and Sigmoid Function; Different Models: McCulloch and Pitts Model, Hopfield Model and Memories, Boltzmann Machines and Energy Computations, Learning Problems and Issues in feed-forward model: Supervised learning, Perceptron Learning, Delta rule and Backpropagation Learning.

3. **Unsupervised Learning with ANN:** Competitive Learning, Hebbian Coincidence Learning, Attractor Networks, SOM, Adaptive Resonance Theory (ART): Architecture, classifications, Implementation and training, Introduction to Deep learning and Ensemble methods

4. **Genetic Algorithm and Applications:** Introduction to genetic algorithms (GA), encoding, fitness functions, genetic operators, reproduction, evolutionary strategies, Applications of GA in Data Mining, and other applications e.g. Travelling Salesman problem, differential evolution, co-evolution, multi-objective GA (MOGA), Neuro-Genetic hybrid algorithm; Swarm Intelligence: Introduction, Swarm Based versus Population based techniques, Particle Swarm Optimization, Ant Colony Optimization

5. **Fuzzy Logic:** Introduction to Fuzzy Systems – fuzzy sets: properties and operations: union, intersection, complement, s-norm, t-norm, alpha-cut; Fuzzy logic and fuzzy rules, Mamdani fuzzy rule inferencing mechanism, Fuzzy logic based Systems: e.g. Room Cooler; introduction to Neuro Fuzzy Systems: modeling fuzzy neuron, fuzzy neural network etc.

## REFERENCES

**Tom Mitchell: Machine Learning, TMH**

Stuart Russel and Peter Norvig: Artificial Intelligence–A Modern Approach, Pearson.

Michael Negnevitsky: Ärtificial Intelligence-A guide to intelligent systems, Pearson

Padhy, Artificial intelligence and intelligent systems. Oxford University Press

Yegna Narayana: Artificial Neural Network, EEE, PHI

| CBCSE117: e-Business Systems |
|---|

1. **Business Systems:** System and Models; Need for Framework and Models; Work System Framework; Work System Principles; Relationship between Work Systems and Information Systems; Need for Balanced View of a System; The Principle Based Systems Analysis Methods; Measuring WS Performance; and Elements of a Work System, Business Operation Through Systems; Phases of Building and Maintaining Systems; Information Technology as Driving Force for Innovations: Grater Miniaturization, Speed and Portability, Greater Connectivity and Continuing Convergence of Computing and Communication Technologies, Greater Use of Digitization and Multimedia, Better Software Techniques and Interface with People; and Obstacles in Applying IT in Real World.

2. **Business Processes and Models**: Business Processes; Process Modeling: DFD, Flowcharts and Structured English; Process Characteristics: Degree of Structure, Range of Involvement, Level of Integration, Rhythm, Complexity, Degree of Reliance on Machines etc; Communication and Decision Making; Evaluating Business Process Performance: Activity Rate and Output, Consistency, Productivity, Cycle Time, Downtime and Security; Basic Communication and Decision Making Concepts.

3. **Typical Information Systems:** Information System Categories related to Specific Functional Areas of Business, IS Categories applicable Functional Areas; Office Automation Systems; Communication Systems: Teleconferencing, E-Mail, Fax,, SMS, Groupware, Internet, Intranets, Extranets, Knowledge Management, and Group Support Systems; Transaction Processing Systems; MIS and Executive Information Systems; Decision Support Systems, Case Based Reasoning, and Intelligent Systems; Enterprise Systems; and Limitation and Uses of Typical Information Systems.

4. **Customer, Product and IT:** Customer's View of Product and services; The Customers' Experience; Evaluating Products and Services: Cost, quality, responsiveness, Reliability and Conformance to standards; Performance Variables of IT: Functional Capabilities and Limitations, Ease of use, Compatibility and Maintainability; Approaches of Organizational Computing-Centralized, Personal, Distributed, Networked and Client-Server.

5. **BIS, Software and AI**: BIS Context and Demands; Current Limits of Software; Types of Software; Programming viewed as Business Process; Generations of Programming Languages; Major Developments in Programming – Special purpose, Spreadsheets and CASE; Artificial Intelligence and Intelligent Systems.

| REFERENCES |
|---|

**Alter: Information Systems – The Foundations of E-Business, Pearson**
Haag and Cummings: Information Systems Essentials, TMHl
Nickeson: Business Information Systems, PHU

| CBCSE227: System Analysis and Design |
|---|

1. **System Concepts:** System Concepts; Information and Management; Information Architecture in the Organizations; Management Triangle; Computer-Based Information System – Need & Significance; Types of Information System, Factors Affecting the Information Systems, Drivers of Information system; System Stakeholders, System Analyst – Roles and Responsibilities, Skills and Characteristics.

2. **System Development Life Cycle:** Methodologies of System Development, System Analysis –Identifying Problems and Objectives, Systems Proposal, Questionnaires, Interviewing, Brain-Storming, Prototyping, Determining Information Requirements, Analyzing System Needs, System Specifications, Ascertaining Hardware and Software Needs and Selection; Feasibility Study; Cost-Benefit Analysis;Planning and Scheduling of Projects.

3. **System Analysis Tools:** Tools used for Structured Analysis, Data Flow Diagram (DFD), Logical and Physical DFDs, Data Dictionary and Process Specification, Structured English, Decision Tables, Decision Trees.

4. **Systems Design:** Designing the Recommended System, Structured Design, Tools for Structured Design, Modular Decomposition, Top-Down and Bottom-Up Designs, Using Structure Charts to Design Systems, Designing Effective Input, Designing Effective Output, Form Design, Designing Databases, Designing User-Interfaces.

5. **OMT & UML:** Software Complexity; S/W Crisis & Related Issues; Significance of OO Approach, OMT: Modeling Concepts; Object Modeling – Objects and Classes, Links & Associations, Generalization & Inheritance, Grouping Constructs : Dynamic Modeling & Functional Modeling; Object Oriented Design; Evolution of UML, Notations; UML Diagrams; Use Cases, Abuse cases and Misuse cases

| REFERENCES |
|---|

**Whitten & Bentley: Systems Analysis and Design Methods, TMH**
Kendall & Kendall: Systems Analysis and Design, PE
Rambaugh, Blaha & Eddy: Object-Oriented Modeling and Design, PHI

# DEPARTMENT OF COMPUTER SCIENCE
Faculty of Natural Sciences, Jamia Millia Islamia

| **CBCSE227: Scientific and Statistical Techniques** |
|---|
| 1. **Solution of Equations and System of Simultaneous Equations**: Solution of Algebraic and Transcendental Equations using Bisection, Regula False, and Newton Raphson Methods, Solutions of Linear Systems using Matrix Inverse, Gauss Elimination, Gauss Seidel, and Jacobi Methods |
| 2. **Interpolation, Numerical Differentiation and Integration, and Differential Equations:** Interpolation using Lagrange, and Newton's methods, Extrapolation, Least Square Fitting, Numerical Differentiation, Numerical Integration using Trapezoidal, and Simpson's Rules, Numerical Solution of Ordinary Differential Equations using Euler's and Range-Kutta Methods |
| 3. **Statistics:** Population, Sample, Sample Collection Methods, Data Representations and Classification, Central Tendency and Dispersion: Mean, Geometric Mean, Harmonic Mean, Median and Mode, Quartiles and Percentiles, Measures of Dispersion: Range, Variance, Standard Deviation, and Coefficient of Variation |
| 4. **Probability, Correlation and Regression:** Sample Space, Events, Equally Likely Events, Probability, Independent Events, Addition and Multiplication Rules, Conditional Probability, Probability Distributions – Normal, Binomial, and Poison Distributions; Correlation using Karl Pearson and Spearman Method, Regression Analysis |
| 5. **Hypothesis:** Hypotheses, Hypothesis Testing, t-Test, Chi-Square Test, Analysis of Variance (ANOVA), One and Two-way ANOVA, F-Test |
| REFERENCES<br>**Sastry, Introductory Methods of Numerical Analysis, PHI.**<br>**Gupta and Kapoor, Fundamentals of Mathematical Statistics a Modern Approach, S.Chand**.<br>Seymour  Lipschutz, John Schiller: Introduction to Probability and Statistics, TMH |
| **CBCSE337: Modeling and Simulation** |
| 1. **Basics:** Concepts of Systems, Models, and Simulation. Distributed Lag Model, Cobweb Models, The process of a simulation Study, Exponential Growth Models, Exponential Decay Models, Type of simulation, Discrete-Event Simulation: Time-Advance Mechanisms, Components and Organization of a Discrete Event Simulation Model. |
| 2. **Monte Carlo Method:** Discrete Simulation and Continuous Simulation and their Examples; Discrete Simulation: Simulation of Inventory problem, Simulation of Single-Server Queuing System, Continuous Simulation: Pure-pursuit Problem. |
| 3. **Random Number Generators:** Linear Congruential Generators, Other kinds of Generators, Testing Random-Number Generators. Generating Random Variat: General Approaches. |
| 4. **Output Data Analysis for a Single System:** Transient and Steady-State Behaviour of a Stochastic Process, Type of Simulations with regard to output Analysis and Statistical Analysis for Testing Simulation. Introduction to different types of simulation languages. |
| 5. **Verification and Validation:** Model Building, Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions, Validating Input, Output Transformations. |
| REFERENCES<br>**Geoffrey Gordon, System Simulation, PHI**<br>Jerry Banks, Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice", Wiley.<br>Zeigler and Kim, Theory of Modelling and Simulation, Academic Press<br>Law and Kelton, Simulation Modeling and Analysis, TMH |

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

| CBCSE447: Data Mining and Warehousing |
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1. **Data Mining:** Introduction, Data warehouses, Transactional databases, Advanced Data Information Systems and Applications, Data Mining Functionalities, Classification of data mining systems, data mining task primitives, Integration of data mining systems with a data warehouse systems, Data Preprocessing: Descriptive data summarization, Data cleaning, Data Integration and Transformation, Data Reduction, Data discretization and Concept hierarchy generation.
2. **Data Warehouse and OLAP technology:** Multidimensional data model, Data Warehouse architecture and Implementation: OLAP, ROLAP, MOLAP, HOLAP etc., Data Cubes, Indexing OLAP data, OLAP queries, Full Cube Computation, BUC, Star-cubing, Discovery-driven exploration of data cubes.
3. **Frequent Patterns, Associations and Classification:** Association Rules, Frequent Itemsets, Closed Itemsets, Apriori algorithm, Generating association rules from frequent itemsets, Mining Closed Frequent Itemsets, Correlation Analysis, Metarule guided mining of Association Rules, Constraint Pushing, Classification v/s Prediction methods, Classification by Decision Tree Induction, Bagging and Boosting.
4. **Data Mining techniques:** Rule-based Classification, Rule extraction from a Decision Tree, Support Vector Machines for linear and non-linear separable data, Classification by Association Rule Analysis, k- Nearest-Neighbor Classifier, Case-based Reasoning, Prediction: Linear v/s Non-linear Regression, Accuracy and Error measures: Hold-out method, Cross-validation, Bootstrap, estimating confidence intervals, ROC curves
5. **Clustering:** Types of data in Cluster Analysis, Categorization of Clustering methods, Partitioning Methods: k-means, k-Medoids, CLARANS, Hierarchical Methods: BIRCH, ROCK, Desity-based Methods: DBSCAN, Grid-based Methods, Mining Time-series data, Introduction to Text Mining, Graph Mining, Social Network Analysis, and Web or Link Mining

| REFERENCES |
|---|

**Han & Kamber: Data Mining - Concepts and Techniques, Elsevier**
Witten, Frank & Hall: Data Mining: Practical Machine Learning Tools and Techniques, Elsevier.
Mohammed Zaki, Wagner Meira: Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge Press.

| CBCSE447: Software Quality Assurance |
|---|

1. **Fundamental Concept :** Testing Fundamentals and Terminology, Types of Testing: Black Box and White Box Testing; White Box Testing:; Basis Path Testing: Flow Graph Notation, Independent Program Paths, Deriving Test Cases and Graph Metrics; Control Structure Testing: Condition Testing, Data Flow Testing, and Loop Testing; Black Box Testing: Graph Based Testing methods, Equivalence Partitioning, Boundary Value Analysis; Objected Oriented Testing Methods: Testing Specialized Environments, Architecture and Applications: Testing GUI, Client Server Architecture, Documentation and Help Facilities, and Real Time Systems.
2. **Testing Strategies:** Strategic Approach to Software Testing: Verification and Validation, Organizing for Software Testing, Strategies for Conventional Architecture, Object Oriented Structure and Criterion for Completion of Testing; Strategic Issue; Significance and Potential; Testability; Unit and Integration Testing; OO Strategies: Unit Testing in OO Context, Integration Testing for OO Context; Validation Testing: Criteria, Configuration, Review, Alpha and Beta Testing; System Testing: Recovery Testing, Security Testing, Stress Testing, and Performance Testing; Art of Debugging: Debugging Process, Debugging Strategies and Fixing Errors.
3. **Testing Web Applications:** Testing Concepts for Web Applications; Dimensions of Quality, Errors in Web App Environment, Testing Strategy and Test Planning; Testing Process Overview; Content Testing: Objectives and Database Testing; User Interface Testing: Testing Strategy, Interface Mechanism, Interface Semantics, Usability Testing and Compatibity Tests; Component Level Testing:, Navigation Testing: Syntax and Semantics; Configuration Testing: Server and Client Side Issues; Security Testing; Performance Testing: Objectives, Load and Stress Testing.
4. **Software Quality Assurance**: Quality Concepts: Quality, Quality Control, Quality Assurance and Cost of Quality; SQA: Issues and Activities; Software Reviews: Const Impact of Software Defects , Defect Amplification and Removal; Formal Technical Reviews: Review Meeting, Reporting and Record Keeping;, Review Guidelines, and Sample Driven Reviews; Formal Approaches to SQA; Statistical Software Quality Assurance: Generic View and Six Sigma for Software Engineering; Software Reliability: Measures of Reliability and Availability, and Software Safety; ISO 9000 Quality Standards and SQA Plan.
5. **Product Metrics and Risk Management:** McCall's Quality Factors, ISO 9126 Quality Factors and the Transition to Quantitative View; Framework for Product Metrics – Measures, Metrics and Indicators; Challenges, Measurement Priniciples, Goal Oriented Software Developments, Attributes of Effective Software Metrics; Metrics for Analysis Model-architectural Design Metrics, Metrics for OOD, Class Oriented Metrics, MOOd Metrics, Component Level Design Metrics and User Interface Design Metrics; Metrics for Source Code; Metrics for Testing – HalStead Metrics Applied to Testing and Metrics for Object Oriented Testing; Maintenance Metrics. Risk Management: Risk, Threat and Vulnerabilities; Reactive vs Proactive Strategies; Software Risks; Risk Identification: assessment of Overall Project Risks and Risk Components and Drivers; Risk Projection: Developing Risk Table and Assessing Risk Impact; Risk Refinement; Risk Mitigation, Monitoring and Management; The Comprehensive RMMM Plan.

| REFERENCES |
|---|

**Pressman : Software Engineering, TMH**
Aggarwal and Singh: Software Engineering, NAI
Jalote: Software Engineering, Narosa

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

| CBCSE557: Advanced DBMS |
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1. **Coping with System Failures:** Introduction to ADBMS, ACID properties, Issues and Models for Resilient Operation, Undo Logging, Redo Logging, Undo/Redo Logging, Logging Rules, Recovery using different Logging methods, Quiescent and NonquiescentCheck pointing a Log, Recovery with a checkpointed Log, Protecting against Media Failures, Nonquiescent Archiving, Recovery using an Archive and Log, Transactions in SQL,Serializability, Atomicity, Read-only Transactions, Dirty Reads, other Isolations Levels, Review of PL/SQL.
2. **Concurrency Control:** Serial and Serializable Schedules, Conflict-Serializability, Precedence Graphs and a Test for Conflict-Serializability, Enforcing Serializability by Locks, The Locking Scheduler, Two-Phase Locking (2PL), Locking Systems with several Lock Modes: shared and Exclusive Locks, Compatibility Matrices, Upgrading Locks, Update Locks, Increment Locks,  An architecture for a Locking Scheduler, The Lock Table, Managing Hierarchies of Database Elements: Locks with Multiple Granularity, The Tree Protocol, Concurrency Control by Timestamps, Concurrency Control by Validation, Constraints and Triggers.
3. **Advanced Transaction Management:** Serializability and Recoverability, Recoverable Schedules, ACR, Logical Logging, Recovery from Logical Logs, View Serializability, Polygraphs and the Test for View-Serializability, Resolving Deadlocks, Deadlock Prevention by Ordering Elements and Timestamps, Distributed Databases: Distributed Commit, Two-phase Commit (2PC), Distributed Locking, Long-duration Transactions, Sagas and Compensating Transactions
4. **The Query Compiler:** Parsing, Estimating the cost of operations, Query optimization, Completing the Physical-Query-Plan and Query Execution; Storage management**.**
5. **Database System Architectures:** Object Definition Language (ODL), Object-relational Model,XML and its Data Model, Object-orientation in Query Languages,Logical Query Languages, Centralized and Client-Server Architectures,Parallel Databases,Spatial and Geographic Databases, Multimedia Databases, Mobility and Personal Databases.

| REFERENCES |
|---|

**Garcia-Molina, Ullman and Widom: Database Systems: The Complete Book, Pearson**
A.Silberschatz, Korth and Sudarshan: Database System Concepts, TMH
Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, TMH.

| CBCSE337: Digital Image Processing |
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1. **Introduction and Spatial filtering:**  Components of a DIP system, Elements of visual perception, Light and Electromagnetic Spectrum, Image sensing, acquisition, Sampling and Quantization, Spatial and Intensity resolution, Basic relationships between pixels, Basic mathematical tools used in DIP, Intensity transformation functions, Histogram processing, Lowpass and Highpass Spatial Filters
2. **Frequency domain filtering and Image Restoration:** 1-D and 2-D Discrete Fourier Transform (DFT) and IDFT, Lowpass, Highpass, selective Frequency Domain filters, Fast Fourier Transform (FFT), Model of Image restoration and Reconstruction, Noise models, Restoration in presence of noise only-Spatial filtering, Max, Min, Mean, Median filters, Periodic Noise reduction using frequency domain filtering.
3. **Color Image Processing:** Color Models: RGB, HSI, CMYK, YCbCr, Full Color Image Processing, Color image smoothing, sharpening, Using color in image segmentation, Intro to wavelet and other image transform
4. **Image Compression:** Relative Data Redundancy (RDR), Compression Ratio, Coding Redundancy, Fidelity criteria, Lossless v/s Lossy Image Compression, Image compression Model, Huffman coding, Run-length coding, Bit plane coding, Image formats and standards, KLT, JPEG-steps etc., Introduction to Morphological Image Processing, Watermarking
5. **Image Segmentation and Classification:** Point, Line, and Edge detection, thresholding,  Edge and Region based segmentation, Region Segmentation using Clustering, Feature extraction: Boundary and Region feature descriptors, Principal components, whole image features etc, Image datasets, Image Classifiers using Neural Networks, Deep learning, Deep Convolutional Neural Networks etc.

| REFERENCES |
|---|

**Gonzalez and Woods, Digital Image Processing, PE**
Rafael C. Gonzalez, Richard E. Woods, Steven Eddins: Digital Image Processing using MATLAB, PE
Milan Sonka et al: IMAGE PROCESSING, ANALYSIS AND MACHINE VISION, Brookes/Cole, VPH

| CBCSE557: Distributed Systems |
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1. **Concept of Distributed Systems:** Definition, Goals – Connecting users with resources, Transparency, Scalability, Openness; Hardware Concepts: Multiprocessors, Multicomputer, Homogenous and Heterogeneous, Multicomputer; Software Concepts: Distributed Applications, Distributed OS, NOS and Middleware; Client Software model; Clients and Servers, Application Layering, Client-Server Architectures.
2. **Architecture Styles:** System Architecture - Centralized Architectures, Decentralized Architectures and Hybrid Architectures; Architecture vs Middleware – Interceptors and General Approaches to Adaptive Software; Self Management in Distributed Systems - Feedback Control Model; Systems Monitoring with Astrolabe, Differentiating Replication and Globule; Automatic Component Repair Management in Jade
3. **Processes:** Introduction to Threads, Threads in Distributed Systems; Virtualization: The Role of Virtualization in Distributed Systems, Architectures of Virtual Machines and Clients; Networked User Interfaces - Client-Side Software for Distribution Transparency; Servers - General Design Issues, Server Clusters and Managing Server Clusters; Code Migration - Approaches to Code Migration, Migration and Local Resources and Migration in Heterogeneous Systems.
4. **Communication:** Fundamentals - Layered Protocols and Types of Communication; RPC - Basic RPC Operatio, Parameter Passing, Asynchronous RPC and Example of DCE RPC; Message Oriented Communication - Transient Communication and Persistent Communication; Stream Oriented Communication - Support for Continuous Media, Streams and Quality of Service, Stream Synchronization; Multicast Communication - Application-Level Multicasting and Gossip-Based Data Dissemination.
5. **Naming and Synchronization Clock:** Names, Identifiers and Addresses; Flat Naming - Simple Solutions, Home-Based Approaches, Distributed Hash Tables and Hierarchical Approaches; Structured Naming - Name Spaces, Name Resolution, Implementation of Name Space and Domain Name System; Attribute-Based Naming - Directory Services, Hierarchical Implementations LDAP and Decentralized Implementations. Synchronization Clock Physical Clocks, Global Positioning System and Clock Synchronization Algorithms; Logical Clocks - Lamport's Logical Clocks, Vector Clocks; Mutual exclusion - Overview, Centralised, Decentralised, Distributed and Token Ring Algorithms; Global Positioning Nodes; Election Algorithms.

REFERENCES
**Garcia Tennenbaum: Distributed Systems, PE**
Coulouris, Jean & Tim:Distributed Systems: Concepts and Design, Pearson
Crichlow: Distributed Systems - Computing Over Networks, PHI

| CBCSE557: Cyber Security |
|---|

1. **Cybercrime:** Cybercrime and Information Security, Cybercriminals, Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses , Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usenet Newsgroup as the Source of Cybercrimes , Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft.
2. **Cyberoffences:** Cyberoffences and its Categories; Attacks Planning: Reconnaissance, Passive Attack, Active Attacks, Scanning and Scrutinizing gathered Information; Attacks, Social Engineering, and Classification of Social Engineering; Cyberstalking: Types of Stalkers, Cases Reported on Cyberstalking, How Stalking Works? Real-Life Incident of Cyberstalking, Cybercafe and Cybercrimes; Botnets: The Fuel for Cybercrime, Botnet; Attack Vector Cloud Computing and Services.
3. **Cybercrime with Mobile and Wireless Devices:** Proliferation of Mobile and Wireless Devices, Trends in Mobility; Credit Card Frauds in Mobile and Wireless Computing Era: Types and Techniques; Authentication Service Security: Cryptographic Security for Mobile Devices; LDAP Security for Hand-Held Mobile Computing Devices, RAS Security for Mobile Devices, Media Player Control Security; Networking API Security for Mobile Computing Applications; Attacks on Mobile Phones; Security Implications for Organizations: Managing Diversity and Proliferation of Hand-Held Devices, Unconventional/Stealth Storage Devices Threats through Lost and Stolen Devices, Protecting Data on Lost Devices, Mobile Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era; Mobile Devices, Laptops & Physical Security Countermeasure
4. **Cybersecurity Tools and Methods:** Proxy Servers and Anonymizers, Phishing, Cracking; Keyloggers and Spywares; Virus and Worms; Steganography & Stegnalysis; DoS, DDoS Attacks & Classification; SQL Injection Attacks, Buffer Overflows; Attacks on Wireless Networks; Identity Theft: Introduction, Phishing: Methods of Phishing, Phishing Techniques, Spear Phishing, Types of Phishing Scams, Phishing Toolkits and Spy Phishing, Phishing Countermeasures, Identity Theft, Personally Identifiable Information(PII), Types of Identity Theft, Techniques of ID Theft, Identity Theft-Countermeasures, How to Protect your Online Identity
5. **Cybersecurity Legal Perspectives:** Need for Cyberlaws, The Indian Context; Indian IT Act; Admissibility of Electronic Records; Amendments, Positive Aspects of the ITA 2000, Weaknesses; Challenges to Indian Scenario, Consequences, Amendments; Indian ITA 2008: Overview, Cybercafe-Related Matters, State Government Powers Impacted by the Amendments to the Indian IT Act, Impact of IT Act Amendments Impact Information Technology Organizations, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

**Godbole & Belapur: Cyber Security - Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, WIP**
Jones: Internet Forensics: Using Digital Evidence to Solve Computer Crime, O'Reilly Media
Steel: Windows Forensics: The field guide for conducting corporate computer investigations, WIP

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

### CBCS (Ability/Skill Enhancement for PG Students)

| **CBCSS118: MATLAB Computation** |
|---|
| 1. **Vectors and Matrices:** MATLAB Desktop Environment, Data types, Variables and Assignment Statements, Numerical Expressions, Operator precedence, Random number generation, Characters and Encoding, Relational Expressions, Creating matrix variables, dimensions, Scalar and Array Operations on Vectors and Matrices, Matrix Multiplication, Logical vectors, Meshgrid functions, Saving workspace, Importing and Exporting data |
| 2. **MATLAB Scripts:** Scripts with Input and Output, Scripts to Produce and Customize simple plots, Introduction to File Input/Output (Load and Save), User-Defined Functions that Return a Single Value, Commands and Functions, Vectors and Matrices as function arguments, Selection statements: if, else, elseif, switch, Loop statements: while, for, Vectorizing Code, MATLAB Program Organization, Application: Menu-Driven Modular Program, "is" Functions in MATLAB Variable, Scope, M-files etc. |
| 3. **String Manipulation and Cell Arrays:** Creating String Variables, Operations on Strings, "is" Functions for Strings, Converting between String and Number Types, creating Cell Arrays, Referring to and Displaying Cell Array Elements and Attributes, Storing Strings in Cell Arrays, Structures and operations, |
| 4. **Advanced File Input and Output:** Opening and Closing a File, file identifier and file modes, Reading from file: fscanf, fgets, fgetl, textscan, Lower-Level File I/O Functions, Writing and Reading Spreadsheet Files, Using MAT-files for Variables |
| 5. **Advanced problem solving with MATLAB:** 2-D plot types, logarithmic scale plots, pie charts, and histograms, customizing plots using cell arrays and string functions, 3-D plot functions, Built-in statistical and set operations, Sorting and Indexing, Sights and Sounds, programming GUIs etc. |

| REFERENCES |
|---|
| **Stormy Attaway: Matlab, A Practical Introduction to Programming and Problem Solving, Elsevier Inc.** |
| Amos Gilat, MATLAB: An Introduction with Applications, Wiley |
| Cleve Moler, Numerical Computing with MATLAB, SIAM |

| **CBCSS228: Multimedia Applications** |
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| 1. **Multimedia Primer:** Basic Concepts, Multimedia Storage Devices, Multimedia Highway, Multimedia Applications; Stages in Multimedia Development; Multimedia Development Requirements, Multimedia Skills Development and Expertise Requirements |
| 2. **Multimedia Text, Sound, Images, and Video**: Text-Power and Meaning, Fonts and Faces, Using Text in Multimedia; Computers and Text, Font Editing and Design Tools, Hypermedia and Hypertext; Sound-Power of Sound, Multimedia Systems Sound, Digital Audio, Making MIDI Audio, Audio File Formats, MIDI vs Digital Audio, Sound in Multimedia Applications, Music CDs and Audio Production Guidelines. Still Images and Vector Graphic, Bitmaps, Vector Drawings, 3-D Drawing and Rendering, Color and Image File Formats; Animation-Power, Principles, Techniques, File Formats, Developing Animation; Video-Using Video, Working of Videos, Analog Standards, NTSC, PAL, SECAM and ATSC DTV; Digital Display Standards; Digital Video, Video recording etc; Shooting, Editing Video; Storyboarding, Platform, Lighting, Chroma Keys etc; and Optimizing Video File Storages |
| 3. **Multimedia Hardware and Software:** Multimedia Platforms, Connections- SCSI,IDE,USB and Firewire; Multimedia Storage Devices, MM Input-Output Devices, Multimedia Communication Devices; Multimedia Software Tools – Text, Editing and WP tools, OCR Software, Drawing and Painting Tools, 3-D Modeling and Animation Tools; Image and Sound Editing Tools; Animation, Video and Digital Movie Tools; and Multimedia Accessories |
| 4. **Multimedia Authoring and Integration:** Developing Multimedia Applications, Types of Authoring Systems: Object Based, Icon Based, Page based, Card-based, Stages of Authoring, Editing, Organizing, Interactivity, Performance Tuning, Cross Platform Features, Cross Platform Authoring Notes; Authoring Notes; Introduction to MX Flash MX / Director MX. |
| 5. **Multimedia for WWW:** Internet, Internetworking, Bandwidth Issue, Internet Services, WWW and HTML, Web Pages, Dynamic Webpages and XML; Multimedia Web; Web Servers, Browsers and Search Engines; Web Page Makers and Site Builders, Plug-in and Delivery Vehicles; Beyond HTML, 3D Worlds; Multimedia on the Web- Workspace, Nibbling, HTML and multimedia; Text for Web, Images for the web – GIF, PNG Images, JPEG, Image Maps; Sound and Animation on the Web. Miscellaneous topics and supplements |

| REFERENCES |
|---|
| **Vaughon: Multimedia – Making it Work, TMH** |
| Parekh: Principles of Multimedia, TMH |
| Li and Drew: Fundamentals of Multimedia, PE |

| CBCSS338: Mobile Applications Developments |
|---|
| 1. **Introduction**: Factors affecting Development of Mobile Applications, Frameworks and Tools for Mobile App Development, Characteristics of Mobile Applications, History of Mobile Application Frameworks and Tools, Introduction to Android. <br> 2. **Mobile Application Architectures:** Client-Server Architecture, One-Tier, Two-Tier, Three Tier Architecture, Types of Connection, Synchronization, Mobile Device Types, Mobile Device Components, Types of Mobile Applications. <br> 3. **Mobile Client Interface and Applications:** User Interface, Best Practices for developing a User Interface, Thin Client, Fat Clients, Web Page Hosting. Managing Application Data, <br> 4. **Mobile Application Development using Android:** Introduction to Android, Android versions and its feature set, Android Development Environment - System Requirements, Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs), The Android Software Stack, The Linux Kernel, Java Interoperability Libraries, Android Libraries, Application Framework, Creating Your First Android Application. <br> 5. **Security:** User to Mobile Client Security Issues, Mobile Client Security Issues, Client-Server Communications Security Issues, Existing Web Architectures and Back-End Systems Security Issues, Mobile Application Development Management. |
| REFERENCES <br> **Mobile Applications: Architecture, Design, and Development by Robbie Schell, Heather Schneider, Valentino Lee** <br> Android Programming the Big Nerd Ranch Guide by Bill Phillips & Brian Hardy <br> Mobile Design and Development by Brian Fling |
| **CBCSS448: Programming in Python** |
| 1. **Introduction Concepts:** History, Features, Setting up path, Working with Python, Basic Syntax variable and Data Types,Operators, conditional statements,Looping statements,control statements. Input/output: Printing on Screen, Reading data from keyboard, Opening and closing file, Reading and writing files, I/O Functions <br> 2. **String Manipulation and Pattern Matching:** Accessing Strings, Basic Operations, String slices, Functions and Methods, Regular Expressions, Match function, Search function, Matching vs Searching, Modifiers, Patterns, Pattern Matching <br> 3. **Basic Data Structures and OOP concepts:** List, accessing list, Working with lists, Operations, related Functions and Methods, Tuple, Accessing tuples, Working with tuples, Operations, related Functions and Methods, Dictionary, Working with dictionary, Accessing values in dictionaries, Working with dictionaries, Operations, related Functions and Methods. OOPs concepts, Class and object, Attributes, Inheritance, Overloading, Overriding, Data hiding. <br> 4. **Functions and Modules:** Defining a function, Calling a function, Types of functions Function Arguments, Anonymous functions, Global and local variables, Introduction to Modules, Importing module, Math module, Random module, Packages. <br> 5. **CGI and Database:** Introduction, Architecture, CGI environment variable, GET and POST methods Cookies, File upload, Database connectivity, Introduction, Connections, Executing queries, Transaction |
| REFERENCES <br> **Allen B. Downey: Think Python- How to think like a Computer Scientist, Green Teen press.** <br> Kenneth Lambert: Fundamental of Python, Course Technology. <br> Alberto Apostolico, Zvi Galil: Pattern Matching algorithms, Oxford University Press |

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

| **CBCSS558: Big Data Analytics and Hadoop** |
|---|
| 1. **Cloud Computing Basics:** Introduction to Cloud Computing; Concept of Utility Computing; Feature, Attributes, Characteristics of Cloud Computing; Benefits and Limitations of Cloud Computing; Components of Cloud Computing; Organizational Scenarios of Cloud Administering and Monitoring Cloud Services |
| 2. **Computing Architecture:** Cloud Computing Architecture; Delivery Models; Deployment Models; cloud service model; SOA and the Cloud; Virtualization; Designing Web Applications with Cloud Support; Amazon Web Services |
| 3. **Big Data and Hadoop:** What is Big Data; Limitations of existing architectures; How Hadoop solves these problems; Hadoop Ecosystem; Core components of Hadoop; Hadoop functions: Perform, Read and Write; Rack Awareness |
| 4. **Hadoop Architecture and HDFS:** Hadoop 2.x Cluster Architecture – Federation and High Availability; Resource Management in Hadoop; Hadoop Configuration Files; Hadoop Cluster Modes; Password-less SSH; Data Loading Techniques and Analysis; Basic HDFS Commands; Running a MapReduce Job on Hadoop |
| 5. **MapReduce:** Use Cases of MapReduce; Difference between MapReduce and Traditional Techniques; Hadoop 2.x architecture and components; Execution flow of YARN MapReduce application; Input Splits concept; MapReduce Job Submission Flow; Combiner and Partitioners; Counters in MapReduce; Map and Reduce Side Joins; MR Testing Framework; Distributed Cache Concept; Custom Input Formatting MapReduce; Sequence Input Format in MapReduce, Pig: Use cases for using Pig; Conceptual data flow; Pig Execution; Data Models; Querying with Pig Operators. |
| <div align="center">REFERENCES</div><br>**Vecchiola, Buyya, and Selvi: Mastering Cloud Computing: Foundations and Applications Programming, Elsevier.**<br>Hurwitz, Nugent, Halper & Kaufman: Big Data for Dummies, John Wiley & Sons.<br>Tom White: Hadoop: The Definitive Guide.<br>Capriolo, Wampler & Rutherglen: Programming Hive, Data Warehouse and Query Language for Hadoop, O'Reilly Media.<br>Gates: Programming Pig. Book, O'Reilly Media. |

# DEPARTMENT OF COMPUTER SCIENCE
Faculty of Natural Sciences, Jamia Millia Islamia

### III. PGDCA Programme Structure: 2019-20

| SEM | Code | Course Title | L-T-P | Credits | Semester Summary |
|-----|------|--------------|-------|---------|------------------|
| I | CSC101 | Problem Solving using C | 3-0-0 | 3 | Periods/Week: 28 (+1) Credits: 23 |
| | CSC102 | Applied Operating Systems | 3-0-0 | 3 | |
| | CSC103 | Multimedia Applications | 3-0-0 | 3 | |
| | CSC104 | Information Systems | 3-0-0 | 3 | |
| | CSC105 | Lab-I(C) | 0-0-4 | 2 | |
| | CSC106 | Lab-II (Shell Prog. + MA) | 0-0-4 | 2 | |
| | | CBCS-I | | 4 | |
| | | AESE-I | | 3 | |
| II | CSC201 | Visual Programming | 3-0-0 | 3 | Periods/Week: 32(+1) Credits: 23 |
| | CSC202 | Network Technologies | 3-0-0 | 3 | |
| | CSC203 | Database Management Systems | 3-0-0 | 3 | |
| | CSC204 | Lab-III (VB) | 0-0-4 | 2 | |
| | CSC205 | Lab-IV (Oracle) | 0-0-4 | 2 | |
| | CSC206 | Minor Project | 0-1-4 | 3 | |
| | | CBCS-II | | 4 | |
| | | AESE-II | | 3 | |
| **PGDCA Summary:- Core-Courses(7), Lab-Courses (4), CBCSE & CBCSS-Courses (2 + 2), Project (1) & Credits: 42 – 46** | | | | | |
| **\*Minimum Valid Credit Requirements for award of PGDCA degree = 42** | | | | | |
| | | | | | |
| **CBCS Courses for PG-Diploma Students: L-T-P: 4-0-0  (4 Credits)** | | | | | |
| I | CBCSE107 | Computer Fundamentals, | | | |
| II | CBCSE207 | Business Information Systems, E-Commerce | | | |
| **CBCS (Skill Enhancement) Courses for PG-Diploma Students: L-T-P: 2-0-2 (3 Credits)** | | | | | |
| I | CBCSS108 | DTP with MS Office | | | |
| II | CBCSS208 | Website Design and Maintenance | | | |
| **NOTE:-** Relevant CBCS courses, of minimum 2 credits, may also be chosen from other departments. | | | | | |

# DEPARTMENT OF COMPUTER SCIENCE

Faculty of Natural Sciences, Jamia Millia Islamia

**PGDCA SYLLABUS-2019: (CORE Courses)**

| CSC101: Problem Solving using C |
|---|
| 1. **Problem Solving Approach**: Introduction to Programs and Algorithms; Problem Solving Aspect (Algorithm Devising); Basic Features of an Algorithm; Algorithm Design Using Pseudo codes; Algorithm Implementation; Program Verification; Flowchart – Symbols and Conventions.. |
| 2. **Basic Concepts of C:** Character Set; Keywords; Identifier, Constants, and Variables; Constant Types – Numeric and Character Constants; Data Types –Character, Integer and Floating Point; Signed, Unsigned, Short, and Long Integers; Data Declaration and Definition, Operator & Expression – Arithmetic, Relational, Logical, Increment, Decrement, Assignment, Conditional, and Bitwise Operators; Precedence & Associability of Operators; Managing Console I/O, Formatted I/O, Control Structures: Decision Making (Branching) Structures – If Statement, If-Else Statement, Nested If-Else Statement, Else-If Ladder, Switch Statement, Goto Statement; Looping Structures – While Statement, Do-While Statement, For Statement, Continue and Break Statements. |
| 3. **Functions:** Library Functions; User-Defined Functions; Function Declaration (Prototype) and Function Definition; Function Arguments – Dummy, Actual and Formal Arguments; Local and Global Variables; Function Calls – Call by Value and Call by Reference; Returning Multiple Values from a Function, Recursion and Recursive Functions, Storage Class & Scope of Variables – Automatic Storage, Extern Storage, Static Storage, and Register Storage. |
| 4. **Arrays, Strings & Pointers:** Single Dimensional Arrays; Accessing Array Elements; Initializing an Array; Multidimensional Arrays; Initializing Multidimensional Arrays; Memory Representation; Accessing Multidimensional Array Elements; Array of Characters; String Manipulation Functions; Introduction to Pointers; Pointer Variable Declarations and Initializations; Null Pointer; Constant Pointers; Void Pointer; Pointer Operators; Pointer Arithmetic; Application of Pointers; Dynamic Memory Allocations – malloc, calloc, realloc and free functions; Pointers and Strings. |
| 5. **Structure, Union, Enumeration and Files:** Structure Declaration and Initialization; Accessing Structure Members, Structure Assignments; Array of Structures and Arrays within Structures, Nested Structures; Structure as Function Arguments; Structure Pointer; Unions; Difference between Structure and Union; Bit-Fields; Introduction to File; Text and Binary Files; Defining, Opening and Closing Files; I/O Operations on Files, Command Line Arguments |
| **Balagruswamy: Programming in ANSI C, TMHl**<br>Dromey: How to Solve by Computer, PE<br>Deitel & Deitel: C – How to Program, PE |
| CSC102: Applied Operating Systems |
| 1. **Operating Systems Primitives:** Definition, Structure and Operations; Process Management; Memory Management; Storage Management; Protection and Security; Distributed Systems; Special-Purpose Systems; Computing Environments; Open Source Operating Systems. OS Structures: Operating System Services; User Operating System Interface; System Calls; Types of System Calls; System Programs; Operating System Design and Implementation; Operating-System Structure; Virtual Machines, Operating System Generation; System Boot. |
| 2. **Process Management:** Process Scheduling; Operations on Processes; Process Scheduling Criteria, Scheduling Algorithms, Operating System Examples; Process Synchronization – Introduction; Critical-Section Problem; Peterson's Solution; Synchronization Hardware; Semaphores; Classic Problems of Synchronization; Monitors; Synchronization Examples; Atomic Transactions. Deadlocks – System Model; Deadlock Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery. |
| 3. **Memory Management:** Basic Concepts; Swapping; Contiguous Memory Allocation;  Paging; Structure of Page Table; Segmentation; Virtual Memory; Demand Paging; Copy-on-Write; Page Replacement; Page Replacement Algorithms; Allocation of Frames; Thrashing; Memory-Mapped Files;  Allocating Kernel Memory. |
| 4. **Basic Concepts of UNIX:** The Unix Environment, Unix Structure, Commands, The vi Editor, Modes, Commands; File Systems – File Names, File Types, Regular Files, Directories, File System Implementation, Operations on Directories and Files. |
| 5. **Security and File Permission:** Users and Groups; Security Levels; Changing Permissions; User Masks; Changing Ownership and Group, Introduction to Shells; UNIX Session; Standard Streams; Redirection; Pipes; Command Execution; Command-Line Editing; Quotes; Command Substitution; Job Control; Aliases; Variables; Predefined Variables; Options; Shell/ Environment Customization. |
| **Silberschatz, Galvin and Gagne: Operating System Concept,  John Willey**<br>Forouzan: Unix and Shell Programming, Thomson Press<br>Sumitabha Das: UNIX – Concepts and Applications. |

| CSC103: Multimedia Applications |
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1. **Multimedia Primer:** Basic Concepts, Multimedia Storage Devices, Multimedia Highway, Multimedia Applications; Stages in Multimedia Development; Multimedia Development Requirements, Multimedia Skills Development and Expertise Requirements.

2. **Multimedia Text, Sound, Images, and Video:** Text-Power and Meaning, Fonts and Faces, Using Text in Multimedia; Computers and Text, Font Editing and Design Tools, Hypermedia and Hypertext; Sound-Power of Sound, Multimedia Systems Sound, Digital Audio, Making MIDI Audio, Audio File Formats, MIDI vs Digital Audio, Sound in Multimedia Applications, Music CDs and Audio Production Guidelines. Still Images and Vector Graphic; Bitmaps, Vector Drawings, 3-D Drawing and Rendering, Color and Image File Formats; Animation-Power, Principles, Techniques, File Formats, Animation; Video-Using Video, Working of Videos, Analog Standards, NTSC, PAL, SECAM and ATSC DTV; Digital Display Standards; Digital Video, Video recording etc; Shooting, Editing Video; Storyboarding, Platform, Lighting, Chroma Keys etc; and Optimizing Video File Storages.

3. **Multimedia Hardware and Software:** Multimedia Platforms, Connections and Firewire; Multimedia Storage Devices; MM Input-Output Devices, Multimedia Communication Devices; Multimedia Software Tools – Text, Editing and WP tools, OCR Software, Drawing and Painting Tools, 3-D Modeling and Animation Tools; Image and Sound Editing Tools; Animation, Video and Digital Movie Tools; and Multimedia Accessories.

4. **Multimedia Authoring and Integration:** Developing Multimedia Applications, Types of Authoring Systems: Object Based, Icon Based, Page based, Card-based, Stages of Authoring, Editing, Organizing, Interactivity, Performance Tuning, Cross Platform Features, Cross Platform Authoring Notes; Authoring Notes; Introduction to MX Flash MX.

5. **Multimedia for WWW**: Internet, Internetworking, Bandwidth Issue, Internet Services, WWW and HTML, Web Pages, Dynamic Webpages and XML; Multimedia Web; Web Servers, Browsers and Search Engines; Web Page Makers and Site Builders, Plug-in and Delivery Vehicles; Beyond HTML, 3D Worlds; Multimedia on the Web- Workspace, Nibbling, HTML and multimedia; Text for Web, Images for the web – GIF, PNG Images, JPEG, Image Maps; Sound and Animation on the Web.

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**Vaughon: Multimedia – Making it Work, TMH**
Parekh: Principles of Multimedia, TMH
Li & Drew: Fundamentals of Multimedia, PE

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| CSC104: Information Systems |
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1. **IS and the Digital Firm :** Information System Evolution, Information Technology Revolution, Dual nature of Information Systems; Information System for Competitive Advantage-Why use IS?, Sources of Competitive of competitive advantage, IS role in value chain analysis, Making and Presenting the Business case for a System, Competitive Advantage in Being at the Cutting Edge. Future of IS Function within the firm

2. **Organizational Systems:** Decision-making Levels of an organization-Operational, Managerial and Executive. Types of IS: TPS, MIS, EIS; Expert Systems, Office automation system, Collaborative technologies, Functional area Information systems, Global information systems., Enterprise-Wide Information Systems: Internally Focused Applications. Types of enterprise Systems-Legacy Systems, Enterprise Resource Planning, Customer Relationship Management, Supply Chain Management. SAP.

3. **Role of Telecommunications and Networks in organizations:** Role of Telecommunications and Networks in organizations; **Internet** and WWW capabilities, Electronic Commerce, B2B Electronic Commerce, Career Implications, The formula for electronic Commerce Success

4. **Developing IS :** Need for Systems Analysis and Design; Systems Analyst - Role, Expertise, Qualities, and Responsibilities; System Development Life Cycles, Information Requirements Gathering, Analyzing Requirements, Development and Documentation; Use Case Tools; Software Engineering, Reverse Engineering, and Reengineering; OOAD, Software Testing and Quality Assurance.

5. **Managing IS in digital firm:** IS Security and control: vulnerability and abuse, Creating a control environment, Ensuring system quality. Ethical and social Issues: Computer Crime and Security.

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REFERENCES
**Leonard Jesup, Joseph Valacich, Information Systems Today; PHI**
Loudon and Loudon : Management Information Systems, PE.
Rajaraman: Analysis and Design of Information System., PHI.

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# DEPARTMENT OF COMPUTER SCIENCE

Faculty of Natural Sciences, Jamia Millia Islamia

| **CSC105: Lab-I (C)** |
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**Implementation of at least ONE specific assignment concerning each of the following:**
1. Simple programs based on operators and input/ output.
2. Programs based on conditional control statements.
3. Programs based on looping and transfer statements.
4. Programs based on functions.
5. Programs based on recursive functions.
6. Programs based on array.
7. Sorting and searching programs.
8. Programs based on structures.
9. File handling programs.
10. File handling with structure programs.

| **CSC204: Computational Lab-IV (Oracle)** |
|---|

**Implementation of at least ONE specific assignment concerning each of the following:**
1. SQL statements to create, update, and delete databases and tables
2. SQL statements to insert, update, and delete records from tables
3. SQL statements to create, update, and delete views
4. Simple SQL queries to retrieve information from a database
5. Nested SQL queries to handle complex information retrieval requirements.
6. SQL queries using aggregate functions like count, average, sum, etc.
7. PL/SQL blocks using basic data types and operators
8. PL/SQL blocks using branching and looping constructs
9. Database triggers using PL/SQL
10. Database functions/procedures using PL/SQL

# DEPARTMENT OF COMPUTER SCIENCE
Faculty of Natural Sciences, Jamia Millia Islamia

| CSC201: Visual Programming |
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1. **VB.NET Fundamentals:** Windows Applications; Programming Languages: Procedural, Event Driven, Object Oriented and Visual Paradigms; Object Model and MS-Visual Studio; Writing VB Projects; Programming VB vs other Projects; Visual Studio Environment; Typical Errors and Visual Studio Help Features.. Controls, Declarations and Calculation: Controls and their Importance; Multiple Controls: selection, Properties, Alignments etc; Designing GUI: Events, KAK, Defaults, Tab orders and Yool-tips; Coding for Controls and Programming; Data, Variables and Constants; Calculations; Formatting; Handling Exceptions; and Ménage Boxes.

2. **Decisions, Conditions and Subroutines**: Conditions; If and nested 1F statements; Radio Buttons and Text Boxes; Enhancing Message Boxes; Input Vilifications and VB-Based Provisions; Calling Event Procedures; and Debugging VB Projects; Minus and Common Dialog Boxes; Creating Context Minus; and Writing General Sub-procedures and Functions.

3. **Object Oriented Programming:** OOP Concepts: Objects, 0objet 0rientation Attributes and Terminology; Reusable Objects; Multi-tier Applications; Classes; Creating New Objects; Constructors and Destructors; Inheritance; Object Browser; List Boxes and Combo Boxes; Do/Loops; for/next loops; Selection of Entries and Printing; Programming Example; Arrays; Case Structure, Sharing Event Procedures, 1-Dim Arrays, for/Next Statements; Structures; Accumulators; Table Looking; List Boxes with Arrays; Multi-Dimensional Arrays; and a Programming example.

4. **Data Storage and Retrievals:** DB Files; File vs Arrays, DB terminology and XML data; Using ADO.NET and VB; Creating DB Applications; Using Data-Bound Labels; Populating Combo Boxes with Data; Making DB objects Portable; Updating Data Sets; and Programming example. Date File and Project Files; Data File Terminology, Using Streams and File Handling, Using the File Common Dialog Boxes; Saving Contents of List Boxes; Serialization – Making a Class Serializable, Adding Formatter Object File Stream, Saving and Stream and Recreating Objects; and a programming example.

5. **Web Form, Graphics and Animation:** VB and the Web Programming; Client Server Web Application; Creating Web Forms – WF in Visual Studio IDE; HTML Code, Browser view, Toolbars Controls, Event handling, Debugging etc; Laying out Web Forms; Validator Controls, Managing Web Projects and Programming Web Forms. Graphics in Windows and on the web; The graphics Environment Drawing Objects, Paint Procedure; Pen and Brush objects, Coordinate system, and Graphics Methods; Random Numbers; Animation – Display, Control and Movements; The Timer Control; Scrool Bar Controls: Properties, Events and Programming; and a Programming Example.

REFERENCES
**Bradley et al.: Programming with VB.NET, TMHl**
Deitel & Deitel: VB.NET – How to Program? Gad Pilan
Date: Programming and Problem Solving with VB.NET, Narosa
Robin: Object Oriented Programming with VB.NET, PHI

| CSC202: Network Technologies |
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1. **Networks standards & Model:** Introduction to Computer Networks; Communication Media and Nodes; Workstations; Hosts and Servers; Packets, Frames, and Cells; Networking Capabilities; Peer-to-Peer Networking and Workgroups; Networking with Servers; Client-Server Networking; Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Network (WAN), Enterprise Network; Networking Standards and their Types; ISO-OSI Model; TCP/IP Model.

2. **Topologies, Communication Media and Network Transport Systems:** Network Topologies, Communication Media, Communication Media Costs and Considerations; Ethernet and the IEEE 802.3 Standards, Token Ring and the IEEE 802.5 Standards.

3. **High Speed Network Transport and Devices for Network Connectivity:** WAN and Enterprise Network Communications; Fast Ethernet; FDDI; X.25, ISDN, Frame Relay; Multistation Access Units (MAU); Multiplexers, Repeaters, Bridges, Routers, Hubs, Gateways ; ATM Switches, VLANs.

4. **Network Planning and Fault-Tolerance Techniques:** Assessing Network Needs; Developing a Plan; Selecting the Right Network Media and Topology; Estimating Network Costs; Managing Network Performance through Centralized Planning; Planning Network Security; Component Failures; Fault Tolerance; Disk-Storage Fault Tolerance; Server Fault Tolerance; Developing a Disaster Recovery Plan.

5. **Remote Network Access and Network Monitoring:** A Brief History of Remote Access; Modems; Remote Access Protocols; Security; An Overview of Network Monitoring; Establishing Network Traffic Characteristics; SNMP; Network Monitoring Devices; An Overview of Enterprise Network Management Tools; Event Management; Domain Services Management; Server and Workstation Management; Firewalls. Troubleshooting Network Problems: Developing a Problem Solving Strategy; Know Your Network; Know the Business Processes of Your Organization, Solving Problem Step-by-Step.

REFERENCES
**Palmer: Hands-on Networking Essentials with Projects, VPH**
Tanenbaum: Computer Networks, PE
Stallings : Data and Computer Communications, PHI

# DEPARTMENT OF COMPUTER SCIENCE

Faculty of Natural Sciences, Jamia Millia Islamia

| **CSC203: Database Management Systems** |
|---|
| 1. **Database:** Data, Database and Database Management System (DBMS); Database vs. Traditional File System Approach; Three Schema Architecture of DBMS and Data Independence; Classification of Database Management Systems – Hierarchical, Network and Relational Database Systems; Centralized and Client-Server Architectures for DBMSs Database Languages and Interfaces; Database Users. |
| 2. **Database Models**: Introduction, Categories of Database Models: High-level or Conceptual Data Models, Representational or Implementation Data Models, Low-level or Physical Data Models, Object Data Models. Entity relationship (ER) Model: Basic Concepts and their representations – Entity, Entity Type and Entity Set, Attributes and Keys, Relationships, Relationship Types, and Structural Constraints, Weak Entity, Naming Conventions & Design Issues in ER Model. ER Diagrams. |
| 3. **Relational Database Model:** Structure of Relational Model; Domains, Attributes, Tuples, and Relations; Characteristics of Relations; Relational Constraints – Domain Constraints, Key Constraints, Entity Integrity, and Referential Integrity Constraints; Relational Database Schema; Relational Algebra Operations – Select, Project, Rename, Union, Intersection, Set Difference, Join, and Division Operations; Aggregate Functions and Groupings. |
| 4. **Functional Dependencies and Normalization:** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Inference Rules for Functional Dependencies; Normalization using Functional Dependencies – First Normal Form (INF), Second Normal Form (2NF), Third Normal Form (3NF), and Boyce-Codd Normal Form (BCNF); Relation Decomposition and Insufficiency of Normal Forms; Dependency Preserving and Lossless Join Decompositions; Null Values and Dangling Tuples. |
| 5. **Oracle and Structured Query Language (SQL):** Introduction to Oracle; Features of Oracle; Form Design; Schema and Table Creation; Schema and Table Deletion; Table Modification; Insert, Delete, and Update Statements; SELECT-FROM-WHERE Structure; Renaming Attributes; Nested Queries and Set Comparisons; EXISTS and UNIQUE Functions; Aggregate Functions; Creating and Updating Views. Introduction to PL/SQL, Handling Data in PL/SQL Blocks; PL/SQL Processing; Programming Constructs, Procedures, Functions, Exception handling, PL/SQL Packages; Database Triggers; Oracle-Supplied Packages. |
| REFERENCES<br>**Navathe: Fundamentals of Database Systems**, **PE**<br>Date: An Introduction to Database Systems, AW<br>Ivan Bayross: SQL, Pl/SQL – The Programming Language of Oracle, BPB |
| **CBCS Courses for PG Diploma Students** |
| **CBCSE107: Computer Fundamental** |
| 1. **Computing Concepts:** Basic Computing Systems, Layers of a Computing System, History of Computing, History of Computing Software, Stored-Program Concept and von Neumann Architecture. Fetch-Execute Cycle, Input-Output Devices, Mouse, Keyboard, Touch Screens. |
| 2. **Data Representation and Logic Gates:** Binary Values and Computers, Data and Computers, Analog and Digital Data; Binary Representation. Number Systems: Binary, Octal, Decimal, and Hexadecimal. Conversions of Data from one Number System to another Number System. Representation of Numeric Data – Negatives and Real Data Representation. Representing Texts - ASCII and Unicode Character Sets. Binary Arithmetics – Addition and Substraction of Numbers in Different Number Systems. Gates and Circuits**:** Computers and Electricity. |
| 3. **Logic Gates and Circuits:** AND, OR, NOT, XOR, NAND and NOR Gates. Gate Processing; Gates with More Inputs; Constructing Gates; Transistors; Circuits – Combinatorial Circuits: Adders and Multiplexers. Circuit as Memory; Integrated Circuits; CPU Chips. |
| 4. **Programming Languages:** Computer Operations; Levels of Abstraction; Machine Language; Assembly Language; Pseudo-Operations; Introduction to Interpreter and Compiler, Programming Language Paradigms, Procedural vs. Object-Oriented Paradigms. Boolean Expressions; Strong Typing; Input-Output Structures; Control Structures; Composite Data Types. System Programs: Compilers; Interpreters; Loader, Linker, and Operating Systems. |
| 5. **Memory :** Basic Concepts of Memory, Types of Memory, Hierarchy: Registers, Cache, ROM, RAM, ROM BIOS/Firmware, Secondary, Tertiary Storage Devices, and their Relative Characteristics |
| REFERENCES<br>**Dale & Lewis: Computer Science Illuminated, Narosa**<br>Rajaraman: Fundamentals of Computers,PHI<br>ITL Esl: Introduction to Computer Science, PE |

# DEPARTMENT OF COMPUTER SCIENCE
## Faculty of Natural Sciences, Jamia Millia Islamia

| CBCSE207: Business Information Systems |
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1. **Understanding Systems:** System and Models; Need for Framework and Models; Work System Framework; Work System Principles; Relationship between Work Systems and Information Systems;Need for Balanced View of a System; The Principle Based Systems Analysis Methods; Measuring WS Performance; and Elements of a Work System.
2. **Towards E-Business Systems:** Business Operation Through Systems; Phases of Building and Maintaining Systems; Information Technology as Driving Force for Innovations: Grater Miniaturization, Speed and Portability, Greater Connectivity and Continuing Convergence of Computing and Communication Technologies, Greater Use of Digitization and Multimedia, Better Software Techniques and Interface with People; and Obstacles in Applying IT in Real World.
3. **Business Processes**: Business Processes; Process Modeling: DFD, Flowcharts and Structured English; Process Characteristics: Degree of Structure, Range of Involvement, Level of Integration, Rhythm, Complexity, Degree of Reliance on Machines etc; Communication and Decision Making; Evaluating Business Process Performance: Activity Rate and Output, Consistency, Productivity, Cycle Time, Downtime and Security; Basic Communication and Decision Making Concepts.
4. **Typical Information Systems:** Information System Categories related to Specific Functional Areas of Business, IS Categories applicable Functional Areas; Office Automation Systems; Communication Systems: Teleconferencing, E-Mail, Fax,, SMS, Groupware, Internet, Intranets, Extranets, Knowledge Management, and Group Support Systems; Transaction Processing Systems; MIS and Executive Information Systems; Decision Support Systems: Simulation and Optimization, OLAP and Data Mining Expert Systems, Neural Networks, Fuzzy Logic, Case Based Reasoning, and Intelligent Systems; Enterprise Systems; and Limitation and Uses of Typical Information Systems.
6. **Customer, Product and IT:** Customer's View of Product and services; The Customers' Experience; Evaluating Products and Services – Cost, quality, responsiveness, Reliability and Conformance to standards; Performance Variables of IT – Functional Capabilities and Limitations, Ease of use, Compatibility and Maintainability; Units of Measurement – Amount of Data, Time etc; Overview of Computer systems- Basic Model and types; Approaches of Organizational Computing-Centralized, Personal, Distributed, Networked and Client-Server., BIS, Software :BIS Context and Demands; Current Limits of Software; Types of Software; Programming viewed as Business Process;

| REFERENCES |
|---|

**Alter: Information Systems – The Foundations of E-Business, Pearson**
Haag & Cummings: Information Systems Essentials, TMHl
Simha & Magal: Business Information Systems – Analysis and Design and Practice, AW

| CBCSE207: E-Commerce |
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1. **The internet and the World Wide Web:** The Internet Today, World Wide Web, ISP, Stability and reliability of the Web, Benefits of the internet, Marketing and Selling Products and services. Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.
2. **Launching a Business on the Internet:** The Business Planning and Strategizing phase, planning process strategy, deciding on the type of site; Hardware, Software security phase; Design phase, web storefront, Maintenance and Enhancement phase, Managing customer feedback, Managing customer service. Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, and FRAME RELAY).
3. **Marketing on the Internet:** Pros and Cons of online shopping, Internet Marketing Techniques, The E-Cycle of Internet Marketing, Business plan, The Product, Pricing, Place, Promotion, Personalization, Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.
4. **E-Commerce and Payment Systems:** Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models: Business-to Consumer (Internet),Business-to-Business(Internet and Extranet), Business-Within-Business(Internet). Electronic Payments Systems: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking, types of electronic payments media, Digi cash, E-cash and E-wallet.
5. **Web-Based Business-to-Business E-Commerce:** B2B E-Commerce, B2B Vs B2C, Advantages and Disadvantages of B2B, Supply chain, B2B building blocks, B2B Integration Chllenges.B2B Models- Buyer Oriented B2B, Supplier-Oriented B2B, Electronic auctions, Intermediary oriented B2B.. EDI: How EDI works, justifying EDI, Financial EDI, and EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda. Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.

| REFERENCES |
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**Lohsin and John Vacca: Electronic Commerce, NAI**
Hansom and Kalyanam : Internet Marketing and Ecommerce, , CL Press.
Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", AW.
Dave Chaffrey: Internet Marketing: Strategy, Implementation and Practice,, PHI.

# DEPARTMENT OF COMPUTER SCIENCE

**Ability/Skill Enhancement Courses for PG Diploma Students**

| CBCSS 108: DTP with MS Office |
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| 1. **MS Windows Basic Operations:** Acquaintance with Vocabulary**:** Start Button, Desktop, Taskbar, Dialog Box, Icon, Select or Highlight, Blinking Cursor / Insertion Point/ I-Beam, Right-Mouse Button. Parts of a Window /Manipulating Windows: Minimize, Maximize, Restore, Resize and Close. Keyboard awareness: Return <Enter>, Arrow Keys, Home. End, Page Up, Page Down, <Ctrl>, Alt. Backspace, Delete, Escape <Esc>. Keystrokes for efficiency: Alt-Tab, Cut, Copy, Paste, Undo, Escape, Ctrl - Alt – Delete. |
| 2. **Editing and Formatting Text:** Exploring MS Word, Making changes to a document, Inserting saved text, Reorganizing a document outline, Finding and replacing text, Correcting spelling and grammatical errors, Highlighting, Using Comments, Tracking Changes |
| 3. **Working with Entire Document**: Paragraph formatting, Adding headers and footers, Inserting tables, Formatting tables, Changing Page orientation, Inserting WordArt, Inserting and modifying graphics. |
| 4. **MS Excel:** Creating worksheets: Insert, Move, Copy, Cut, Paste, Drag and Summing up data in worksheets, Formatting worksheets: formatting numbers, text and cells, Freezing Columns. Manipulating data: Copying formulas across cells, Editing and formatting formulas, performing calculations on data, Using the Chart Wizard, Embedded charts vs chart sheets. Managing list data: Sorting and organizing data in list, Using a data entry form, Copy and move worksheets, Copying formulas across worksheets, Troubleshooting, Repeating labels on all pages, Setting print area |
| 5. **MS Power Point:** Exploring MS PowerPoint, Learn about PowerPoint toolbars, Demonstration of PowerPoint features, Choosing layouts, backgrounds and colours, Formatting text and bullets, Inserting Sound, Graphics & Animation, Exploring Print Options in PowerPoint: Slide format, Handout Format, Grayscale, Outline. |
| REFERENCES<br>Step-by- Step, Microsoft Office<br>https://digital.com/blog/excel-tutorials/ |
| **CBCSS 208: Website Design and Maintenance** |
| 1. **Fundamental C0ncepts:** Overview; Technical Infrastructure; Information Sharing; Types of Web Sites; Website Architecture – 2-Tiered and n-Tiered Architecture, Website Design Issues – Administrative, Creative, Technical, and Marketing; Introduction to Web Site Editors. Web Site Design Process – Analysis, Design, Development, Implementation, Evaluation and Maintenance, and Promotion; Factors Influencing Web Site Design; Elements of Web Site Design, Web Page Design and Layout. |
| 2. **Web Page Design**: Introduction; Components of a Web Page – Typography (Fonts and Styles), Color (Color Models, Color Profiles, etc.), Graphics (Raster and Vector Graphics), Audio, Video, Plug-ins; Slicing Images; making Images Load Faster; Reducing the Colors in an Image; Reducing the Size of Images – Resizing, Cropping, and Creating Thumbnails; Developing Web Site Using Dreamweaver, Testing a Web Site. |
| 3. **Hyper Text Mark-up Language:** HTML Document Structure – HTML, HEAD, and BODY; HTML Tags and their Functions; Creating Web Pages Using HTML. Dynamic HTML (DHTML): Introduction, DHTML Features – Dynamic Content, Dynamic Style, Dynamic Positioning, Data Binding; Components of DHTML – Cascading Style Sheets (CSS); Animations; Types of Animations – GIF Animations, Swf Animations, DHTML Animations, Web Video Animations, 3-Dimentional and Virtual Reality Animations; Object Referencing, Dynamic Styles, Dynamic Positioning, Event Model – Event onclick, Event onload; Filters and Transition – Flip Filters (flipv and fliph) ,Transparency with Chroma Filter, Creating Image Masks, Miscellaneous Image Filters (invert, gray and X-ray). |
| 4. **Java Script:** Introduction to Scripting; Obtaining User Input with Prompt Dialogs, Memory Concepts, Arithmetic; Control Statements& Loop structures, Break and Continue Statements, Labeled Break and Continue Statements. Functions – Programmer Defined Functions, Function Definition, Scope Rules, Java Script Global Functions, Recursion. Arrays – Declaring, Allocating  and using Arrays; Sorting Arrays; Searching Arrays; Multidimensional Arrays Introduction to Objects; Types of Objects – Math, String, Date, Boolean, and Window Objects. ASP.NET – Introduction, .NET Overview, Setup, JScript.NET, Web Forms, Session Tracking. |
| 5. **Web Servers**: Introduction to Internet Information Services (IIS), HTTP Request Types, System Architecture, Client-Side Scripting versus Server-Side Scripting, Accessing Web Servers; Apache Web Server; Requesting Documents (XHTML, ASP.NET, Perl, PHP, Python). Miscellaneous topics and supplements |
| REFERENCES<br>**Basics of Website Design, PHI**<br>Deitel – Internet & World Wide Web: How to Program, PHI<br>Steven Holzner - HTML Black Book, DreamTech Press<br>Michael K. Glass, et. al.- Beginning PHP, Apache, MySQL Web Development, Wrox |