## Scheme for Integrated Programme (Computer Science)

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Detailed Syllabus

CS 101: Computer Fundamentals & Programming in C

UNIT - I

Introduction to Computer, Von Neumann Architecture, Generation of Computer, Storage Device- Primary Memory and Secondary Storage, Random, Direct, Sequential access methods. Concept of High-Level, Assembly and Low Level programming languages, Program Development Steps, Representing Algorithms through flow chart, pseudo code.


Concept of radix and representation of numbers in radix r with special cases of r=2, 8, 10 and 16 with conversion from radix r1 to radix r2. r’s and (r-1)’s complement. Representation of Integer in sign-magnitude, signed 1’s and 2’s complement

UNIT-II

Structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

Input-output statements, statements and blocks, if and switch statements, loops- while, do-while and for statements, break, continue, goto and labels, programming examples.

UNIT-III

Designing structured programs, Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, example c programs.

UNIT - IV

Introduction to Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays. String and String functions.

Derived types- structures- declaration, definition, Pointers- concepts, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays

Text/Reference Books

CS 103: Object Oriented Programming in C++

UNIT I

Introduction to programming paradigms- (Process oriented and Object oriented).
Concept of object, class, objects as variables of class data type, difference in structures and class in terms of access to members, private and public members of a class, data & function members. Characteristics of OOP- Data hiding, Encapsulation, data security.

UNIT II

Basics of C++: Structure of C++ programs, introduction to defining member functions within and outside a class, keyword using, declaring class, creating objects, constructors & destructor functions, Initializing member values with and without use of constructors, simple programs to access & manipulate data members, cin and cout functions. Dangers of returning reference to a private data member, constant objects and members function, composition of classes, friend functions and classes, using this pointer, creating and destroying objects dynamically using new and delete operators. Static class members, container classes and iterators, proxy classes.

UNIT III

Operator overloading: Fundamentals, Restrictions, operator functions as class members v/s as friend functions. Overloading stream function, binary operators and unary operators. Converting between types.

UNIT IV

Inheritance: Base classes and derived classes, protected members, relationship between base class and derived classes, constructors and destructors in derived classes, public, private and protected inheritance, relationship among objects in an inheritance hierarchy, abstract classes, virtual functions and dynamic binding, virtual destructors.
Multiple inheritance, virtual base classes, pointers to classes and class members, multiple class members. Templates, exception handling.
CS 201: DATA STRUCTURE

Unit I
Introduction to data structures: concept of data structures, data structure operations, algorithms, time and space analysis of algorithms, memory representation of arrays. Stacks and Queues: Introduction to stack and operations on stack, stack applications: infix, postfix, prefix, recursion, Tower of Hanoi, Introduction to queues and operations on queues, circular queues, deques.

Unit II
Linked List: Introduction to linked list, Representation in memory, Header nodes, doubly linked list, circular linked list. Operations on linked list- traversing, insertion, deletion, searching and concatenation.

Unit III
Trees: definition & concepts, binary trees, representation of binary tree in memory, traversal of binary tree: inorder, preorder & postorder, binary search tree, heap, general trees, conversion of general trees to binary trees, minimal spanning tree, Kruskal’s algorithm to find a minimal spanning tree.
Graphs: various definitions, digraphs, multigraphs and weighted graphs, path and circuits, Eulerian path and circuits, Hamiltonian paths and circuits, planner graphs.

Unit IV
Searching & Sorting: sequential searching, binary searching, insertion sort, selection sort, quick sort, bubble sort, heap sort, merge sort, radix sort, comparison of sorting methods. String processing: string storage, string operations, word processing: replacement, insertion, deletion, pattern matching algorithms. Note:- Implementation of algorithms through C.

Reference Books:
1. Data Structure and Program Design by Robert Kruse.
2. Data Structures by Seymour Lipschutz, Schaum Outline Series
3. Discrete Mathematics by K.D.Joshi
CS 203: DATABASE MANAGEMENT SYSTEM

Unit I
Introduction to E-R Model & Relational Algebra: Introduction, advantage of DBMS approach, various views of data, data independence, schema & sub-schema, primary concept of data models, Data base languages, Database Administrator & users, Data dictionary, Overall System architecture. E-R Model: basic concept, design issues, mapping constraints, keys, ER-diagram, weak and strong entity sets, specialization & generalization, aggregation, design of ER Schema to tables.

Unit II
Relational Model: domains, relations, relational databases, various types of keys (super, candidate, primary, alternate, secondary, foreign keys), structure of Relational Algebra, Relational Algebra with extended operations, modifications of databases, idea of relational calculus.

Unit III
SQL, Functional Dependencies & Normalization: basic structure of SQL, set operations, aggregate functions, null values, nested sub-queries, views, modification of databases, join relations, DDL, DML, Assertion and Triggers: basic definitions, trivial and non-trivial dependencies, closure set of dependencies & of attributes, canonical cover. Introductions to normalization: loss less and lossy decomposition, First, second and third normal forms, dependency preservation, BCNF, multi-valued dependencies and fourth normal form, join dependencies and fifth normal form.

Unit IV
Transactions, Concurrency & Distributed Databases: basic concept of transaction, ACID properties, transaction state, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, data access. Recovery & Atomicity - log based recovery, deferred database modification, immediate database modification, check points. Distributed Databases: basic idea, distributed data storage, data replication, data fragmentation (horizontal, vertical & mixed).

Reference Books:
1. An Introduction to Database System by C.J. Date (6th edition) Addison Wesley.
2. An Introduction to Database System by B.C. Desai, Galgotia Publication.
4. Database Management System by Alexix Leon Mathews Leon
5. Oracle 8 The complete reference by Koch & Loney, Oracle Press.
CS 301: Computer Systems Architecture

UNIT I
Digital Logic, Number Systems & codes, Computer Arithmetic: Logic Gates, Boolean Algebra

UNIT II
Digital Component: Multiplexer, Decoder, Encoder, Registers: Shift Register, Counters,
Floating Point Arithmetic: Floating point representation, Add, Subtract, Multiplication, Division

UNIT III
Register Transfer and Micro-operation: Register Transfer, Bus and Memory Transfers,

UNIT IV
Central Progressing Unit (CPU): General Register Organization, Control Word, Example of Micro operation, Stack Organization: Register stack, Memory Stack, Reverse Polish Notation. Instruction Formats, Three, Two, One, Zero Address Instructions, RISC Instructions, Addressing Modes, CISC Characteristics and RISC Characteristics.

Text/References:
5. Nicolas Carter, Computer Architecture, Schaum’s Series, TMH
CS 302: Discrete Structures

UNIT I
Sets: Definition and types, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles), Recursive definition of set.
Functions, Relations, Properties of binary relations, closure, Partial Ordering Relations, The Pigeonhole & Generalized Pigeonhole Principles, Composition of Functions Concept, Mathematical induction

UNIT II
Graph Theory: Graphs – Directed, Undirected, Simple., Adjacency & Incidence, Degree of Vertex, Subgraph, Complete graph, Cycle & Wheel Graph, Bipartite & Complete Bipartite Graph, Weighed Graph, Union of Simple Graphs, Complete Graphs, Isomorphic Graphs, Path, Cycles & Circuits Euclerian & Hamiltonian Graphs.

UNIT III
Planar Graph: Kuratowski’s Two Graphs, Euler’s Formula, Kuratowski’s Theorem.
Trees: Spanning trees- Kruskal’s Algo, Finding Spanning Tree using Depth First Search, Breadth First Search, Complexity of Graph, Minimal Spanning Tree.

UNIT IV
Language of Logic: Proposition, Compound Proposition, Conjunction, Disjunction, Implication, Converse, Inverse & Contrapositive, Biconditional Statements, tautology, Contradiction & Contingency, Logical Equivalences, Quantifiers, Arguments
Groups, Ring, fields and Lattice

Text/Reference Books
4. Narsingh & Deo, Graph Theory with Applications to Engineering and Computer Science, PHI 2004 Publication
CS 303: Computer Networks

Unit I

Introduction to Networks and Layered Architectures (OSI, TCP/IP), Categories of Networks Network performance measures e.g. bandwidth, latency, Delay/bandwidth product. Transmission Media: Guided Media (twisted pair cable, Coaxial Cable, fibre optic cable), Unguided media (radio waves, microwaves, infrared), Topology. Hardware building Blocks of a network e.g. switches, routers, gateways etc.

UNIT II


UNIT III


UNIT IV

Application layers: Domain name system – Electronic mail – The World Wide Web. Introduction to Network security

Text/References:

2. Computer Networking Top Down approach 3rd edition By Jim kurose and keithross
CS 304: Operating System

UNIT-I

Introduction to Operating Systems, Types of operating systems, Multiprogramming, Time-sharing systems, Operating system services, System calls and System programs, Storage structures

UNIT-II

Memory Management, Single and multiple partitioned allocations, paging segmentation, Virtual Memory Management, Demand paging and Page Replacement Algorithms

UNIT III

Process concepts, process scheduling, operations on process, threads, Inter process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization.

UNIT-IV

Deadlock: Introduction, problem, characterization, prevention, avoidance, detection, recovery from deadlock, Methods for deadlock handling.

File concept, Access methods, Directory structure, allocation methods, free space management, disk scheduling.

Text/References:

1. Abraham Silberschatz and P. B. Galvin - Operating system concepts – Addison Wesley Publication
CS 305: Software Engineering

UNIT I

System Analysis: Characteristics, Problems in system Development, System Level project Planning, System Development Life cycle (SDLC), computer system engineering & system analysis, modeling the architecture, system specification. Capability Maturity Model Integration (CMMI)

UNIT II


UNIT III

Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation, coding – Programming style, Program quality, quantifying program quality, complete programming example

UNIT IV

Testing Strategies and tactics: Testing fundamentals, strategic approach to software testing, Validation testing, system testing, Black-Box testing, white-box testing and their types, basic path testing.

Text/Reference Books

3. KK Agarwal an Y. Singh, Software Engineering, New Age International Publishers
CS 306: Design & Analysis of Algorithms

UNIT I
Definition & characteristics of algorithms, structures. Difficulties in estimating exact execution time of algorithms. Concept of complexity of program. Asymptotic notations: Big-Oh, theta, Omega- Definitions and examples, Determination of time and space complexity of simple algorithms without recursion. Representing a function in asymptotic notations viz $5n^2-6n=\_n^2$

UNIT II
Divide-and-conquer, Dynamic Programming, Greedy methods, Backtracking, Branch-and Bound Technique.

UNIT III

UNIT IV
P and NP class, NP-completeness and reducibility, NP-complete problems.

Text/References
1. T. Cormen, C. Leiserson, R. Rivest. Introduction to Algorithms, Indian Reprint, PHI
CS 307: Theory of Computation

UNIT I
Languages: Alphabets, string, language, basic operations on language, concatenation, Kleene Star

UNIT II
Regular languages model: finite state machine (deterministic and non deterministic), regular grammars, regular expressions, equivalence of deterministic and non deterministic machine and of the three models; Properties: closure, decidability, minimality of automata.

UNIT III

UNIT IV
Turing machines, grammars, recursive functions and their equivalence, language acceptability, decidability, halting problem

CS 308: Internet Technologies

UNIT I

An overview of Java: Object oriented programming, Two paradigms, abstraction, the, OOP principles, Java class libraries, Data types, variables and arrays, Operators
Class fundamentals, declaring object reference variable, Introducing methods, constructors, the key word, garbage collection, the finalize () method, Overloading methods, using objects as parameters, classes, using exceptions. Inheritance and polymorphism, String handling
Exception handling

UNIT II


Introduction of HTML HTML: common tags and controls, HTML basic HTML forms, more complex HTML forms, internal linking, creating and using image maps.

UNIT III

Applets & Java script – Introduction to Applets: Applet Fundamentals, using paint method
introduction to scripting: introduction- memory concepts- arithmetic- decision making.
Java script control structures, Java script functions: introduction – program modules in avascript - function definitions, duration of identifiers, scope rules, recursion, java script global functions.


UNIT IV

Servlets: Lifecycle of a servlet, types of servlets: Generic servlets, HTTP, GET and POST method, RMI, java beans, JDBC, ODBC, Swings

Text/References

1. Herbert Schildt: JAVA 2 - The Complete Reference, TMH, Delhi
2. Deitel: How to Program JAVA, PHI
CS 309 (Elective)

Elective1 CS 309/1: Artificial Intelligence

UNIT –I

Introduction to artificial intelligence: Meaning and definition, various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search Techniques.

UNIT-II

Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning

UNIT-III

Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning.

UNIT-IV

Introduction to learning, learning by neural networks, Introduction to Natural language processing and expert systems

Text/References:

2. Elaine Rich, Kevin Knight, Nair Artificial Intelligence, Mc-Graw Hill. 2008
3. Dan W. Patterson, Introduction to AI & Expert Systems, PHI.
Elective 2 CS 309/2: Computer Graphics

UNIT I

Introduction: Cathode Ray tube, Video Display Devices, Raster Scan Systems, Random Scan systems. Input devices.

UNIT II


UNIT III


3D Viewing: Plane. Different types of projections.

UNIT IV

Fractals Graphics- Introduction to fractals, some natural examples, one-step feedback machine, Multiple Reduction Copy Machine, properties of fractal objects. fractal dimension, Applications of fractals. Generation of a few fractals, e.g., Cantor set, Fractal carpet, Koch curve etc.

Text/References

Elective 3 CS 309/3: Data Mining & Knowledge Discovery

UNIT I

Introduction to data mining & knowledge discovery in databases, Data mining v/s Databases, Complexities of Data mining, Application & future scope of data mining, the knowledge discovery process: normalization, converting, smoothing data, method for attribute elimination and creation. Data mining versus KDD, Data mining versus OLTP, introduction to data warehouse, OLAP, Application areas of data mining, Functionality of Data mining.

UNIT II


UNIT III


UNIT IV

Neural Networks, Introduction to web mining, Case study: Biomedical, Financial, Retail industry, web based.

Text/Reference

3. Data Mining Introductory and Advanced topics. By Margaret H. Dunham. Pearson Education.
4. Data mining and data warehousing by Teck June Ho, Pearson/Prentice Hall, 2005
5. Data Mining By Gopalan & Sivaselvan, PHI Learning Pvt. Ltd.
7. Data Mining Techniques by Arun k Punjari ,University Press,2007
**Elective 4 CS 309/4: Information Security**

**UNIT I**

Introduction to security, attacks, computer criminals, security services,

Cryptography: Substitution ciphers, transposition cipher, confusion, diffusion, symmetric and asymmetric encryption. DES, odes of DES. Hash function, key exchange, digital signatures and certificates

**UNIT II**


**UNIT III**


Digital Signatures: RSA Based, ElGamal Signatures, Undeniable Signatures.

Authentication: Model of Authentication Systems, Impersonation, Substitution and spoofing games, Authentication schemes for mutual authentication based on shared secret, two-way public key, one-way public key, Mediated Authentication, One way Authentication

**UNIT IV**

Security in networks: Threats in networks, network security controls, firewalls, intrusion detection system Administering security: Security planning, risk analysis, physical security, Ethical issues in security


**Elective 5 CS 309/5: Advance topics in Computer Science**