DIT University, Dehradun
Syllabus for Ph.D. Entrance


Security: Securing the cloud-The security boundary, Security service boundary, security mapping, Data security-Brokered cloud storage access, storage location and tenancy, encryption, Auditing and compliance, Establishing identity and presence, Network security, Host security, compromise response, High-throughput computing: Task programming. Advanced topics in cloud computing: energy efficiency in clouds, market based management of clouds- market oriented cloud computing; A reference model of MOCC technologies and initiatives supporting MOCC, Federated clouds / InterClouds, Third party cloud services- Meta CDN; SpotCloud, Using the mobile cloud.


**Programming in C:** Fundamentals: Character set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedence of operators, Input-output Assignments, Control structures, Decision making and Branching, Decision making & looping. C Functions: User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Recursion, Storage Classes. Arrays and Strings: One dimensional Array, Multidimensional Array declaration and their applications, String Manipulation. Pointers: Pointer variable and its importance, Pointer Arithmetic, passing parameters by reference, pointer to pointer, linked list, pointers to functions, dynamic memory allocation. Structures, Unions: Declaration of structures, declaration of unions, pointer to structure & unions. File Handling: Console input output functions, Disk input output functions, Data files. Additional Features in C: Command line arguments, bit wise operators, enumerated data types, type casting, macros, the C preprocessor, more about library functions.

**Programming with Java:** Object Modeling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints. Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model. Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD. Java Programming: Introduction, Operator, Data types, Variables, Methods & Classes, Multithread Programming, I/O, Java Applet. Java Library:
String Handling, Input/Output exploring Java.io, Networking, Applets classes, Event Handling, Introduction to AWT, Working with window, Graphics, AWT Controls, Layout Manager and Menus, Images, Additional packages. Software Development using Java: Java Beans, Java Swing, Java Servlets, Migrating from C++ to java, Application of java, Dynamic Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabblets, JDBC, Brief functioning of upper layer E-mail and their applications.

**Theory of Computation:** Mathematical preliminaries, alphabets, strings, languages, states, transition, transition graph, generalized transition graph, Deterministic Finite Automata, Non-Deterministic Finite Automata, Non-Deterministic Finite Automata with ε transitions, minimization of DFA._Conversions and Equivalence:_ Equivalence between NFA with and without ε transitions. NFA to DFA conversion; Equivalence between two DFA’s, Limitations of FSM; Application of finite automata, Finite Automata with output- Moore & Melay machine and its conversion._Regular Languages:_ Regular sets; Regular expressions, Arden’s theorem, Construction of finite Automata for a given regular expression, Pumping lemma for regular sets. Closure properties of regular sets. Grammar Formalism: right linear and left linear grammars; Equivalence between regular linear grammar and FA, Context free grammar; Derivation trees, sentential forms. Ambiguity in context free grammars; Normal forms: Chomsky normal form and Greibach normal form; Pumping Lemma for Context Free Languages, Closure property of CFL. Push Down Automata: Push down automata, definition; Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence; Equivalence of CFL and PDA; Introduction to DCFL and DPDA._Turing Machine:_ Turing Machine, definition, model, Design of TM, Computable functions Church’s hypothesis, Types of Turing machines: Universal Turing Machine, Halting problem, Properties of recursive and recursively enumerable languages, unsolvable decision problem, undecidability of Post correspondence problem, Church turing Thesis.


**Database Management System:** Introduction: Data base System Applications, data base System VS file System, Data Abstraction, Instances and Schemas, data Models: the ER Model, Relational Model & Other Models , Database Languages, data base Users and Administrator, data base System Structure, Storage Manager, the Query Processor, Two/Three tier architecture. E-R model: Basic concepts, Design Issues, Mapping Constraints, Attributes and Entity sets, Relationships and Relationship sets, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features. Relational Model & SQL: Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra; SQL: Form of Basic SQL Query, Nested Queries, Aggregative Operators, NULL values, Logical operators, Outer Joins, Complex Integrity Constraints in
SQL. Database Design: Schema refinement, Different anomalies in designing a Database, Decompositions , Problem related to decomposition, Functional Dependency, Normalization using functional dependencies, 1NF, 2NF, 3NF & BCNF , Lossless join decomposition, Dependency preserving Decomposition , Schema refinement in Data base Design, Multi valued Dependencies, 4NF, 5NF. Transaction Management: Transaction-concepts, states, ACID property, schedule, serializability of schedules, concurrency control techniques - locking, timestamp, deadlock handling, recovery-log based recovery, shadow paging.

