Integral University, Lucknow
Department of Computer Application

Syllabus for Admission to PhD Programme
w.e.f. session 2016-2017

Computer Fundamentals: History, Generation and Application of Computer, Number System, Input Output Devices, Memory Types.

Discrete Mathematics: Number System, Set Theory, Relations, Functions, Lattices, Theory of Groups, Boolean algebra, Recurrence Relations, Numeric Functions.

Programming and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps, Tree and graph traversals.

Object Oriented Concepts Using C++ and Java: Object and Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Constructor and Destructors, Operator and Function Overloading, Virtual and Pure Virtual Class.

Database Management System: E-R Model, Relational Model, SQL Queries, Referential Integrity, Normal Form (1 NF, 2 NF, 3 NF and BCNF).

Operating System: Introduction, Process Concept, Multithreading, Process Scheduling, Synchronization and Deadlock, Memory Management, Virtual Memory Management, Disk Scheduling.

Algorithms: Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity.

Computer Organization and Architecture: Machine instructions and addressing modes, ALU, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage, Logic functions, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).

Theory of Computation: Regular languages and finite automata, Context free languages, Push-down automata, Turing machines.

Compiler Design: Lexical analysis, Parsing, Syntax directed translation, Intermediate and target code generation, Basics of code optimization.

Information Systems and Software Engineering: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

Computer Networks: OSI Reference Model, Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http), Basic concepts of hubs, switches, gateways, and routers, Network security basic concepts of public key and private key cryptography, digital signature, firewalls.