

# Department of Computer Science & Engineering

## Syllabus for PhD Entrance Test

The syllabus for the Basic test will be as follows

Area	
<b>Basic Mathematics:</b>	Discrete structures (sets, graphs and trees, algebraic structures, matrix algebra, elementary counting and probability), elementary calculus, linear algebra, 2-3D geometry.
<b>Programming Aptitude</b>	Ability to write and analyze programs in C/C++ to solve simple problems. Use of elementary data structures such as arrays, lists, stacks, queues, trees, graphs. Familiarity with recursion, pointers and file handling. Ability to differentiate procedure & OOP concepts, writing loop invariants and assertions.
<b>Computer Science and Engineering [Core 7 Areas]</b>	
<b>Algorithm Design and Analysis:</b>	Analysis of Algorithm, Divide and Conquer Dynamic Programming, Greedy, Backtracking, P, NP, NP-C, NP-Hard Class Problems.
<b>Artificial Intelligence</b>	Knowledge Representation and organization, Search and control Strategies, Matching Techniques, Expert System Architecture.
<b>Theory of Computation &amp; Compiler Construction</b>	Finite State Automata (FSM)-deterministic and non-deterministic, Regular Expression, Grammar, Derivation, Ambiguous grammar, Idea on Left-factoring and left-recursion, Push-down automata, Turing Machine, Halting problem of Turing Machine and undecidable Language, Translators, Phases of Compiler: Lexical analysis, Syntax analysis, Intermediate code generation, Code optimization, Run-Time
<b>Computer Graphics and Image Processing:</b>	Graphics Display, Scan Conversion, 2D and 3D Transformations, Projections, 2D and 3D viewing and Clipping, Splines, Visible surface Detection, Illumination Models and Surface Rendering, Image Enhancement, Segmentation, Restoration, Segmentation, Image Compression.
<b>Computer Networks</b>	Fundamental communication theory, Data Link Layer protocols, Internetworking, Transport Protocols, Application Layer Protocols.
<b>Database Management Systems and Software Engineering</b>	Relational Query Languages, Transaction Processing Concepts, Process of Normalization Concepts of Indexing and Hashing. System Development Lifecycle Models Object-Oriented Design, Software Testing, Software Metrics
<b>Operating Systems</b>	Basic concepts, Process Scheduling, Synchronization, Deadlock, Memory and Virtual Memory Management
<b>Computer System Organization and Architecture</b>	Machine instructions and addressing modes, ALU, Data-path and control unit, Instruction pipelining, Memory hierarchy: cache, main memory and secondary storage; I/O interface.