**Ph.D. Preliminary Examination Reading List**

**Updated January 1, 2024**

This is the topics and reading list for the Ph.D. Preliminary Examination. This reading list is the official description of the exam topics.

1. **Design and Analysis of Algorithms**
	* Basic analysis tools: growth functions and asymptotic analysis
	* Algorithm design strategies: greedy, divide and conquer, dynamic programming
	* Analysis & design: hashing, basic searching & sorting, elementary graph algorithms

**Suggested reading:** Cormen, Leiserson, Rivest & Stein, Introduction to Algorithms, 2nd edition.

Chapters: 2-4, 6-8, 11-16, 22-25 (excluding sections 4.4, 11.5, 12.4, 16.4, 16.5, 24.4, 24.5, 25.3).

1. **Data Structures & Fundamentals of Programming**
	* C++ and object oriented programming, inheritance, polymorphism, and dynamic variable binding
	* Abstract data types and f undamental data structures including: stacks, queues, lists, binary trees, graphs, vectors, maps, sets, containers/iterators, hashing
	* Dynamic data structures: dynamic arrays, linked lists, pointers, memory allocation/de-allocation,
	* destructors, copy constructors, assignment/copy semantics
	* Expression notations: prefix, postfix, infix
	* Recursion

 **Suggested reading:**  Main & Savitch, Data Structures and other objects using C++ , 4th edition.

 Chapters: 1-10, 14, 15

1. **Computer Operating Systems**
	* Process management: processes, threads, CPU scheduling, Process synchronization
	* Memory management: main memory, virtual memory
	* Storage management: file system interface and implementation, disk structure, deadlocks, OS I/O systems

 **Suggested reading:**  Silberschatz, Galvin, & Gagne, Operating Systems Concepts, 8th edition.

 Chapters: 1-13.