

Prerequisite: CSE 101 or CMPS 101. CSE 102 is a theory course. No programming is required. Students are expected to have familiarity with asymptotic notation, the reading and writing of formal proofs, elementary data structures (lists, stacks, queues, sorted arrays, heaps, trees, etc.), graphs (depth- and breadth-first search, shortest paths, etc.), basic mathematical tools (arithmetic and geometric series, logarithms, polynomials, and exponential functions, counting permutations and subsets), logic (negation and nested quantification), basic calculus (integration, differentiation, limits), vectors and matrices.

Syllabus (tentative)

1. Introduction to Analysis of Algorithms
(Recurrence and Induction, Asymptotic Growth, Common Functions and Masters Theorem)
2. Divide and Conquer Algorithms
3. Dynamic Programming (and Backtracking)
4. Graph Traversal Algorithms: Depth First Search, Breadth First Search, Graph Reductions
5. Graph Algorithms: Minimum Spanning Trees, Shortest Paths, All Pairs Shortest Paths
6. Greedy Algorithms
7. Lower Bounds, Adversary Arguments and Computational Complexity
8. NP-Complete Problems, Backtracking and Approximation Algorithms

It is possible that topics 7 or 8 may be covered only briefly if we fall short of time.

The instructor will focus on providing high quality education. 5-week instructions will be rapid and intense. Students are expected to come prepared for the lecture by reading handouts *before the lecture* to maximize learning, be prepared to ask questions, and be motivated to learn the materials, at their own initiative.

Highly Recommended Book

- [Algorithms](#) by Jeff Erickson, 2019. (JE)

Recommended Books

- [Introduction to Algorithms, Third Edition](#) by Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein. MIT Press, 2009. (CLRS)
- [Algorithm Design](#) by Kleinberg and Tardos, Pearson Education, 2012 (KT)
- [Algorithms](#) by Sanjoy Dasgupta, Christos Papadimitriou, and Umesh Vazirani. McGraw Hill, 2006. (DP)
- [Fundamentals of Algorithmics](#) by G. Brassard and P. Bratley (BB).
- [Computer Algorithms](#) by S. Basse and A. Van Gelder, Addison-Wesley. (BVG)
- [Computer Algorithms](#) by Horowitz, Sahani, and Rajasekaran, Freeman and Company. (HSR)

e-copies of these books should be available freely on the internet. A slightly older edition may also work. Students are expected to have an e-copy of the book by Jeff Erickson. The instructor will borrow course materials from many of these books. Short excerpts from these books will be provided online as needed. and will expect students to have access to them.