

CSE214 - DATA STRUCTURES

Spring 2025

Instructor: Byungkon Kang (byungkon.kang@sunykorea.ac.kr)

Time: T,Th 12:30 – 13:50 (Main lecture), W 14:00 – 14:55 (Recitation)

Location: A115

Course website: https://sites.google.com/view/byungkon/spring2025_ds

(Anything stated in the website and email announcement are also part of the official instruction, so please pay close attention to those)

Prerequisite: A grade of C or higher in CSE114 is required.

Course Description: This is a course designed to introduce core concepts in data structures and their related algorithms. We will go over some of the most fundamental and often-used programming constructs (known as data structures) and the associated algorithms that will help you store, manage, and manipulate your data efficiently. In addition to the data structures, we'll also study slightly more theoretical concepts involving complexity analysis and recursions.

Course outcomes:

- An ability to program using sophisticated features of object oriented programming.
- An ability to define and use data types, and use data structures.
- An understanding of the importance of time and memory efficiency in algorithm design.

Textbooks and references: There is no required textbook for this course, but having one around always helps. These are the ones I often use for reference:

- “Data structures and the Java collections framework”, William J. Collins. ISBN-10: 0470482672 (Main text)
- ”Introduction to algorithms”, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. ISBN: 0-262-53196-8 (Supplementary)

Grading:

- Homework assignments – 10%
- Two midterm exams – 40% (20% each \times 2)
- Comprehensive final exam – 30%
- Recitations (pop-quizzes and exercises) – 20%

Although attendance is not part of the grade composition, missing more than 20% of the class will automatically result in a grade of F.

You *must* complete all homework assignments. Late submissions are worth 0%, but are nevertheless required to be completed. For every missed assignment, your final grade will be reduced by one whole letter (e.g., 'B-' to 'C-'). You may not submit an empty project to bypass this policy - A valid submission is a work that receives a non-zero grade.

Any re-grade requests of assignments (homework and tests) must be submitted in writing within 3 days of the release of the grades.

Major topics:

- Software Design: Specifications; memory and execution time efficiency; introduction to Big Oh notation; abstract data types and examples; review of object-oriented techniques.
- Lists: ArrayList; Singly-linked lists; implementation; inserting and removing data; variations: doubly-linked lists, circularly-linked lists; comparison of arrays and linked lists to store general lists.
- Stacks and Queues: Basic operations of a stack; implementation using an array and a linked list; various stack applications (evaluating postfix, conversion of infix to postfix, etc.).
- Recursion: Recursion and activation records, backtracking, introduction to dynamic programming, tail recursion.
- Binary Trees: Terminology; implementation of trees using nodes; Binary search trees: insertion and removal of data; Tree traversals. Heaps; implementation using arrays; use of a heap as a priority queue.
- Balanced Trees: Red-black trees.
- Searching: Sequential and binary search algorithms; hashing and hash tables; time analysis.
- Sorting: Bubble sort; divide and conquer sorts (quick sort and merge sort); heap sort, time analysis.
- Graphs: Terminology; implementations using arrays and linked nodes; graph traversals.
- Introduction to dynamic programming: A short, week-long discussion on the main concepts and examples of dynamic programming in the context of data structures.

Academic integrity: Students should pursue their academic goals in an honest way that does not put you at an unfair advantage over other students. You are responsible for all work you submitted and representing others work as yours is always wrong. Faculty is required to report any suspected instance of academic dishonesty to the school. Regarding your homework, you are encouraged to discuss it with others, but you should write your own code. For more information please refer to http://www.stonybrook.edu/commcms/academic_integrity/index.html

Students with disability: If you have a physical, psychological, medical or learning disability that may impact your course work, please let the instructor know. Reasonable accommodation will be provided if necessary and appropriate. All information and documentation are confidential.

Critical incident management: The University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.