CSE214 Data Structures

Spring 2022

Course Description:
An extension of programming methodology to data storage and manipulation on complex data sets. Topics include: programming and applications of data structures; stacks, queues, lists, binary trees, heaps, priority queues, balanced trees and graphs. Recursive programming is heavily utilized. Fundamental sorting and searching algorithms are examined along with informal efficiency comparisons.

Class hours: Lecture: TuTh 10:30pm ~ 11:50pm, Recitation: W 2:00pm ~ 2:55pm
Class room: Online (https://stonybrook.zoom.us/j/5078058515/)
Prerequisites: Completed CSE114 with a C or higher grade

Instructor:
YoungMin Kwon (youngmin.kwon at sunykorea dot ac dot kr), Office B420
Office hours: TuTh: 3:30pm ~ 4:30pm

TA:
Shubhangi Garnaik (Graduate TA)
Hyo Jong Chung (hyojong.chung at stonybrook dot edu, https://stonybrook.zoom.us/j/3940919131)
M 6:00pm ~ 10:00pm, F 6:00pm ~ 10:00pm

Textbook and References:
- Data Structures and Algorithms in Java, 6th Edition, Wiley, 2014, ISBN-10: 1-11-877133-8;
Authors: Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser

Course Website:
http://www3.cs.stonybrook.edu/~youngkwon/cse214/

Grading:
1st midterm exam: 20%
2nd midterm exam: 20%
Final exam: 25%
Programming assignments: 30%
Recitation exercises: 5%
Attendance: missing more than 20% of the class will fail the course

Major Topics Covered in the Course:

- Software Design: Specifications; memory and execution time efficiency; introduction to Big Oh notation; abstract data types and examples; review of object-oriented techniques
- Linked Lists: 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.). Basic operations of a queue; implementation using an array and a linked list; queue applications (Josephus problem, simulations, Jai Alai)
- 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: B-trees; 2-3-trees; 2-3-4-trees; red-black trees; AVL trees; splay trees; examples
- Searching: Sequential and binary search algorithms; hashing and hash tables; time analysis
- Sorting: Quadratic sorting algorithms; divide and conquer sorts (quick sort and merge sort); heap sort, time analysis
- Introduction to Graphs: Terminology; implementations using arrays and linked nodes; graph traversals

Course Learning 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

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 other's 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 disabilities:
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.

Tentative Course Schedule

Week	Topics
Week 1	Introduction & Overview Abstract Data Type
Week 2	Order of Complexity
Week 3	Linked Lists
Week 4	Linked Lists
	First midterm exam
Week 5	Stacks
Week 6	Queues and Priority Queues
Week 7	Recursion
Week 8	Binary Trees
Week 9	Heaps and Balanced Trees
	Second midterm exam
Week 10	Searching Algorithms and Hash tables
Week 11	Java Collections
Week 12	Sorting Algorithms
Week 13	Graphs