New York University Tandon School of Engineering
ECE-GY 9343: Special Topic Course in Telecom Networks
Data Structure and Algorithm, Fall 2021
Instructor: Yong Liu

Course Prerequisites
1) Basic knowledge of fundamental data structures.
2) Basic programming language skills, such as C/C++, Java, Python
If you are not sure you have the proper preparation, you must talk to me before taking this course. Additionally, you should not take this course if you have taken a similar course, such as CS6033 with a 'B' or better grade.

No differences between CS & ECE Version

Course Description
- Review of basic data structures and mathematical tools.
- Data structures: priority queues, binary search trees, balanced search trees.
- Algorithm design and analysis techniques illustrated in searching and sorting: heapsort, quicksort, sorting in linear time, medians and order statistics. *Sorting*
- Design and analysis techniques: divide and conquer, dynamic programming, greedy algorithms.
- Graph algorithms: elementary graph algorithms (breadth-first search, depth-first search, topological sort, connected components, strongly connected components), minimum spanning trees, shortest paths.
- Brief introduction of complexity and NP-completeness.

Textbook
Cormen, Leiserson, Rivest, and Stein,
Introduction to Algorithms, 3rd Edition, MIT Press, 2009;
ISBN-13: 9780262033848; The paperback international version has ISBN-13 9780262533058. It is known as CLRS.

Gradescope: lh2577@nyu.edu
Pass: P@ss lecton 1998

Teaching Assistants: TBA

Office Hours: Tuesday, 9pm to 10pm (over Zoom)
https://nyu.zoom.us/j/91635099650?pwd=Zm9BWFJscXlJSWRaWG9XcEpxTzUzQT09

Course Work and Grading: Your final grade will be determined roughly as follows:

Homework	10%
Midterm	40%
Final	50%

① 2 pages double-sided cheat sheets
② Exams will be in-person and on campus
③ Hand writing homework every week.

Tentative Schedule

- Week 1: Introduction to algorithm: correctness and performance. Best-, worst-, and average-case performance. Asymptotic notation: big-O, big-Ω, and big-Θ; little-o, and little-ω.

- Week 2: Recurrence and solving methods: iteration, substitution and master theorem

- Week 3: Divide and conquer algorithms, introduction to sorting: insertion sort, bubble sort

- Week 4: Sorting: MergeSort, Heap and HeapSort,

- Week 5: Sorting: quick sort, randomized algorithms, lower bound for comparison sorting, counting sort and radix sort, order statistics and selection

- Week 6: Hashing and Universal Hashing, Binary search trees

- Week 7: Binary search trees (cont.d), midterm review

- Week 8: Midterm Exam

- Week 9: Graph basics, Breath-First Search, Depth-First Search

- Week 10: Directed-acyclic graph and topological ordering, strongly connected components,

- Week 11: Intro to dynamic programming, greedy algorithm

- Week 12: Greedy algorithm, Huffman coding, Minimum Spanning Tree

- Week 13: Single-source shortest paths, all-pairs shortest paths

- Week 14: NP-Completeness and Final Review

- Week 15: Final Exam

Inclusion Statement
The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect.   It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me. More information can be found at:
https://engineering.nyu.edu/about/diversity-inclusion