

Code	DCC 030 / DCC 049
Course	Advanced Algorithms
Professor (es)	Vinicius dos Santos (Instructor: Bruno Monteiro)
Audience	(x) Undergraduate students () Graduate students

Syllabus. Data structures for manipulating sequences, sets, and trees.
Algorithms for complex problems in graphs and computational geometry.
Advanced techniques for complexity analysis and algorithm development.

Programa

Lesson	Date	Content	Mode
1	23/08/2022	Introduction, DSU	Synchronous
2	25/08/2022	Randomized Reduction / Treap	Synchronous
3	30/08/2022	Amortized Analysis / Splaytree	Synchronous
4	01/09/2022	Union of Sets	Synchronous
5	06/09/2022	Sparse Table, RMQ	Synchronous
6	08/09/2022	Segment Tree	Synchronous
7	13/09/2022	Segment Tree Beats	Synchronous
8	15/09/2022	MO Algorithm	Synchronous
9	20/09/2022	Path Minimum Query, HLD	Synchronous
10	22/09/2022	Link-Cut Tree	Synchronous
11	27/09/2022	Binary Heap, Binomial, Fibonacci	Synchronous
12	29/09/2022	van Embde Boas / predecessor	Synchronous
13	04/10/2022	Flow, Edmonds-Karp, Dinitz	Synchronous
14	06/10/2022	Cuts	Synchronous
15	11/10/2022	Matchings	Synchronous
16	13/10/2022	Matroid Intersection	Synchronous
17	18/10/2022	Polynomial Hashing, KMP, Aho-Corasick	Synchronous
18	20/10/2022	Suffix Array 1	Synchronous
19	25/10/2022	Suffix Array 2	Synchronous
20	27/10/2022	Manacher, eertree	Synchronous
21	03/11/2022	Polynomials	Synchronous
22	08/11/2022	Convolutions	Synchronous
23	22/11/2022	Linear Recurrences	Synchronous
24	29/11/2022	Möbius Inversion	Asynchronous
25	01/12/2022	Geometric Algorithms	Synchronous
26	06/12/2022	Sorting in $O(n \log \log n)$	Synchronous
27	13/12/2022	Dominator Tree	Synchronous

Bibliografia

- Cormen, Thomas H., et al. Introduction to algorithms. MIT press, 2022.
- De Berg, Mark, et al. Computational geometry. Springer Berlin Heidelberg, 2000.
- CS 224: Advanced Algorithms - Jelani Nelson. Lecture Notes. Available at: <https://people.seas.harvard.edu/~cs224/fall14/index.html>

Supporting Material

- Moodle (material extra será indicado quando necessário)
- Vídeos do CS 224

Assessments

1	Theoretical Assignment 1	10 points
2	Theoretical Assignment 2	20 points

3	Theoretical Assignment 3	20 points
4	Theoretical Assignment 4	20 points
5	Theoretical Assignment 5	15 points
6	Theoretical Assignment 6	15 points