Study Materials

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Lecture notes from previous years are included below. While they do not follow the current schedule, these are still good resources for the course.

LEC #	TOPICS	LECTURE NOTES
1	Introduction	No notes for Lecture 1
2	Linear programming (LP): basic notions, simplex method	(PDF) (Courtesy of Alice Oh. Used with permission.)
3	LP: Farkas Lemma, duality	(PDF) (Courtesy of Abhinav Kumar and Nodari Sitchinava. Used with permission.)
4	LP: complexity issues, ellipsoid method	(PDF) (Courtesy of Reina Riemann. Used with permission.)
5	LP: ellipsoid method	(PDF) (Courtesy of Dennis Quan. Used with permission.)
6	LP: optimization vs. separation, interior-point algorithm	(PDF) (Courtesy of Bin Song and Hanson Zhou. Used with permission.)
7	LP: optimality conditions, interior-point algorithm (analysis)	(PDF) (Courtesy of Nick Hanssens and Nicholas Matsakis. Used with permission.)
8	LP: interior-point algorithm wrap up Network flows (NF)	(PDF) (Courtesy of Jelena Spasojevic. Used with permission.)
9	NF: Min-cost circulation problem (MCCP)	(PDF) (Courtesy of Jasper Lin. Used with permission.)
10	NF: cycle cancelling algs for MCCP	(PDF) (Courtesy of Ashish Koul. Used with permission.)
11	NF: Goldberg-Tarjan alg for MCCP and analysis	(PDF) (Courtesy of Mohammad Hajiaghayi and Vahab Mirrokni. Used with permission.)
12	NF: cancel-and-tighten Data structures (DS): Binary search trees	(PDF) (Courtesy of David Woodruff and Xiaowen Xin. Used with permission.)
13	DS: Splay trees, amortized analysis, dynamic tree	(PDF) (Courtesy of Naveen Sunkavally. Used with permission.)
14	DS: dynamic tree operations	(PDF) (Courtesy of Sanmay Das. Used with permission.)
15	DS: analysis of dynamic trees NF: use of dynamic trees for cancel-and-tighten	(PDF) (Courtesy of Timothy Danford. Used with permission.)
16	Approximation algorithms (AA): hardness, inapproximability, analysis of approximation algorithms	(PDF) (Courtesy of Nicole Immorlica and Mana Taghdiri. Used with permission.)

LEC #	TOPICS	LECTURE NOTES
18	AA: primal-dual alg for generalized Steiner tree	(PDF) (Courtesy of Johnny Chen and Ahmed Ismail. Used with permission.)
19	AA: derandomization	(PDF) (Courtesy of Shalini Agarwal and Shane Swenson. Used with permission.)
20	AA: MAXCUT, SDP-based 0.878-approximation algorithm	(PDF 1.2 MB) (Courtesy of William Theis and David Liben-Nowell. Used with permission.)
21	AA: polynomial approximation schemes, scheduling problem: $P\|\|C_{max}$	(PDF)
22	AA: approximation Scheme for Euclidean TSP	(PDF - 1.2 MB)* (Courtesy of Salil Vadhan (Thomas D. Cabot Associate Professor of Computer Science). Used with permission.)
23	AA: multicommodity flows and cuts and embeddings of metrics	(PDF - 7.2 MB)**

* There were no scribe notes for this lecture for the Fall 2001 term. The notes from a previous term cover the same topic and are linked here.

** There were no scribe notes for this lecture for the Fall 2001 term. Section 8 of the notes from a previous term cover the same topic and are linked here.

Linear Programming (PDF - 5.1 MB)

Network Flows (PDF - 3.1 MB)

Approximation Algorithms (PDF - 7.2 MB)

The lecture notes below were provided by students who took the class in an earlier term:

- A Simple Mincut Algorithm (PDF) (Courtesy of Roberto De Prisco (Associate Professor at the University of Salerno, Italy). Used with permission.)
- Euclidean TSP Approximation Scheme (PDF - 1.2 MB) (Courtesy of Salil Vadhan (Thomas D. Cabot Associate Professor of Computer Science). Used with permission.)
- Lattices (PDF - 2.2 MB) (Courtesy of David Wilson. Used with permission.)