

**Operations Research 1, Prof. Matteo Fischetti, 2021-2022;**  
**Lecture notes available at [www.dei.unipd.it/~fisch/ricop/OR1\\_2021\\_2022/](http://www.dei.unipd.it/~fisch/ricop/OR1_2021_2022/)**

Lesson	Date	Topic	Lecture Note	Video
1	4/10/2021	Introduction to OR	/OR1_01_04-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/Fischetti%27s+classroom/1_5n2qll9l">https://mediaspace.unipd.it/media/Fischetti%27s+classroom/1_5n2qll9l</a>
2	5/10/2021	Convex optimization	/OR1_02_05-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+05-oct-2021/1_gv24n2q7">https://mediaspace.unipd.it/media/OR1+Lesson+05-oct-2021/1_gv24n2q7</a>
3	7/10/2021	Linear Optimization (graphical example)	/OR1_03_06-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+07-oct-2021/1_479j8xfe">https://mediaspace.unipd.it/media/OR1+Lesson+07-oct-2021/1_479j8xfe</a>
4	11/10/2021	LP geometry, vertices and basic sol.s	/OR1_04_11-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+11-oct-2021/1_q0zvbkz9">https://mediaspace.unipd.it/media/OR1+Lesson+11-oct-2021/1_q0zvbkz9</a>
5	12/10/2021	Equivalence vertices and BFSs, optimality test	/OR1_05_12-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+12-oct-2021/1_n9gd9r9f">https://mediaspace.unipd.it/media/OR1+Lesson+12-oct-2021/1_n9gd9r9f</a>
6	13/10/2021	The simplex method	/OR1_06_13-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+13-oct-2021/1_it6p7qma">https://mediaspace.unipd.it/media/OR1+Lesson+13-oct-2021/1_it6p7qma</a>
7	18/10/2021	Tableau form of the simplex method	/OR1_07_18-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+18-oct-2021/1_vsb4w9he">https://mediaspace.unipd.it/media/OR1+Lesson+18-oct-2021/1_vsb4w9he</a>
8	19/10/2021	Two-phase method	/OR1_08_19-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+19-oct-2021/1_o421r1uf">https://mediaspace.unipd.it/media/OR1+Lesson+19-oct-2021/1_o421r1uf</a>
9	20/10/2021	Degeneracy and Bland's rule	/OR1_09_20-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+20-oct-2021/1_4v7jccz6">https://mediaspace.unipd.it/media/OR1+Lesson+20-oct-2021/1_4v7jccz6</a>
10	25/10/2021	Revised and bounded simplex methods	/OR1_10_25-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+25-oct-2021/1_2xl8f39n">https://mediaspace.unipd.it/media/OR1+Lesson+25-oct-2021/1_2xl8f39n</a>
11	26/10/2021	Duality	/OR1_11_26-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+26-oct-2021/1_e91b27tk">https://mediaspace.unipd.it/media/OR1+Lesson+26-oct-2021/1_e91b27tk</a>
12	27/10/2021	Weak duality and optimality conditions	/OR1_12_27-oct-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+27-oct-2020/1_en2lkc5">https://mediaspace.unipd.it/media/OR1+Lesson+27-oct-2020/1_en2lkc5</a>
13	2/11/2021	Dual simplex algorithm	/OR1_13_02-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+02-nov-2021/1_u8kg5605">https://mediaspace.unipd.it/media/OR1+Lesson+02-nov-2021/1_u8kg5605</a>
14	3/11/2021	Sensitivity analysis	/OR1_14_03-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+03-nov-2021/1_tpepg13g">https://mediaspace.unipd.it/media/OR1+Lesson+03-nov-2021/1_tpepg13g</a>
15	8/11/2021	Integer Linear Programming and Total Unimodularity	/OR1_15_08-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+08-nov-2021/1_nddfcqg2">https://mediaspace.unipd.it/media/OR1+Lesson+08-nov-2021/1_nddfcqg2</a>
16	9/11/2021	TUM and the Transportation Problem	/OR1_16_09-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+09-nov-2021/1_ypqm46hp">https://mediaspace.unipd.it/media/OR1+Lesson+09-nov-2021/1_ypqm46hp</a>
17	10/11/2021	Chvátal cuts	/OR1_17_10-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+10-nov-2021/1_2hgdbp6w">https://mediaspace.unipd.it/media/OR1+Lesson+10-nov-2021/1_2hgdbp6w</a>
18	15/11/2021	Gomory cuts	/OR1_18_15-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+15-nov-2021/1_zmqci4tm">https://mediaspace.unipd.it/media/OR1+Lesson+15-nov-2021/1_zmqci4tm</a>
19	16/11/2021	Branch and Bound	/OR1_19_16-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+16-nov-2021/1_h5hebjw8">https://mediaspace.unipd.it/media/OR1+Lesson+16-nov-2021/1_h5hebjw8</a>
20	17/11/2021	Branch and Cut	/OR1_20_17-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+17-nov-2021/1_k489fotr">https://mediaspace.unipd.it/media/OR1+Lesson+17-nov-2021/1_k489fotr</a>
21	22/11/2021	Cut separation for the Index Selection Problem	/OR1_21_22-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+22-nov-2021/1_adixw9ki">https://mediaspace.unipd.it/media/OR1+Lesson+22-nov-2021/1_adixw9ki</a>
22	23/11/2021	Graph theory	/OR1_22_23-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+23-nov-2021/1_krvifm20">https://mediaspace.unipd.it/media/OR1+Lesson+23-nov-2021/1_krvifm20</a>
23	24/11/2021	Minimum spanning tree	/OR1_23_24-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+24-nov-2021/1_3yqclex0">https://mediaspace.unipd.it/media/OR1+Lesson+24-nov-2021/1_3yqclex0</a>
24	29/11/2021	Prim-Dijkstra and Kruskal's algorithms	/OR1_24_29-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+29-nov-2021/1_evlf6ft1g">https://mediaspace.unipd.it/media/OR1+Lesson+29-nov-2021/1_evlf6ft1g</a>
25	30/11/2021	Shortest paths	/OR1_25_30-nov-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+30-nov-2021/1_b11v7yg7">https://mediaspace.unipd.it/media/OR1+Lesson+30-nov-2021/1_b11v7yg7</a>
26	1/12/2021	Dijkstra and Floyd-Warshall alg.s	/OR1_26_01-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+01-dec-021/1_s3tmv2j8">https://mediaspace.unipd.it/media/OR1+Lesson+01-dec-021/1_s3tmv2j8</a>
27	6/12/2021	Project planning (CPM/PERT)	/OR1_27_06-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+06-dec-2021/1_u2mcegim">https://mediaspace.unipd.it/media/OR1+Lesson+06-dec-2021/1_u2mcegim</a>
28	7/12/2021	Network flow	/OR1_28_07-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+07-dec-2021/1_60ek1rrs">https://mediaspace.unipd.it/media/OR1+Lesson+07-dec-2021/1_60ek1rrs</a>
29	13/12/2021	Ford-Fulkerson alg.	/OR1_29_13-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+13-dec-2021/1_548a3o01">https://mediaspace.unipd.it/media/OR1+Lesson+13-dec-2021/1_548a3o01</a>
30	14/12/2021	Knapsack Problem	/OR1_30_14-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+14-dec-2021/1_4kxc4nnk">https://mediaspace.unipd.it/media/OR1+Lesson+14-dec-2021/1_4kxc4nnk</a>
31	15/12/2021	Traveling Salesman Problem	/OR1_31_15-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+15-dec-2021/1_nx23f4zw">https://mediaspace.unipd.it/media/OR1+Lesson+15-dec-2021/1_nx23f4zw</a>
32	20/12/2021	Steiner Tree, Facility Location and Set Covering prob.s	/OR1_32_20-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+20-dec-2021/1_eoen7x09">https://mediaspace.unipd.it/media/OR1+Lesson+20-dec-2021/1_eoen7x09</a>
33	21/12/2021	Advanced ILP models	/OR1_33_21-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR2+Lesson+21-dec-2021/1_d6g6y3jw">https://mediaspace.unipd.it/media/OR2+Lesson+21-dec-2021/1_d6g6y3jw</a>
34	22/12/2021	About the final exam	/OR1_34_22-dec-2021.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+22-dec-021/1_cdku0xe6">https://mediaspace.unipd.it/media/OR1+Lesson+22-dec-021/1_cdku0xe6</a>
35	10/01/2022	Heuristics	/OR1_35_10-jan-2022.pdf	<a href="https://mediaspace.unipd.it/media/OR1+Lesson+10-jan-2022/1_Qq23coet">https://mediaspace.unipd.it/media/OR1+Lesson+10-jan-2022/1_Qq23coet</a>