

# IE 203 - HOMEWORK 1

*Due Date: March 14, 2022 23:59*

For this homework you are expected to model a problem with two different approaches and write the necessary code to solve the same problem with two different formulations. You need to model single-machine scheduling problem. There can be two alternative formulations to overcome overlapping jobs:

- i) For every starting time-job ( $X_{jt}$ ) possibility write necessary constraints to compare them in two pairs and ban any conflict (Same as the example in class):  $X_{jt} + X_{j't'} \leq 1$
- ii) At every time point, there can be at most one job in process. (Use the alternative formulation presented in class.)

As parameter values for processing times and due times you will use your student number as the base.

- 1) Start filling the table from the upper left corner.
- 2) Change all 0 values to 3.
- 3) Swap the Process Time and Due Time pair if Due Time is smaller than the Process Time.

An example for (2013402111) is provided below:

Jobs:	1	2	3	4	5
(1) Process Time	2	0	1	3	4
(1) Due Time	0	2	1	1	1
(2) Process Time	2	3	1	3	4
(2) Due Time	3	2	1	1	1
(3) Process Time	2	2	1	1	1
(3) Due Time	3	3	1	3	4

The objective is to minimize the number of tardy jobs (i.e., number of jobs that are completed after the due time). You need to write the code using PuLP or any other suitable optimization package in Python. In your code, for both formulations (i,ii) you should print:

- 1) The model (variables, constraints and the objective function)
- 2) The computation time (you can use cell magic (`%%time`) or line magic (`%time`))
- 3) The optimal solution

Readability of your code is important thus, while writing your code, please use comments as much as possible and name your variables and constraints properly. In Jupyter Notebook, you can add separate text blocks so you are expected to comment on your solutions, computational times and formulations and compare them for both solutions. You can use File->DownloadAs->html to save your code and output as html. You should submit a single html file containing the code and comments and a pdf file with your formulations as the output.