

IE460 – Fall 2023

Homework II - Due date – October 6, 2023 Friday – 17:00 pm

Information on Homework II

- **Homework II is 2%. Make sure that you review course material before you start. Cite sources used if any.**
- **Grading Policy:** The homework grades will not be only based on the correctness of the answers provided, but on the perceived degree of effort on the returned assignment. This means that even without obtaining the correct answers one can obtain full credit. The grade scale will be “2” (full effort, all questions); “1” (some effort or full effort, some questions); “0” (no effort or no submission). The submissions that exceed expectations may get a bonus – grade will be “3” (extra effort). Note that “2” corresponds to a grade out of 100% - 2% of the overall grade in this case. Late submissions will not be accepted.
- The grading scale for each question is 2 points (close to full effort), 1 point (some effort), and 0 (no effort or no submission). Total points that would lead to your overall HW grade are given below:

Total Points	HW Grade
4+	3
3-4	2
1-2	1
0	0

- **Academic Dishonesty (taken from IE460 Course Information):** For assignments: Discussion of the course material and working in groups are effective ways of learning. However, this does not mean that you can copy the assignment from one of your friends. You can discuss with your friends, but you should be alone, without any written solution in front of you, when you actually prepare your assignment. It is extremely important to understand the value of this exercise in the process of learning. Any violation of the above understanding will result measures outlined in the student rules and regulations.
- **Submission Information:** An assignment submission box is to be placed in front of office EA307 about two days before submission date and is to be removed at the time of the deadline. You need to put your assignment in the designated box before the deadline. **Submission via e-mail is NOT accepted.**

Suggestions: Before you start solving the problems:

Edition 6 - Chopra and Meindl (2016) – Available in the reserve library

Edition 7 – Chopra (2019) – Meteksan Bookstore and Reserve Library (soon)

- 1) Read Chapter 11, in both editions, in detail before solving your homework. The way things are described may be a bit different than your previous text-books (IE375).
- 2) For each question, each part: Outline what you need to do in steps before you actually solve. You can use a spread-sheet to solve your problem, as long as your outline is detailed enough to specify your parameters, decision variables and formulas to apply.

Homework Problems:

Question 1. Consider a three-stage serial production system with the following data:

<u>Stage</u>	<u>Holding cost rate</u> (per dollar per unit time)	<u>Purchase Value</u> (dollar per unit)	<u>setup cost</u>
1 (first)	I	C_1	S_1
2 (intermediate)	I	C_2	S_2
3 (final)	I	C_3	S_3

The demand rate for the final product is D units/year and is deterministic. Note that $C_1 < C_2 < C_3$. The production system is technologically restricted in the sense that the lot size that can be used for stage 2 should be **exactly the same** as the lot size used in stage 1. The problem is to determine lot sizes for each stage, assuming that the lot size in stage 2 is an **integer multiple** of the lot size in stage 3.

- Define the decision variables in the problem where you want to minimize average cost while satisfying all demand without any shortage.
- Write an expression for the average holding cost for all stages, $AHC(.)$. You can use echelon holding costs.
- Write an expression for the average total cost (average total cost of setup + average holding cost for all stages) $ATC(.)$. Express lot size requirements as constraints.
- Describe an algorithm to solve for the optimal integer multiple. DO NOT SOLVE.

Question 2. A certain large manufacturing company has hired a new mwmbwe of its IE department, a Mr. Hasan Çokbilir, knowing all about coordinated control, selects a family of 2 items with the following information:

Item, j	Demand, D_j (units per year)	Cost, c_j (\$ per unit)
1	10 000	0.50
2	1 000	0.40

Other costs are estimated as follows:

Major set up cost = \$5.00

Minor set-up cost for item 1 = \$1.00

Minor set-up cost for item 2 = \$4.00

Inventory carrying cost rate = 0.2/\$/year

- Compute the best values for the base cycle time T , m_1 and m_2 .
- Mr. Çokbilir is skeptical of the value of coordination and argues that independent control is less costly, at least for this family of two items. Is her correct?