

Two hours, on your own

2105623 Optimization of Chemical Processes · Semester 1 / 2026 · Monday 17 August 2026

Today's session ran for one hour instead of three. Both classroom activities are in here instead, and they are the part that carries the learning. Budget about two hours. Every file named here is on the course page:

www.skhgroup.net/teaching/2105623/

Part A Aurora Specialty Chemicals — the specification

35 minutes

Aurora Specialty Chemicals makes two grades of electrolyte, **Standard** and **HighPurity**, on one shared reactor train. The reactor is available **640 hours per month**. Standard needs **1.0** reactor hours per tonne and HighPurity needs **1.4**. Marketing has issued a demand forecast for the next four months: for Standard, **180, 210, 260, 190** tonnes; for HighPurity, **90, 120, 150, 110** tonnes. Production cost differs by grade and rises in month 3, when electricity is dearest. Anything finished but not shipped in the month it is made is stored in a single warehouse that holds **120 tonnes**, at **7 USD per tonne per month**. Thirty tonnes of Standard are already in store. The plant wants the cheapest four-month plan that meets the forecast.

A1 Write the specification table only, in the format from today's template: sets and indices; parameters with symbol and units; decision variables with symbol, units and bounds; the objective in words with its units; the constraints in words, numbered.

Writing algebra is forbidden. So is writing any spreadsheet formula. That restriction is the exercise, not a formality.

A2 Then list **two things in that description that two engineers could read two different ways** and would implement differently. State, for each, which reading you chose and why. There are at least four to find. Week 3 opens with the ones you send me.

Part B Finish the slides

30 minutes

Open the **full** Week 2 slides on the course page — not the one-hour version — and read from *Start or end of period?* to the end. Then answer, two or three sentences each:

- B1** Inventory measured at the *end* of a period, or at the *start*: write the balance equation both ways in words, and say what changes in the answer.
- B2** What is a backlog variable for, and what goes wrong in a model that has demand as a hard requirement and no backlog?
- B3** Why must something be said about stock left at the end of the last period, and what happens to the plan if nothing is?

Part C The multiperiod sheet — predict, then check

40 minutes

Download **w02-multiperiod-planning.xlsx**. Six periods; the data is on the sheet.

- C1** Complete the yellow cells — the balance row for each period, and the objective — then solve. Report the total cost, and the production, inventory and backlog in each period.
- C2** **Before you change anything, write down a prediction.** If the period-4 capacity is raised by one tonne, by how much does the total cost fall? Commit to a number on paper first.
- C3** Now raise it, re-solve, and compare with your prediction. Then explain why the same one-tonne change in *period 1* does nothing at all.
- C4** Open **w02-modeling1.ipynb**, run it, and confirm Pyomo gives the same total cost as your sheet. If they disagree, say which you trust and why.

Write the prediction down before you check it. A prediction you can revise after seeing the answer teaches nothing. This is the same number Week 8 will call a shadow price.

Part D Start HW1

15 minutes

HW1 is released today and is due in Week 4, Monday 31 August. The linear half rests entirely on this week, so open it now and do 15 minutes: read it through and list, for each question, what data you would need and which of the four patterns it uses. Hand in that list — not the finished homework.

What to hand in, and when

One PDF containing **A1–A2, B1–B3, C1–C4** and **D**. Handwriting is fine — photograph it. Name the file **2105623-w02-yourID.pdf** and submit it on myCourseVille **before midnight on Friday 21 August**.

Graded as participation, not as a test. The ambiguities you find in Part A and the prediction you write in C2 are worth more to me than a correct total cost — Week 3 opens with both, and that only works if they are yours.

Stuck on the software? Do not lose the two hours to it. Write down the error, do Parts A, B and D on paper, and bring it to the start of Week 3.