

Computational Project: Proposal Form (due Week 6)

2105623 Optimization of Chemical Processes | Semester 1/2026 | Instructor: Assoc. Prof. Dr. Soorathep Kheawhom |
Two pages only

Sections 2 to 8 are the structured specification of Week 6, in the order taught there: scope and decision, sets, parameters, variables, objective, constraints in words, assumptions. Write the specification before writing any code. Every parameter and every variable carries a unit, and every constraint is stated in words before it is stated in algebra. A specification complete enough to be translated mechanically into Pyomo is what is being approved here; the code is not submitted with this form.

Group no.: _____ Date: _____ Topic: ☐ menu topic T_____ ☐ self-proposed
Working title: _____

1. Group members (2 to 3), correspondent marked

No.	Name	Student ID	Program	Corr.
1	_____	_____	_____	☐
2	_____	_____	_____	☐
3	_____	_____	_____	☐

2. Scope and decision

One paragraph: the physical system, what is being decided, over what horizon, by whom, and what is held fixed. State why the decision is not obvious: what is scarce and what competes with what. Declare any overlap with other work.

3. Sets and indices

One line per set: symbol, index, meaning, cardinality in the instance you intend to solve.

4. Parameters

Symbol, meaning, units, source or synthesis rule, and whether the value is certain or uncertain. Continue on a separate sheet if needed; four rows here are the minimum, not the target.

Symbol	Meaning	Units	Source	Certain?
_____	_____	_____	_____	☐ y ☐ n
_____	_____	_____	_____	☐ y ☐ n
_____	_____	_____	_____	☐ y ☐ n
_____	_____	_____	_____	☐ y ☐ n

5. Decision variables

Symbol, meaning, units, domain and bounds. If a variable may be negative, say what a negative value means physically. Mark which variables are the real decision and which are auxiliary.

Symbol	Meaning	Units	Domain	Bounds
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

6. Objective

State $f(x)$ in words, then in symbols, with its units and its sense. One objective only; a second one belongs in a trade-off curve, not in the objective.

Sense: ☐ minimize ☐ maximize Units of $f(x)$: _____

7. Constraints in words

One numbered line each, in plain language, before any algebra: balances, capacities, specifications, logic, bounds. Mark each $g(x) \leq 0$ or $h(x) = 0$. This numbered list is the checklist you will audit the solved model against, so omissions here become wrong answers later.

1. _____ ☐ g ☐ h
2. _____ ☐ g ☐ h
3. _____ ☐ g ☐ h
4. _____ ☐ g ☐ h
5. _____ ☐ g ☐ h
6. _____ ☐ g ☐ h

8. Assumptions made explicit

Everything the model does not represent: what is held constant, what physics is linearized, what is assumed known in advance. A specification usually fails not by stating something false but by silently omitting something true.

9. Expected model class, reason and size

☐ LP ☐ MILP ☐ NLP ☐ MINLP ☐ Stochastic ☐ Other: _____

Reason for the class (one sentence): _____

Estimated size: _____ continuous variables, _____ binaries, _____ constraints.

10. Data plan

Cite each source, or give the synthesis rule and its basis. Confidential data must be scaled or anonymized, with permission.

11. Planned verification (deliverable D3)

Name the tests now, while the specification is fresh. Three degenerate instances whose answers you can derive by hand, the parameter you will sweep for monotonicity and the direction you expect, and the scope of the units audit. Expected answers must be computable without building the model.

Test	Instance	Closed form expected
Degenerate 1	_____	_____
Degenerate 2	_____	_____
Degenerate 3	_____	_____
Monotonicity	parameter: _____	direction: _____
Units audit	☐ all constraints ☐ objective	☐ by code ☐ by hand

Intended AI assistance: ☐ specification review ☐ code drafting ☐ test code ☐ figures ☐ language
☐ none Tool: _____

12. Intended environment and solver

Environment: ☐ Pyomo ☐ GAMS ☐ JuMP ☐ AMPL ☐ Other: _____ Tested: ☐ yes ☐ no

LP or MILP solver: ☐ HiGHS ☐ CBC ☐ GLPK ☐ Gurobi ☐ CPLEX

NLP or MINLP solver: ☐ Ipopt ☐ Bonmin ☐ Couenne ☐ Other: _____

Instructor use only.

☐ Approved ☐ Approved with comments ☐ Resubmit within seven days

Criteria: ☐ C1 decision ☐ C2 relevance ☐ C3 class ☐ C4 tractability ☐ C5 data ☐ C6 non-duplication

Specification: ☐ units complete ☐ bounds stated ☐ constraints in words ☐ assumptions stated ☐ tests plausible

Comments: _____

Signature

Date