A First Course on Kinetics and Reaction Engineering
Unit 29. Lesson Plan

Before Class

- Provide the redacted slides to the students and tell them to bring a printed copy of the slides to class

During Class

- Introduce today's topic and where it fits in the course
  - Slides 1 and 2
- Review of Unit 29 (5 minutes)
  - Slides 3 and 4: go over points on the slides
  - Slide 5: ask whether the students have any questions from their pre-class preparation and answer them
- Learning Activity 29 (~40 minutes)
  - Slide 6: Read through the problem and then start ask which reactor or network they think will be best (or take a vote); if anyone answers, ask generally why; lead the discussion to recognize that they may be able to get a good idea from a qualitative analysis
  - Slide 7: Go over the bullet items and then give them a few minutes to perform a qualitative analysis; when most have finished ask whether the qualitative analysis changed any of their minds, then go to next slide
  - Slide 8: Go over the first 2 bullet items, optionally have them rank the possibilities from best to worst for each of the two cases; go over the remaining bullets
    - ‣ When going over the approach (last bullet item) note that if there is only one reactor, the problem will be fully specified and they can solve directly, but when there are two reactors, it will be underspecified
  - Slide 9: Have half of the class generate the CSTR design equations while the other half generates the PFR design equations; one person from each half goes to the board and acts as scribe while rest of that half tells them what to write.
  - Slide 10: Use this slide to summarize what the groups wrote; note that while the equations and the initial conditions for the ODEs will always be the same, the unknowns for the CSTR and the final condition for the PFR will depend upon which of the five cases are being analyzed, then go to next slide
  - Slide 11: Use this to emphasize that while the equations are the same, the knowns and unknowns are not
    - ‣ If the MATLAB template files are used for the CSTRs, the subroutine that evaluates the equations will be different depending whether the CSTR is first or second
    - ‣ If the MATLAB template files are used, a different template must be used when depending whether the PFR is first or second

‣ Can either write different codes depending whether the reactor is first or second or can try to adapt template files to accommodate the two situations.

- Slide 12: Irrespective of whether different codes are used when reactor is first and second or a single code is used, this is how the results can be calculated; if time and in-class facilities permit writing and solving equations have them do so

‣ Warn that there might not be a single guess for the solution to the CSTR equations that will work over the whole range of reactor volumes used in making the plot

- Slides 13 and 14: Use this slide to go over the final results; optionally, assign the completion of this problem as homework.

• Summary
  - Slide 15: Put the material covered in this class into the overall context of the course.

After Class

• If the students were told to complete the activity as homework, give them the due date