**Instructions**

Basic requirement

Describe on one page (two if absolutely necessary) how to solve each of any 8 of the attached 17 topics to maintain your current passing grade or, if your total points are below 340, to raise your total points to 340, which is the minimum total points to receive a final grade of C. A loss of 5 points from your current ranking will be incurred for each topic not completed correctly. These points may be restored by working additional topics, but it would be simpler to select 8 topics that you know are correct.

Submitting fewer that 8 and taking a loss in points

A student with points beyond those need for a particular grade may elect to submit fewer than 8 topics and be docked 5 points per unsubmitted topic, however, this may risk dropping to a lower final grade if the remaining topics selected are incorrect. For example, a student with 385 points could elect to submit 5 topics and be docked 3\*5 points lowering total points to 370, the minimum for an B. However, if any of the 5 submitted topics is incorrect, they would fall into the C range.

Additional points

An additional 5 points will be added to your total points, after any adjustments from the *basic requirement*, for each additional topic completed correctly. If these additional points raise your score into a higher-grade category, you will receive the higher grade. There will be no recasting of how many points qualify for a particular grade from those set below, which are based on the maximum of 340 possible points in the semester. No points will be detracted from your score if you unsuccessfully attempt additional topics beyond the basic requirement.

No partial credit

Each topic is graded as either correct or incorrect. No partial grade is assigned.

Minimum final grade total point determinations

A >= 370

B >= 340

C >= 310

D’s are not assigned but F’s may be assigned

No distinction between Core and Non-core

There is no distinction between Core and Non-core topics for this exam. I am listing them separately for my own purposes. You may select them without regard to categories. **Please copy and paste the entire topic statement at the top of each of your topic submissions. Unless otherwise noted, the first 8 submitted topics will be assumed to be for the Basic Requirement.**

***Core topics***

1. Derive a V-distribution in laminar flow be it in rectilinear, cylindrical, or spherical coordinates
2. Calculate a drag force for a common, selected geometry using the correlations in Chpt 3
3. Use Ergun’s Equation to calculate the P drop across a packed bed for an incompressible fluid
4. Determine the required superficial velocity needed to achieve a given void fraction in a fluidized bed
5. Use the Expanded Bernoulli Equation to size a pump.
6. Find the total heat loss through a composite wall and find each intermediate interfacial temperature be it in rectilinear or cylindrical coordinates
7. Find h and Q for natural and forced convection settings using the correlations in Chpt 8
8. Solve for net heat flux in radiation heat transfer enclosures using an electrical analog and Kirchhoff Loops.

***Non-core topics***

1. Derive a T-distribution within a solid be it in rectilinear, cylindrical, or spherical coordinates
2. Convert the Equations of Change to dimensionless form to determine dimensionless groups
3. Use the Buckingham Pi theory to determine dimensionless groups
4. Use Ergun’s Equation to calculate P drops across a packed bed for a compressible fluid
5. Solve for the time-to-drain a ladle using the Expanded Bernoulli Equation
6. Use the Product Solution Method in Chapter 9 to find T(t, 3D’s) for 1/8th- , ¼-, and semi-infinite and fully bounded solids.
7. Solve 1D USS HC and 2D SS HC problems with fixed T, zero and fixed flux, and convection BC’s.
8. Determine radiation heat loss through zero-flux opening using the radiation Transfer Factor
9. Determined the mass transfer coefficient and calculate a surface dissolution rate be it for a plate, cylinder, or sphere.