

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY
Department of Materials and Metallurgical Engineering

Met 422

Take Home HQ 01

Due 11:00 pm Oct 15

Submit to the Dropbox Named HQ 01

Submit a typed essay on the essential content of Chapters 1, 2, and 3 of the textbook. Write to a reader as though they were a knowledgeable fellow classmate as of August 2020. Use third person. Include equations as appropriate. Neither calculations nor appendices are needed. The length in Times New Roman 11 font spaced at 1.5 is estimated to be between five and ten pages, but this is not a hard limit.

The major topics must include the following.

- Initiate your essay with a global view of Fluids and what broad topics your writing includes.
- Chapter 1
Basic concepts include types of flow, viscous and convective momentum, Newton's Law of Viscosity, typical viscosity values for gases and liquids and units, and viscosity temperature dependences. Note what kind of viscosity models are available.
- Chapter 2
Force balance and derivation of laminar flow velocity profiles. Include the five steps to deriving a velocity profile, cup mixing, average velocity, and drag. Describe what the Equations of Change (Conservation and Momentum) and how they may be used to arrive at a differential equation (DQ) that obviates steps 1-2 of deriving a DQ and how they may be manipulated to show what dimensionless numbers are needed to model geometrically similar systems.
- Chapter 3
Show how drag forces from laminar flow are extended to find drag forces in turbulent flow systems. Describe how $F_k = fAK = \text{Net external forces resisting flow (Area} \cdot \Delta P + \text{weight)}$ is used to solve a multitude of flow problems such as those in the homework. Describe how Eq 3.57a can be used to solve virtually any packed bed problem involving uniform particles and note Eq. 57b may be employed to solve non-uniform particle problems. If fluids are compressible, describe how $\Delta P/L = -dP/dx$ and the pressure drop across length the bed is determined by integration since V_o and ρ are functions of pressure. Explain the use of Figure 3.13 and how any fluidized bed problem involving unknown V_o , D_p , or void fraction can be solved using it. Show the area-pressure drop product across any fluidized bed is simply the weight of the fluidized bed $(1-\omega)\rho gL$.
- Include for each chapter a concluding paragraph briefly describing how the content may be used and/or how it relates to the next chapter.
- Conclude the entire document with how knowing this content empowers you and expands your capability as an engineer.

Please Observe These Fundamental Writing Tips

Please do not use

- 1) “Due to” for “because”, only for “caused by”.
- 2) “the fact that”
- 3) “in order to”
- 4) “hopefully”

Please convert prepositional phrases to adjectives when possible.

Ex.

Continuous temperature measured was achieved using a thermocouple in a sheath of alumina filed with zirconia.

becomes

A zirconia-filled, alumina-sheathed thermocouple allowed continuous temperature measurement.

Avoid dangles

Ex.

Leaving work, the day was sunny.

becomes

The day was sunny when I left work.

Make certain each sentence makes perfect sense.

Short, concise sentences are preferable.

Each paragraph should start with a general idea or concept and conclude with something that summarizes the idea or concept. Intervening sentences support the idea or concept.

If you employ an optional outline format, do not have a single-item category and do not start subcategories without saying something about them in the level above.

1. Header

----- Always say something here – never blank.

a. Sub as it should be.

b. Sub as it should be.

2. Header

----- Always say something here – never blank.

a. **Sub. No, never just one item.** Combine it under the higher-level item (into #2, here).

3. Header

Do not interject any self-deprecating or attempt any humorous content.

Always consider the reader’s interest, ability, and viewpoint.