External Flow

Learning Objectives:
- Calculate drag on objects in uniform flow
- Estimate drag for composite objects in uniform flow

Motivational Question:
- How far from the mouth of the Mississippi River can we expect a significant sediment plume?

Design

- Pipe Flow
Design

- Bernoulli Equation

Design

- Control Volume Analysis
Exam Review

- 10 Multiple Choice (4 pts each)
  - Requires NO calculations
  - Equally weighted through semester
  - Drawn from lecture Learning Objectives
  - Topics:
    - Fluid properties
    - Bernoulli equation
    - Control volumes
    - Kinematics (Chapter 4)
    - Major and minor losses
    - Moody diagram
    - External flow

Exam Review

- 2 Work-out Problems
  - Application of Momentum and Energy equations to control volumes in a pipe network
  - Includes major and minor losses
    $$h_L = \left(\frac{fL}{D} + \sum K_L\right) \frac{V_{pipe}^2}{2g}$$
  - Pump sizing
  - Auxiliary topics
    - Conservation of mass
    - Identify pressures and velocities at convenient locations
    - Basic skills from applying Bernoulli Equation
Exam Review

- 3 Double-sided sheets of notes
- Closed book
- Bring a working calculator
- DECEMBER 5 (Friday)
  - 10:00 am to 12:00 pm
  - CE 110

Evelyn Wants Some Pizza
James Working Out

Evelyn and James