

Chemical Engineering 374

Fluid Mechanics

Exam Review and Projects

Spiritual Thought

“When prayer works as it should, we express the feelings of our hearts in simple words. Heavenly Father typically answers by putting thoughts in our minds accompanied by feelings. He always hears the sincere prayer we offer when we pray with a commitment to obey Him, whatever His answer and whenever it comes.”

-President Henry B. Eyring

<https://www.youtube.com/watch?v=n2Y8Jalsf5>

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OEP #4 (clip)



OEP #4

Open Ended Problem #4

Escape From a Collapsing Dam

GROUP WORK OKAY, Due 10/9/24 at beginning of class
(Don't be afraid to "Google" good assumptions!)

<https://www.youtube.com/watch?v=au9vdymQV4g>

The fearless Flynn Rider escapes (with significant help from Rapunzel) from the soldiers and thieves only to face the surging water from a collapsing dam. With much fanfare, finesse, and a few less-than-manly squeals, they dash to the nearby cave and into safety mere seconds before a falling rock column traps them inside. Ignoring the falling rock formation (for now) could they have realistically escaped from the cascading water from the dam breaking? (DO NOT ASSUME A WATER VELOCITY!!!)



Project Details

- Handout: its all in there.
- Groups of ~3
- Select a project to measure or study some aspect of fluid mechanics
- Write a project proposal memo to Dr. Memmott
 - Project description/Timeline
 - Equipment/Costs
 - Safety precautions
 - Team structure
- Perform work as a group
 - ~10 hours per person
 - 4-5 meetings
 - Can use on-campus facilities: public spaces, ChEn projects lab (233 EB) via TA evenings/weekend access
- Oral report to class/other groups



Questions to Inspire

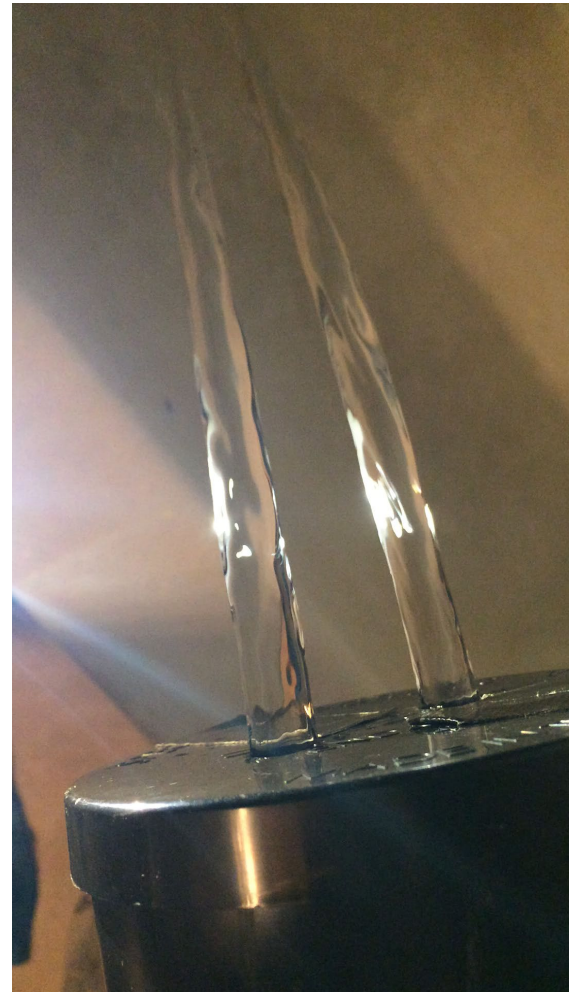
- What is a vortex?
- How does a boomerang work?
- Why do waves form in lakes and oceans, and why do they break on the shore?
- How is a wake created from a boat?
- How do sailboats move into the wind?
- Is the weight of a truck full of chickens less if the chickens are flying?
- Why do curve balls curve?
- Why does a large rock cause water to spurt when thrown into a pool?
- How does a pipe organ work?
- At what speeds do feathers and lead balls fall in air?
- How does a submarine work?
- Can a helicopter (bird, airplane, fly) fly upside down?
- What makes bees buzz?
- Why are owl wings quiet?
- How does a carpet vacuum design affect its ability to pick up dirt?
- What is multi-viscosity oil and how does it work?
- Why does my bathtub form a hole in the water when it drains?
- Who long after a lightning strike does a person hear the thunder?
- Do large or small gas jets penetrate farther into a flow and why?
- How are complex flows predicted?
- What is a sonic boom?
- What is the pressure inside a bubble suspended in the air, underwater, and in a water droplet and does this depend on the size of the bubble?
- Do toilets really swirl in the opposite direction in the southern hemisphere?
- How does a turbine work?
- How do birds fly?
- What causes the trade winds and the jet stream?
- What is cavitation and why are submarine (and other ship crews) so worried about it in the movies?
- Why do the pipes in my house bank when the washing machine or faucets turn on or off?
- Why does catsup often not flow out of a bottle and why does it sometimes flow fast after it finally starts?
- How does a tall tree get water to the leaves at the top?

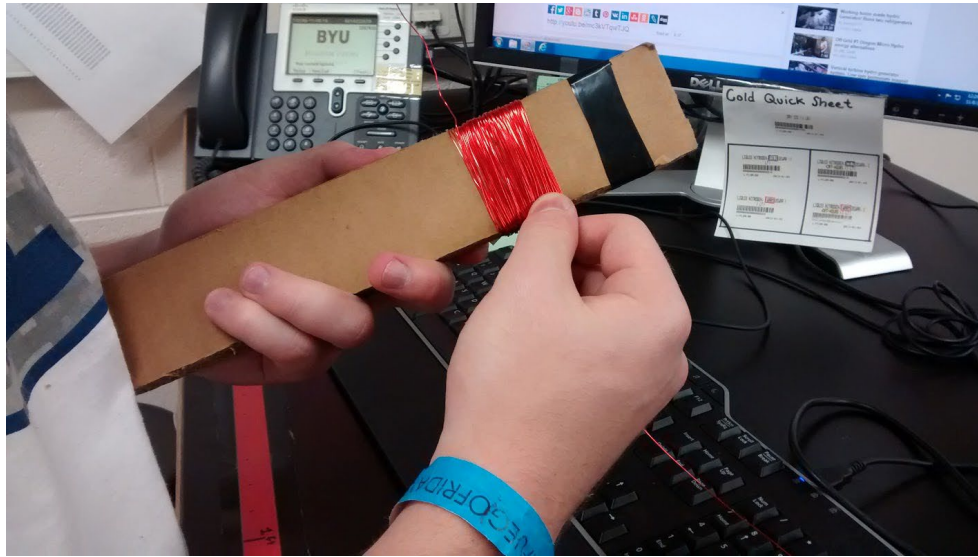


Example Projects

- Build a bottle rocket and test/analyse/predict its performance
- Build a wind tunnel, measure forces on a sail in different configurations
- Measure fluid viscosities by dropping balls through the liquid
- Measure friction factors in pipe flow







Exam Review

