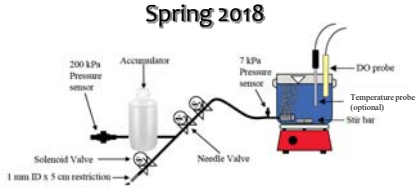
CEE 4530: Laboratory Research in Environmental Engineering

Spring 2018



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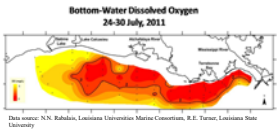

hypoxia

environmental contaminants

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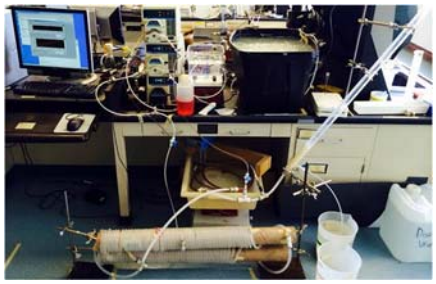


CEE 4530: Laboratory Research in Environmental Engineering

Agenda for our First Meeting

- Course overview
- Introductions
- Working in teams
- Chemical safety

Course Goals To Help Students Develop:

- An intuition for concepts seen in other classes
- Laboratory skills
- Research skills
  - Data analysis
  - Model development
- Engineering skills
  - Designing systems to meet an objective
  - Troubleshooting and problem solving
- Writing skills (Technical Writing Course)
- Teamwork skills

Course Info

- Web site
- Schedule
- Grades
- Text: **"Laboratory Research in Environmental Engineering: Laboratory Manual"** 2018.

Course Elements

- Laboratories – from canned to open-ended
- Lectures/discussions
- Prelab questions – done individually
- Laboratory reports – done in teams
- Project – done in teams

Projects

- A chance to develop your engineering skills
- Learn about process control, automation and application of lots of things that you've learned thus far!
- Nutrient Removal Project
- Research Project

Introductions...

- My name
- About me!
  - a hobby, or
  - what I did over break, or
  - what I like to do when I'm not doing coursework

Team Preferences?

- Teams of 3
- Fill out form at website by Monday! (link on syllabus page)
- We will assign you to a team in time for the Acid Rain laboratory

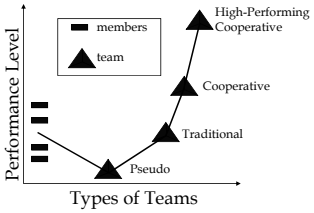
Your To Do list for 4530

- Fill out team formation survey by Monday
- Continue working on Atom and Python Tutorial (due noon on Wednesday)
- Do prelab assignment for Fundamentals Lab **AND** for laboratory Safety before lab on Wednesday

Team Management Reflections

- Think about your most successful/effective team project experience
  - What were the characteristics of the team?
  - What were the conditions?
- Have you had experiences with teams that were ineffective or frustrating?
  - What made the team ineffective?
  - What could you have done to improve the team?

Types of Teams



Traditional Classroom Learning Teams

Team members:

- Believe they will be evaluated and rewarded as individuals, not as a team
- Interact primarily to clarify how assignments are to be done
- Have no motivation to teach what they know to their teammates
- May seek a free ride on the efforts of teammates
- Or may feel exploited and do less

Cooperative Learning Teams

- Have a goal of maximizing all members' learning
- Hold themselves accountable for doing high quality work
- Work face-to-face for efficient communication to produce joint work-products
- Help and encourage each other (academic and personal support)
- Share responsibility for providing leadership
- Analyze how effectively they are achieving their goals
- Emphasize continual improvement of the teamwork process

High-performance Cooperative Learning Team

- Meets all the expectations of the cooperative learning team
- Outperforms all reasonable expectations, given its membership
- High level of commitment
- Mutual concern for each other's personal growth
- Achieve high-performance and also have lots of fun

What Makes Cooperative Learning Work?

- Positive interdependence
- Face-to-face interaction
- Individual accountability/personal responsibility
- Teamwork skills
- Group processing
  - How are we doing as a team?
  - What could we do better?
  - What challenges are we facing?

Danger signs

- High achiever paired with procrastinator
- Procrastinator becomes less and less involved
- High achiever becomes frustrated
- Procrastinator learns little and gets a low final grade (team participation rating is a multiplier)

Antidote to Disengagement

- Engagement!
- Insist on being a full member of the team
- Real time collaboration

Course Grading

- Not on a curve
- You are not competing with your classmates
- If you all do well, you will all get good grades
- Cooperation is rewarded, not penalized

A Few Safety Rules

- Think through each step before beginning an experiment
- Identify possible hazards and take appropriate measures to contain or minimize hazards (read labels)
- If you don't know what is going to happen and think there may be a potential for danger
  - Stop!
  - Get help before proceeding or modify procedure to minimize risk.
- When using hazardous chemicals use secondary containment and appropriate personal protection

Unattended Experiment Guidelines

- Prepare for power failure, _____ failure, or a leak
  - _____ containment of hazardous chemicals
  - Prepare for flooded and ____ conditions
  - Do not let equipment such as power stirrers, hot plates, heating mantles, and water condensers run overnight without _____ provisions and the instructor's consent

Unattended Experiment Guidelines

- Everything well secured
- Check unattended reactions periodically
- Post contact information
- Accurate instructions and _____ for emergency personnel

Routes of Chemical Exposure

- skin
  - protective clothing
  - gloves
- ingestion
  - don't pipette by mouth!
  - no food in the lab
  - wash before leaving the lab
- inhalation
  - dust and vapors (use fume hood when either are present)
- eyes
  - eye protection against splashing and vapors

Safety Data Sheets: an information source

- Emergency information
  - chemical product and company identification
  - composition
  - hazards identification
- Appropriate response to hazardous situations
  - first aid measures
  - fire fighting measures
  - accidental release measures

http://chemicalsafety.com/sds-search/

Safety Data Sheets: an information source

- Prevention of hazardous situations
  - handling and storage
  - exposure controls and personal protection
  - physical and chemical properties
  - stability and reactivity
- Miscellaneous
  - toxicological information
  - ecological information
  - disposal considerations
  - transportation information
  - regulatory information

Safety Data Sheets: an example - Hydrochloric Acid

- You've been asked to mix up a solution of 1N HCl from concentrated hydrochloric acid. You would like to know of any hazards associated with this procedure.
- You remember the safety rule and you think through the steps of preparing the solution. You realize that you've never opened a container of concentrated HCl before. So you STOP! and get some help.

Hydrochloric Acid: My Solution to the solution

- Ventilation is required!
- Solution preparation should be done in a fume hood with gloves, protective clothing, and eye protection

SDS: Summary

- A good source of information on safe handling
- May provide useful information on physical-chemical properties
- Provide first aid, fire fighting, and accidental release measures
- Can be used to obtain concentrations of ingredients in proprietary solutions