Instructor: Khosrow Farahbakhsh, Ph.D., P.Eng.
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GTA: Lab GTA: Rachael Marshall (rmarsh01@uoguelph.ca)
Tutorial GTA: Chris Potvin (cpotvin@uoguelph.ca)

Lecture Times: Tuesday and Thursday from 10:00 to 11:20 in MACK 115

Lab: Monday 13:30 - 16:20; and Tuesday from 14:30 - 17:30, Science Complex (SCIE) 2101. Schedule will be posted outside Rm 1196 in Thornbrough (THRN) as well as SCIE 2101.

Tutorial: Monday from 13:30 - 15:30 or Tuesday from 14:30 – 16:30 in THRN 1006.

Office Hours: Just drop by or by appointment.

Texts/Notes: There is no designated textbook for this course. Several important resources will be provided as either PDF files or URLs in the Courselink.

Laboratory manual will be posted on the Courselink for each specific lab. You must download, print and read the instructions and make necessary preparation prior to each lab.

Prerequisites: As stated in the U of G Calendar

Announcements: See Courselink

COURSE SUMMARY

Water Quality is an essential course for undergraduate students in the Water Resources and Environmental Engineering programs. The concepts and principles presented give students the necessary engineering skills to address the water quality problems they will face in their senior year and upon graduation.

This course builds on the student's experience in chemistry, fluid mechanics, engineering science and provides an engineering perspective on:

- global perspectives on water
- water quality and characterization and interactions between various quality parameters
- significance and interpretation of analytical results
- modeling of water quality in natural systems
- introduction to water and wastewater treatment systems

EVALUATION

• Individual laboratory report (1)	10%
• Group design report (1)	15%
• Literature review paper	10%
• Instructional flash video on the review paper topic	10%
• Midterm (date TBD)	20%
• Final exam (Dec. 6, 2010,2:30-4:30 pm)	35%

Note: Students must attain a combined total of 50% on the examinations (quizzes and final exam) to pass the course. If not, that grade will be assigned for the course.

COURSE OUTLINE

I – Introduction – Water and Civilization 0.5 week

II – Water Characterization 5 weeks

- Physical
- Chemical
- Biological
- Ecological

III - Analysis and Sampling Methods (*water and solid matrices)* 0.5 week

- Sampling techniques
- Common water quality analyses
- Due diligence

IV – Water Quality Modeling

- Simple river model (oxygen sag) 1 week

IV - Water Treatment

2.5 weeks

- history
- pretreatment - source, screens, pre-chlorination, sedimentation, aeration
- treatment – coagulation & sedimentation (Type I and Type II settling), filtration, ozonation, post chlorination
- overview of special treatment - activated carbon, fluoride, softening

V - Wastewater Treatment

2.5 weeks

- history
- pretreatment - source, screens, bar racks
- treatment - sedimentation (Type III and Type IV settling), attached growth, suspended growth, wetlands, septic systems
- overview of special treatment - tertiary treatment, BNR, membrane

LABORATORY EXPERIMENTS

Laboratory work will consist of the following five water quality tests:

- biochemical oxygen demand (BOD)
- coagulation and flocculation (C&F)
- coliforms (total and fecal)
- chlorine demand
- solids - fractions, Type I and/or Type II settling

Assignments:
Approximately ten assignments will be issued throughout the term. Assistance will be available during the tutorial period (Monday from 14:30 to 16:30) to assist in solving the problems and to provide the solutions on request. **Please note that the solutions will not be posted.**

Laboratory and Laboratory Reports:
Six lab sessions have been scheduled, with students working in pairs (your choice). Specific schedules will be posted by the instructor on the Courselink. The procedures for each laboratory are outlined in the *lab handouts posted on the Courselink*, including safety issues. Please read the appropriate sections prior to the lab, to ensure that the lab flows smoothly. If you own a lab coat, please bring it to the laboratory.

Each student will prepare one individually written lab report for BOD lab using the appropriate data set. The due date for this report is as follows:

Due date for BOD labs performed on September 22: October 12
Due date for BOD labs performed on September 27: October 18

Further detail on the lab reports is given in the lab manual.

Group Design Report
Student groups (groups of two students) will prepare a preliminary design report based on the data collected from the laboratory experiments. These data will be used to prepare preliminary sizing of a water treatment plant. The preliminary design report must include necessary diagrams. Further instructions will be provided.

Literature Review:
Each student will complete one literature review on a water quality issue of her/his choice. The topic does not have to be approved by the instructor. The review should be based on five refereed journal articles and should not exceed three pages plus references. The due date is October 29, 2010 @ noon in the drop off box. Late Literature Reviews will be not accepted. Further guidelines regarding the literature review will be provided in a separate handout.

Instructional Flash Video on the Review Paper Topic
Student groups (groups of two students) will prepare a 5-min long instructional video on the topic(s) presented in their review paper. This video should be prepared by converting a PowerPoint presentation to a flash presentation with sound or equivalent. The purpose is for each student group to share its learning with other students in the class. In addition to the video, each student group will prepare two multiple choice questions with answer from their presentation. The final exam will include a selected number of these questions. Further details on this project will be provided later. The due date for the instructional video is November 22, 2010 at noon. Submit this video using the dropbox in the Courselink.

DISLAIMER

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to University of Guelph Academic Regulations.