ENGG*3590 - Water Quality Fall 2012

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Lecture Times: Tuesday and Thursday from 14:00 to 15:50, in MacKinnon 120.

Labs: Please check the Webadvisor for details on your lab sections. Lab schedule will be posted outside Rm 1196 in Thornbrough (THRN) as well as Science Complex (SCIE) 2101.

Lab Instructors: Joanne Ryks (jryks@uoguelph.ca)
Ryan Smith (smith17@uoguelph.ca)

Seminars: Thursdays 19:00 to 20:20, Rozanski Hall 102.

Office Hours: Just drop by or by appointment.

Texts/Notes: Textbook for this course is *Tchobaboglous and Schroeder. 1987. Water Quality, Addison Wesley Longman*. In addition, several important resources will be provided as either PDF files or URLs on the Courselink.

A complete laboratory manual will be posted on the Courselink. 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

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 issues they will face in their senior year, during their work terms and upon graduation. The course will also attempt to introduce a system's approach to water management.

This course builds on the student's experience in chemistry, fluid mechanics, environmental engineering systems, 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 treatment systems

EVALUATION

• Individual laboratory report (1)	10%
• Group design report (1)	25%
• Literature review paper (individual)	10%
• Instructional video on the review paper (group)	10%
• Quizzes (three 1.5-hr long - dates TBD)	45%

Note: Students must attain a combined total of 50% on the three quizzes to pass the course. If not, that grade will be assigned for the course.

COURSE OUTLINE (Tentative)

I – Introduction – Water and Civilization	1 week
II – Water Characterization	5 weeks

- Physical
- Chemical
- Biological
- Ecological

III - Analysis and Sampling Methods	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 4 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 processes

LABORATORY EXPERIMENTS

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

1. coagulation and flocculation Week of Sept. 17 & 24
2. solids - fractions, Type I and/or Type II settling Week of Oct. 1 & 8
3. chlorine demand and fecal coliforms Week of Oct. 15 & 22
4. biochemical oxygen demand (BOD) Week of Oct. 29 & Nov. 5

Further details will be provided by the laboratory instructors.

ASSIGNMENTS

Approximately six assignments will be issued throughout the term. Assistance will be available during the tutorial period to assist in solving the problems and to provide the solutions on request. **Please note that the solutions will be posted only prior to each quiz.**

LABORATORY AND LABORATORY REPORTS

Four 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 the BOD lab using the appropriate data set. The due date for this report will be specified later. Further detail on the lab reports is given in the lab manual.

GROUP DESIGN REPORTS

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. More details will be provided shortly.

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 at least five refereed journal articles and should not exceed three pages plus references. Please refer to table below for due dates. 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 or other presentation types (Prezi for example) to a flash presentation with sound or equivalent. **Videos should not exceed 6MB in size**. 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 four 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. Please refer to table below for due dates. 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.

Important Deliverables and Dates

Deliverable	**Individual/Group**	**Due Date**
Literature Review Report	Individual	October 15, 2012
Instructional Videos	Groups of two students	October 29, 2012
Quiz #1	Location – ROZH 102	October 4, 2012
Quiz #2	Location – ROZH 102	November 1, 2012
Quiz #3	Location – ROZH 102	November 29, 2012
Design Project	Group of three students	November 19, 2012
BOD Lab Report	Individual	November 26, 2012

ENGG*3590 - Suggested Readings

Books

Tchobanoglous, G., Burton, F.L., and Stensel, H.D. (2003). *Wastewater Engineering (Treatment Disposal Reuse) / Metcalf & Eddy, Inc.* (4th ed.). McGraw-Hill Book Company. ISBN 0-07-041878-0.

AWWA (1999). Water Quality and Treatment – A Handbook of Community Water Supplies. Fifth ed. McGraw Hill Inc. New York, NY.

Steven Solomon (2010). Water, The Epic Struggle for Wealth, Power, and Civilization. HarperCollins Publishers. New York, NY.

Mark Benjamin (2002). Water Chemistry. McGraw Hill Inc. New York, NY.

Viessman, Hammer, Prez and Chadik (2009). Water Supply and Pollution Control. Eight ed. Pearson – Prentice Hall Publishing. Upper Saddle River, NJ.

Stumm and Morgan (1996). Aquatic Chemistry. Third ed. John Wiley & Sons Inc. New York, NY.

Ronald Droste (1997). Theory and Practice of Water and Wastewater Treatment. John Wiley & Sons Inc. New York, NY.

Journals

- American Water Works Association (AWWA) Journal
- Water Research
- Water and Health
- Water Environment Federation (WEF)
- Journal of Membrane Science
- Water Science and Technology (IWA)
- Environment Science and Technology