UNIT OPERATIONS OF WATER TREATMENT

OBJECTIVES OF THE COURSE: To present current information and design of physico-chemical water treatment processes. The topics to be addressed include current water treatment problems and regulations, review of process design basics including: coagulation, flocculation, sedimentation, filtration, and disinfection practices.

INSTRUCTOR: Professor O.D. Basu (Mackenzie Bld Room 2366)
email: onita_basu@carleton.ca

LECTURES: Wednesday and Thursday 11:30 am to 2:30 pm(Location: ME 4322)

MARKING SCHEME:
Lab Assignments (15%)
Journal Reviews (10 %)
Term Assignment (15%)
Midterm (20%)
Final Exam (40%)

Lab Assignments
This course will have a lab component, because this is a graduate course it is expected that the students have previous lab experience and will be able to conduct labs with minimal guidance. For instance, students are expected to be familiar with dilution calculations and preparations of stock solutions for the labs. Attendance in the labs is considered mandatory in order to receive marks for the lab, no exceptions. If you are more than 15 minutes to a lab you will be considered to have missed that lab.

Journal Critiques
Journal papers will be reviewed in a class discussion mode – participation marks will be assigned based on quality of students comments in class. Each journal paper discussed in class will have a 1 page summary due at the start of class.

Term Assignment:
Teams of students will design a water treatment plant and present their recommended plant at the end of term. The design will include projection of plant sizing, coagulation, flocculation,
sedimentation, filtration, and disinfection.

Other Assignments
Throughout the course Dr. Basu will post suggested questions from the course textbook for the students to complete in their own time. No marks will be assigned, however it is expected that students will complete the assignments and be familiar with the assignment material which may appear on the midterm and final exams.

Course Outline – Topics to be covered.

1. Water Treatment History and General Water Facts
2. Water Quality and Characteristics
   Review of physical, chemical and microbiological constituents in water. Variation in quantity and quality. Review of general reaction and reactor theory
3. Coagulation/Flocculation/Sedimentation
4. Filtration
5. Disinfection
   Disinfectants such as chlorine, chloramines and ozone, their reactions and characteristics. Kinetics of disinfection for chlorine.

Required Course Text Book
(Available at Haven Bookstore – located at Sunnyside and Seneca)

1. Author/Publisher: Montgomery Hill Watson (MWH)
   Title: Principles of Water Treatment.
   Call Number: TD 430.W375 2005
   Year: 2012

Recommended Books (available at the Carleton Library)
2. Author/Publisher: American Water Works Association (AWWA)
   Title: Water Treatment Plant Design
   Call Number: TD 434.W38 2005
   Year: 2004
3. Web based resource accessed through Library:
Title: Basic Water Treatment, 3rd Edition
Author: Chris Binnie, Martin Kimber and George Smethurst
Year: 2002

Other References:


Other Info:

Final Examination/ Final Grading
The Final Examination will be held during the examination time period.
The Final Exam covers the entire course material content.
Following faculty practice, the final examination papers will not be returned after marking.
A minimum grade of 50% must be obtained on the final to pass the course overall. You must complete and submit on time the Term Assignment (written and oral components) to ensure a passing grade in the class.

Late Assignments/Journal Summaries/Term Papers:
Late assignments, etc are not accepted and will receive a mark of zero.

Plagiarism (*this is serious offense and can result in failure of the entire course*)
The Graduate Calendar reads that plagiarism “will be deemed to have occurred when a student either:
(i) directly copies another’s work without acknowledgment; or
(ii) closely paraphrases the equivalent of a short paragraph or more without acknowledgment; or
(iii) borrows, without acknowledgment, any ideas in a clear and recognizable form in such a way as to present them as the student’s own thought, where such ideas, if they were the student’s own, would contribute to the merit of his or her own work.”
**Requests for Academic Accommodations for Students with Disabilities:**
Students with disabilities requiring academic accommodations are required to contact a coordinator at the Paul Menton Centre (see also carleton.ca/equity) to complete the necessary *letters of accommodation*. The student must then make an appointment to discuss their needs with the instructor at least two weeks prior to the first in-class test or midterm test. This is to ensure sufficient time is available to make the necessary accommodation arrangements.

**Requests for Academic Accommodation for Religious Obligations**
Students requesting academic accommodation on the basis of religious obligation should make a formal, written request to their instructors for alternate dates and/or means of satisfying academic requirements. Such requests should be made during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist, but no later than two weeks before the compulsory event. Accommodation is to be worked out directly and on an individual basis between the student and the instructor(s) involved. Instructors will make accommodations in a way that avoids academic disadvantage to the student. Students or instructors who have questions or want to confirm accommodation eligibility of a religious event or practice may refer to the Equity Services website for a list of holy days and Carleton’s Academic Accommodation policies, or may contact an Equity Services Advisor in the Equity Services Department for assistance.

**Requests for Academic Accommodation for Pregnancy:**
Pregnant students requiring academic accommodations are encouraged to contact an Equity Advisor in Equity Services to complete a *letter of accommodation*. The student must then make an appointment to discuss her needs with the instructor at least two weeks prior to the first academic event in which it is anticipated the accommodation will be required.