1 INSTRUCTOR

Instructor: Hongde Zhou, Ph.D., P.Eng.
Office: THRN 2341, ext. 56990
Email: hzhou@uoguelph.ca
Office hours: Open door or via email

2 LEARNING RESOURCES

2.1 Course Website

Course notes, news, announcements, and grades will be regularly posted to the ENGG*6680 CourseLink site. You are responsible for checking the site regularly.

2.2 Required Resources

No textbook is required, but the reading materials from various scientific publications will be assigned throughout the semester.

2.3 Recommended Resources


2.4 Additional Resources

Suggested Journals:
- Water Research
- American Water Works Association Journal
- Water Environment Research
- Journal of Environmental Engineering
- Environmental Science and Technology
- Journal of Membrane Science; Ozone Science & Engineering, Water Science & Technology, etc.

Assignments: Download the assignments according to the schedule given in this handout.
3 ASSESSMENT

3.1 Dates and Distribution

Assignments: 20%

Note that a 50% reduction in score will be imposed for the assignments up to one day delay, and 100% reduction for the delay of two days.

Term Paper and Presentation: 30%

Final Exam: 50%

Time: 9:30 to 11:30am, April 10

3.2 Course Grading Policies

When You Cannot Meet a Course Requirement: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the instructor in writing, with your name, id#, and e-mail contact. See the graduate calendar for information on regulations and procedures for Academic Consideration:

http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e1415.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:

http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Passing grade: In order to pass the course, you must obtain a grade of 65% or higher on both assignments and term paper portions.

Missed Course Work: If you miss any assignment, term paper or presentation due to grounds for granting academic consideration or religious accommodation, the weight of the missed course work will be added to the final exam. There will be no makeup midterm tests.

4 AIMS & OBJECTIVES

4.1 Calendar Description

This design course will discuss advanced technologies not traditionally covered during an undergraduate curriculum. An important consideration will be the reuse of water.

4.2 Course Aims

The purpose of this course is to provide students the theory and practices of selected advanced treatment technologies that have been considered to be among the most promising in water and wastewater
treatment. Samples and case studies will be provided with emphasis on the latest developments from recent research and engineering practice to highlight the knowledge gaps and future research needs.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1) identify the most critical issues and challenges that limit the use of conventional treatment processes in planning, design and operation of modern water and wastewater treatment facilities,

2) develop in-depth knowledge and hands-on practical experiences that can be used to devise and design effective alternative treatment systems to meet not only current but also anticipated regulatory requirements, and

3) enhance the independent learning and critical thinking skills.

The contents of the course are built on the knowledge of conventional treatment processes covered by ENGG*4260. Only brief reviews will be provided to recap the basic concepts, process principles, practical applications in water and wastewater treatment of these processes.

4.4 Instructor’s Role and Responsibility to Students

The instructor’s role is to develop and deliver course material facilitate the learning for students. Selected lecture notes will be made available to students on Courselink/D2L but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

4.5 Students’ Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and after-class discussions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

E-mail Communication: As per university regulations, all students are required to check their uoguelph.ca e-mail account regularly: e-mail is the official route of communication between the University and its students.

Recording of Materials: Presentations which are made in relation to course work—including lectures—cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a classmate or guest lecturer.

4.6 Relationships with other Courses

Previous Courses: ENGG 4260
Follow-on Courses: Not applicable.
5 Teaching and Learning Activities

5.1 Timetable

Lectures/Discussion: Thursday: 9:30AM to 12:30PM
THRN 1006

5.2 Course Topics and Schedule

Following is a tentative schedule of lectures. Adjustments may be made, subject to the students’ background and interests.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>0.5</td>
<td>Orientation and Course Outline</td>
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| 1.5  | Review  
Water and wastewater quantity and characteristics  
Regulations  
Overview of conventional water and wastewater treatment processes  
Basic principles of process engineering |
| 3    | Enhanced Coagulation and Softening  
NOMs in water  
NOM-particle interactions between coagulated flocs and softening precipitates  
Applications of enhanced coagulation and softening in water treatment |
| 4    | Ozonation  
Review to water disinfection  
Ozonation chemistry and mass transfer  
Design and application of ozonation processes in water and wastewater treatment |
| 5    | UV Disinfection  
UV source and measurement  
UV disinfection applications in water and wastewater treatment  
Introduction to computational fluid dynamics for UV disinfection design |
| 6    | Advanced Oxidation Processes (AOPs)  
Types of AOPs  
Reaction mechanisms and applications with organic compounds  
Ozonation and AOPs by-product formation, implications and control |
| 7    | Membrane Filtration I  
Types of membrane filtration  
Mass transport involved in membrane filtration  
Membrane system operation, maintenance and monitoring  
Membrane filtration applications in water treatment |
Membrane Filtration II
- Membrane bioreactor (MBR) configurations
- Fouling mechanisms and control in MBR
- Tertiary membrane filtration processess

Biological Nutrient Removal (BNR) Processes
- Nitrification-denitrification processes
- Bio-P processes

Biological Nutrient Removal (BNR) Processes (continued)
- Simultaneous nitrogen and phosphorous removal processes
- Application of activated sludge models for BNR processes

Biological Nutrient Removal (BNR) Processes (continued)
- Introduction to IWA Activated Sludge Models
- Influent characterization and model calibration
- Example applications

Term Presentations

5.3 Other Important Dates

Drop Date: The last date to drop one-semester courses, without academic penalty, is March 7. Two-semester courses must be dropped by the last day of the add period in the second semester. Refer to the Graduate Calendar for the schedule of dates:
http://www.uoguelph.ca/registrar/calendars/graduate/current/sched/sched-dates-w11.shtml

6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. The Academic Misconduct Policy is detailed in the Graduate Calendar:
http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e1749.shtml

6.1 Resources

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/
The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

The Graduate Calendar is the source of information about the University of Guelph’s procedures, policies and regulations which apply to graduate programs:
http://www.uoguelph.ca/registrar/calendars/graduate/current/

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7 LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in technical tours you are responsible for taking all reasonable safety precautions and following the safety rules you are encountering. In addition, you are responsible for reporting all safety issues to the lab supervisor, GTA or faculty responsible.

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8 ACCESSIBILITY:

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.csd.uoguelph.ca/csd/