ENGG*4770 Physical & Chemical Water and Wastewater Treatment Design

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Fall 2020
Section(s): C01

School of Engineering
Credit Weight: 0.50
Version 1.00 - September 09, 2020

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1 Course Details

1.1 Calendar Description

This course focuses on the theory, application, and design principles of physical and chemical operations and processes for the treatment of water and wastewater. This involves the design of physical and chemical unit operations, and evaluating the optimum combination to satisfy the given design constraints and criteria. The optimum designs integrate engineering science, basic science, economics, and health and safety for workers and the public.

Pre-Requisites: ENGG*3590
Restrictions: ENGG*4260

1.2 Timetable

Lectures:

Monday	Sec 101&102	09:30AM - 10:20AM AD-S	Room Virtual
Wednesday	Sec 101&102	09:30AM - 10:20AM AD-S	Room Virtual
Friday	Sec 101&102	09:30AM - 10:20AM AD-S	Room Virtual

Laboratory:

Monday	Sec 101	06:00PM - 07:50PM AD-S	Room Virtual
Monday	Sec 102	12:00PM - 01:50PM AD-S	Room Virtual

Timetable is subject to change. Please see WebAdvisor for the latest information.

1.3 Final Exam

There is no final exam for this course.

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Emily Chiang Ph.D., P.Eng.
Email: chiange@uoguelph.ca
Telephone: 519-824-4120 x58217
Office: THRN 3507
Office Hours: By email.

Lab Technician: Joanne Ryks
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Office: THRN 1114

2.2 Teaching Assistants

Teaching Assistant: Jinghan Zhao
Email: jzhao11@uoguelph.ca
Office Hours: By email.

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3 Learning Resources

3.1 Required Resources

Course Website (Website)

http://courselink.uoguelph.ca

Course information, materials, news, announcements, and grades will be regularly posted to the ENGG*4770 Courselink site. You are responsible for checking the site regularly.

3.2 Recommended Resources

Metcalf & Eddy, Inc. (2014). Wastewater Engineering: Treatment and Resource Recovery, 5th edition, McGraw Hill, Inc., New York, NY, 2018p. (Textbook)

Crittenden, J. et al. (2012). Water Treatment Processes, Principle & Designe. MWH, 3rd Edition. (Textbook)

Davis, M.L. (2010). Water and Wastewater Engineering: Design Principles and Practice. McGraw Hill, Inc., New York, NY. (Textbook)

Droste, R.L. (1997). Theory and Practice of Water and Wastewater Treatment. John Wiley & Sons, New York, NY, 800p. (Textbook)

Recommended Standards for Wastewater Facilities. 1997 Edition, The Great Lakes – Upper Mississippi River Board of State and Provincial Public health and Environmental Managers, Albany, NY. (Textbook)

Reynolds, T.D. and Richards, P.A. (1996). Unit Operations and Processes in Environmental Engineering, 2nd Edition, PWS Publishing Co. Boston, MA, 798p. (Textbook)

3.3 Additional Resources

Lecture, lab, and project information (Notes)

All the lecture notes as well as assignments and lab notes are posted on the Courselink throughout the semester. Also, the information for all the design projects and report draft and evaluation rubrics will be posted on the Courselink. Download them according to the schedule given in this handout.

REFEREED JOURNALS

1. Water Research
2. Water Environment Research
3. American Water Works Association Journal
4. Journal of Environmental Engineering, ASCE

4 Learning Outcomes

The goal of this course is to provide the students with the theories and practices for the planning, design and operation of commonly used physical and chemical treatment processes. Emphasis will be placed on integrating individual unit operations and processes to achieve multiple treatment objectives while satisfying the economic, environmental and societal constraints.

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Fully understand the theory behind different physical-chemical methods, that can be used as water & wastewater treatment processes, and their design parameters.
2. Properly identify the critical issues and challenges in planning, design and operation of water and wastewater treatment facilities to meet regulatory requirements
3. Develop reasonable working knowledge and hands-on experiences that can be used to design an efficient, cost-effective treatment systems.
4. Work in a team environment to perform design of water/wastewater treatment processes.
5. Improve communication skills in both verbal and written format.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1
1.4	Recall, describe and apply program-specific engineering principles and concepts	1
2	Problem Analysis	2
2.1	Formulate a problem statement in engineering and non-engineering terminology	2
2.2	Identify, organize and justify appropriate information, including assumptions	2
4	Design	3
4.1	Describe design process used to develop design solution	3
4.2	Construct design-specific problem statements including the definition of criteria and constraints	3
4.4	Evaluate alternative design solutions based on problem definition	3

#	Outcome	Learning Outcome
6	Individual & Teamwork	4
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	4
6.4	Apply strategies to mitigate and/or resolve conflicts	4
6.5	Demonstrate leadership through, for example, influencing team vision and process, promoting a positive team culture, and inspiring team members to excel	4
7	Communication Skills	4, 5
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	5
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	4, 5
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	4
9	Impact of Engineering on Society and the Environment	3, 5
9.3	Anticipate the positive and negative impacts of introducing innovative technologies to solve engineering problems	3, 5

4.3 Graduate Attributes

Successfully completing the course will contribute to the following CEAB Graduate Attributes.

Graduate Attribute	Assessment
1.4 Recall, describe and apply program-specific engineering principles and concepts	Tutorials quizzes
2.1 Formulate a problem statement in engineering and non-engineering terminology	Assignment 1
2.2 Identify, organize and justify appropriate information, including assumptions	Assignment 2
4.1 Describe design process used to develop design solution	Design project report
4.2 Construct design-specific problem statements including the definition	Design project

Graduate Attribute		Assessment
	of criteria and constraints	report
5	4.4 Evaluate alternative design solutions based on problem definition	Design project report
T	6.3 Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	Exist Survey
e	6.4 Apply strategies to mitigate and/or resolve conflicts	Exist Survey
a	6.5 Demonstrate leadership through, for example, influencing team vision and process, promoting a positive team culture, and inspiring team members to excel	Exist Survey
c	7.1 Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	Design Project presentation
h	7.3 Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	Design Project presentation
i	9.3 Anticipate the positive and negative impacts of introducing innovative technologies to solve engineering problems	Design project report
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nd Learning Activities

5.1 Lecture Schedule (Tentative)

Time	Lecture Topics
Week 1	Water and wastewater treatment overview
Week 2	Fundamentals of treatment and reuse
Week 3	Fundamentals of treatment and reuse
Week 4	Hydraulic Engineering Preliminary Treatment 1
Week 5	Preliminary Treatment 2
Week 6	Common physical-chemical processes 1

Week 7	Common physical-chemical processes 2
Week 8	Common physical-chemical processes 3
Week 9	Common physical-chemical processes 4
Week 10	Disinfection, taste & odor control
Week 11	Disinfection By-products
Week 12	Other physical-chemical treatment processes

5.2 Lab Schedule

LAB NUMBER	ACTIVITY
1	No Tutorial
2	Tutorial 1
3	Tutorial 2
4	Tutorial 3
5	Tutorial 4
6	Tutorial 5
7	Tutorial 6
8	Tutorial 7
9	Tutorial 8

10	Tutorial 9
11	Tutorial 10
12	Tutorial 11

5.3 Other Important Dates (Related to this Course)

Please refer to Undergraduate Calendar.

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6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Individual Tutorials/labs	20
Individual Assignments	30
Group Design Presentation	15
Group Design Report	35
Total	100

6.2 Assessment Details

Tutorials (20%)
Date: Throughout the course
Learning Outcome: 1
20%, equally distributed among tutorials.

Assignments (30%)
Date: See below for dates
Learning Outcome: 2
30%, equally distributed. Assignments should be submitted individually.

Assignments' due date (tentative):

- Assignment 1: Wed, noon Oct 07, dropbox
- Assignment 2: Fri, noon Nov 04, dropbox

Group Design Project (50%)
Date: See below
Learning Outcome: 3, 4, 5
Students will work on a design project in group of 3 or 4 (depending on the size of class). At the end of the semester, each group delivers one design project presentation and one design project report.

- **Design project presentation (15%):** The week of Nov 23rd and Nov 30th, during class time. The exact schedule for individual groups will be posted on Courselink.
- **Design project report (35%):** The final report is due noon, Fri, Dec 11th.
- Exit Survey (0%), must be completed for project grade release.

Note: Electronic copies of the presentation and report must be submitted to Dropbox.

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7 Course Statements

7.1 Course Grading Policies

Passing grade: In order to pass the course, you must:

- Pass Tutorials (average mark of Tutorials must be equal or higher than 50%), **AND**
- Pass assignments (average mark on assignments must be equal or higher than 50%).

Note: Students must obtain a grade of 50% or higher on the tutorials AND assignments portions of the course in order for the group project portion of the course to count towards the final grade.

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. Please see below for specific details and consult the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.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

Missed submissions: Missed submissions will not be accepted, and there will be no makeup.

Lab Work: You must attend and complete all lab experiments. If you miss a lab experiment due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab.

Late submissions: Late submissions will not be accepted.

7.2 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

8 School of Engineering Statements

8.1 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. 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 labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. 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.

8.3 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 a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

9 University Statements

9.1 Email Communication

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

9.2 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 course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

9.6 Academic Integrity

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 encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars

9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings and academic schedules. Any such changes will be announced via CourseLink and/or class email. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

9.10 Illness

The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.
