ENGG*4760 Biological Wastewater Treatment Design

Winter 2019
Section(s): C01

School of Engineering
Credit Weight: 0.50
Version 1.00 - January 05, 2019

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1 Course Details

1.1 Calendar Description

The course applies design principles for a variety of biological treatment systems for both municipal and industrial wastewater. This involves the design of suspended growth and attached growth processes, anaerobic digestion, sludge processing and utilization, water reuse and resource recovery facilities.

Pre-Requisite(s): ENGG*3590
Restriction(s): ENGG*4260

1.2 Course Description

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

1.3 Timetable

Lectures:

All sections: Mon, Wed, Fri, 10:30am - 11:20pm, GRHM 2310

Tutorials - Quizzes -Labs

Sec 101: Mon 2:30pm - 4:20pm, MINS 128

Sec 102: Thur 2:30pm - 4:20pm, MCKN 306

Sec 103, Wed 2:30pm - 4:20pm, MCKN 318

1.4 Final Exam

Friday, April 12, 2019, 11:30am - 1:30pm, Room:TBD

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2 Instructional Support

2.1 Instructional Support Team

Instructor:	Shelir Ebrahimi Ph.D.
Email:	shelir@uoguelph.ca
Telephone:	+1-519-824-4120 x54469
Office:	RICH 1511
Office Hours:	Mondays and Wednesdays 3-4pm or by appointment

2.2 Teaching Assistant(s)

Teaching Assistant:	Na Qin
Email:	nqin@uoguelph.ca

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3 Learning Resources

3.1 Required Resource(s)

2.1 Course Website (Website)
https://courselink.uoguelph.ca
Course material, announcements, and grades will be regularly posted to the ENGG*4760 Courselink site. You are responsible for checking the site regularly.

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

3.2 Recommended Resource(s)

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

Biological Wastewater Treatment (Textbook)
Grady, C.P.L., Jr., Gaigger, G.T. G.T., Love, N.L. and Filipe, C.D.M. (2011). 3rd edition, CRC Press, Boca Raron, FL, 991p.

WastewaterTtreatment Plants: Planning, Design, and Operation (Textbook)
Qasim, S.R. (1999). Technomic Pub. Co, Lancaster, PA, 1107p.

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

3.3 Additional Resource(s)

Lecture Information (Notes)
All the lecture notes are posted on the Courselink throughout the semester

Design Project and Assignments (Notes)
The information for all the design projects and assignments will be posted on the Courselink. Download them according to the schedule given in this handout.

Miscellaneous Information (Notes)
Other information related to the course is also posted on the Courselink.

3.4 REFEREED JOURNALS

Water Research
Environmental Science & Technology
Water Environment Research

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4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Fully understand the theory and design of different biological 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. 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(s)
1	Knowledge Base	1
1.4	Recall, describe and apply program-specific engineering principles and concepts	1
4	Design	2, 3
4.3	Create a variety of engineering design solutions	2, 3
4.4	Evaluate alternative design solutions based on problem definition	2, 3
6	Individual & Teamwork	4
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	4
7	Communication Skills	4
7.5	Demonstrate ability to process oral and written communication by following instructions, actively listening, incorporating feedback, and formulating meaningful questions	4

4.3 Relationships with other Courses & Labs

Previous Courses:

ENGG*2560: Mass balance analysis for steady state and unsteady state situations, reactor types and analysis, reaction equilibrium and kinetics
ENGG*31X: Some design tools, writing and public speaking techniques, codes, safety issues, environmental assessment and professional management
ENGG*3590: Water quality, basic theories of physical, chemical and biological treatment processes

Follow-on Courses:

None

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5 Teaching and Learning Activities

5.1 Lecture

Topic(s):

Time	Lecture Topics	Tutorial-Lab activities
Week 1 **Jan 7-11**	• Introduction • Overview of wastewater treatment	No tutorial or lab
Week 2 **Jan 14-18**	• Physical, chemical and biological characteristics • Wastewater sources and flow rates • Treatment objectives • Introduction to wastewater treatment process selection	Quiz 1
Week 3 **Jan 21-25**	• Role and classification of microorganisms • Microbial growth kinetics • Types of biological treatment processes	Project activities: Group selections
Week 4 **Jan 28-Feb 1**	• Suspended Growth Biological Treatment	Quiz 2

Time	Lecture Topics	Tutorial-Lab activities
	Processes	
Week 5 **Feb 4-Feb 8**	• Suspended Growth Biological Treatment Processes	Project activities: Progress Report 1: Topic selection
Week 6 **Feb 11-Feb 15**	• Biological Nutrient Removal Processes • Nitrogen removal • Phosphorous removal • Combined BNR processes	Quiz 3
Week 7 **Feb 18-Feb 22**	**No class**	
Week 8 **Feb 25-Mar 1**	• Attached Growth Biological Treatment • **Midterm exam**	Project activity: Progress Report 2: List of related literature
Week 9 **Mar 4-Mar8**	• Attached Growth Biological Treatment	Quiz 4
Week 10	• Anaerobic Processes	Project activity

Time	Lecture Topics	Tutorial-Lab activities
Mar 11-Mar 15		Progress Report 3: Outline of final report
Week 11 **Mar 18-Mar 22**	• Anaerobic Processes	Quiz 5
Week 12 **Mar 25-Mar 29**	• Sludge Processing, Utilization and Disposal	Project activity
Week 13 **Apr 1-Apr 5**	• Review of the course • Newly developed methods • Project Presentations	Project presentation and final report submission

5.2 Tutorial - Quizzes - Labs

Tutorials - Quizzes - Labs

Sec 101: Mon 2:30pm - 4:20pm, MINS 128

Sec 102: Thur 2:30pm - 4:20pm, MCKN 306

Sec 103, Wed 2:30pm - 4:20pm, MCKN 318

Please check the class activity schedule so you know when you should be ready for quizzes and project reports.

5.3 Other Important Dates

Monday, 7th January, 2019: Winter 2019 Semester Starts
Monday, 7th January, 2019: First lecture of class

Monday, 18th February, 2019 to Friday, 22nd February, 2019: Winter Break - No classes scheduled this week

Friday, 1st March, 2019: Midterm exam, 10:30-11:20 am during lecture time - GRHM 2310

Friday, 8th March, 2019: 40th class day – Last day to drop one semester courses
Friday, 5th April, 2019: Classes conclude
Monday, 8th April, 2019: Examinations commence

Wednesday, 12th April, 2019: Final Exam, 11:30 1m - 1:30 pm, Location TBA.

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6 Assessments

6.1 Marking Schemes & Distributions

Assessment	Weight (%)
Quizzes	15
Group Project Progress Reports	5
Group Project Presentation	5
Group Project Report	5
Midterm exam	25
Final exam	45
Total	100

6.2 Assessment Details

tutorial quizzes (15%)

Learning Outcome(s): 1
All the quizzes will happen during the tutorial classes on the following dates:

1. Week of Jan 14
2. Week of Jan 28
3. Week of Feb 11
4. Week of Mar 4
5. Week of Mar 18

Students should attend their own tutorial section. Taking the quiz in a different tutorial section is not acceptable unless the instructor is informed ahead of time and approves it.

Each quiz is worth 3% of total mark of the course.

Project (15%)
Due: , In class & Tutorials
Learning Outcome(s): 2,3,4

The details of the project will be posted on Course link.

Students will work on a project in group of 2 or 3 (depending on the size of class). The project has different components:

1. Short progress reports (5% of total mark):

Students will submit three short (max 2-page) progress reports at the end of their tutorial classes in the following weeks:

- Week of Feb 4: Progress Report 1: Topic selection
- Week of Feb 25: Progress Report 2: List of related literature
- Week of Mar 11: Progress Report 3: Outline of final report

2. Project presentation (5% of total mark):

At the end of the semester, week of April 1, each group delivers a group project presentation. The exact schedule of presentations will be posted on Courselink as soon as the groups are made.

3. Project final report (5% of total mark):

The final report is due on Fri, April 5th at the end of the lecture time (11:20am) in class.

Note: Both paper and electronic copies should be submitted.

Midterm (25%)
Date: Fri, Mar 1, 10:30 AM - , 11:20 AM, During lecture time - GRHM 2310
Learning Outcome(s): 1
Students are allowed to have one double-sided, letter size, hand-written formula sheet with no examples or solutions on it.

If the formula sheet does not match the criteria it will be taken from the student and he/she will be required to do the exam without formula sheet.

Final Exam (45%)
Date: Fri, Apr 12, 11:30 AM - , 1:30 PM, TBD
Learning Outcome(s): 1,2,3
Students are allowed to have one double-sided, letter size, hand-written formula sheet with no examples or solutions on it.

If the formula sheet does not match the criteria it will be taken from the student and he/she will be required to do the exam without formula sheet.

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7 Course Statements

7.1 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See 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 Midterm Exam: If you miss the midterm due to grounds for granting academic consideration or religious accommodation, the weight of the missed midterm will be added to the final exam. **There will be no makeup midterm tests.**

Passing Grades: The passing grade of this course is 50% of total mark. However, every student must obtain a grade of 50% or higher in the Final Exam portion of the course in order for the midterm exam, group project, and quizzes portion of the course to count towards the final grade. If you do not pass the final exam, you will fail the course and the final mark of the course will be the mark obtained on the final exam.

Missed quizzes: Missed quizzes will not be accepted. There will be no makeup for missed quizzes. You will receive zero for any quiz that you miss. If you miss a quiz with grounds of consideration, the weight of missed quiz will be added to other quizzes.

Late submission of project progress report and final report: Late submission of the project reports (progress and the final) will be devalued by 50% per every day.

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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.

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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

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for course registration are available in the Undergraduate and Graduate 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

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.

More information can be found on the SAS website
https://www.uoguelph.ca/sas

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