ENGG*2560 Environmental Engineering Systems

01

Winter 2020
Section(s): C01

School of Engineering
Credit Weight: 0.50
Version 1.00 - January 05, 2020

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1 Course Details

1.1 Calendar Description

Analysis techniques for natural and engineered systems including chemical, physical and biological processes. Mass balance analysis for steady state and unsteady state situations. Analysis under both equilibrium and non-equilibrium conditions. Reactor types including batch, plug-flow, CSTR. Noise pollution, control and prevention.

Pre-Requisites: CHEM*1050, MATH*2270

1.2 Course Description

This course aims to establish fundamental chemical engineering skills necessary to address environmental engineering systems. The course also aims to introduce basic noise modelling and control approaches.

1.3 Timetable

Lectures:

Tuesday and Thursday	11:30 - 12:50	THRN, 1307

Tutorials & Labs

Monday	Sec 01	02:30- 04:20	ANNU306/ THRN 1116/ THRN2336
Tuesday	Sec 02	02:30- 04:20	MCKN 304/ THRN 1116/ THRN 2336

Wednesday	Sec 03	03:30- 05:20	GRHM, 2302/THRN 2336/THRN 2336
Thursday	Sec 04	03:30-5:20	MCKN 306/ THRN 2336/THRN 2336

* You can switch tutorials without permission ONLY for paper-based tutorials. Paper based tutorials are held in ANNU306/ MCKN 304/ GRHM, 2302/ MCKN 306 depending on your sections. Hands on tutorials are in THRN 1116. Computer labs are in THRN2336.

1.4 Final Exam

The final exam is currently scheduled for:

07:00PM - 09:00PM (date: 2020/04/20)

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Erica Pensini
Email: epensini@uoguelph.ca
Telephone: +1-519-824-4120 x56746
Office: THRN 2415

Lab Technician: Joanne Ryks
Email: jryks@uoguelph.ca
Telephone: +1-519-824-4120 x54087
Office: THRN 1114

Lab Technician: Ryan Smith
Email: rsmith17@uoguelph.ca
Telephone: +1-519-824-4120 x53278
Office: THRN 1114

2.2 Teaching Assistants

Teaching Assistant: Tatianna Marshall
Email: tatianna@uoguelph.ca

Teaching Assistant: Hiral Jariwala

Email: hjariwal@uoguelph.ca

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3 Learning Resources

3.1 Required Resources

Course Website (Website)
ENGG*2560 Courselink site will provide copies of lecture slides, laboratory descriptions and assignments.

3.2 Additional Resources

Lecture and Lab Information, and Assignments (Other)
Posted on Courselink.

3.3 Course Contact Hours (Lectures, Labs, & Tutorials)

The lectures, labs and tutorials are the primary means used to support your learning in this course. Lectures will be the primary means for course news and announcements in addition to provision of course materials. Lecture attendance is expected. Tutorials will be the primary means for the instructional team to coach you. Tutorial attendance is required. Labs will be the primary means for some hands-on experience. Lab attendance is required.

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4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Apply chemical mass balances to a range of environmental engineering components.
2. Develop mathematical models of a range of environmental engineering systems.
3. Explain basic noise control approaches.
4. Apply basic noise modelling equations.
5. Demonstrate safe laboratory practices based on guidance provided.
6. Produce experimental results in an interpretable form (effective tables and figures).
7. Formulate a credible set of conclusions and recommendations based on experimental objectives.
8. Prepare a well-structured laboratory report.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 2, 3, 4, 7
1.1	Recall, describe and apply fundamental mathematical principles and concepts	1, 2, 3, 4, 7
1.3	Recall, describe and apply fundamental engineering principles and concepts	1, 2, 3, 4, 7
1.4	Recall, describe and apply program-specific engineering principles and concepts	7
2	Problem Analysis	1, 2, 3, 4, 7
2.1	Formulate a problem statement in engineering and non-engineering terminology	1, 2, 3, 4, 7
2.2	Identify, organize and justify appropriate information, including assumptions	1, 2, 3, 7
2.3	Construct a conceptual framework and select an appropriate solution approach	1, 2, 3, 4, 7
2.4	Execute an engineering solution	1, 3, 4, 7
2.5	Critique and appraise solution approach and results	1, 2, 3, 7
3	Investigation	2, 3, 4, 7
3.1	Propose a working hypothesis	2, 3, 7
3.2	Design and apply an experimental plan/investigative approach (for example, to characterize, test or troubleshoot a system)	3, 7
3.3	Analyze and interpret experimental data	2, 3, 7
3.4	Assess validity of conclusions within limitations of data and methodologies	2, 3, 4, 7
4	Design	1, 2
4.1	Describe design process used to develop design solution	1, 2
4.2	Construct design-specific problem statements including the definition of criteria and constraints	1, 2
4.5	Develop and refine an engineering design solution, through techniques such as iteration, simulation and/or prototyping	2
5	Use of Engineering Tools	1, 2, 3, 4, 7

#	Outcome	Learning Outcome
5.1	Select appropriate engineering tools from various alternatives	1, 2, 7
5.2	Demonstrate proficiency in the application of selected engineering tools	1, 2, 3, 4, 7
5.3	Recognize limitations of selected engineering tools	1, 2, 3, 4, 7
6	Individual & Teamwork	2, 3, 7
6.1	Describe principles of team dynamics and leadership	2, 3, 7
6.2	Understand all members' roles and responsibilities within a team	2, 3, 7
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	2, 3, 7
6.4	Apply strategies to mitigate and/or resolve conflicts	2, 3, 7
6.5	Demonstrate leadership through, for example, influencing team vision and process, promoting a positive team culture, and inspiring team members to excel	2, 3, 7
7	Communication Skills	1, 2, 3, 6, 7, 8
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	2, 3, 6, 7, 8
7.2	Interpret technical documentation such as device specification sheets, drawings, diagrams, flowcharts, and pseudocode	1, 2, 3, 6, 7, 8
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	1, 2, 3, 6, 7, 8
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	2, 3, 6, 7, 8
7.5	Demonstrate ability to process oral and written communication by following instructions, actively listening, incorporating feedback, and formulating meaningful questions	2, 3, 6, 7, 8
8	Professionalism	2, 3, 4, 5, 6, 7, 8
8.1	Demonstrate an understanding of what it means to be a professional engineer and distinguish between legislated and non-legislated professions	5

#	Outcome	Learning Outcome
8.2	Effectively describe engineering law and its impact on professional engineering practice	5
8.3	Demonstrate professional behaviour	2, 3, 4, 5, 6, 7, 8
12	Life Long Learning	3
12.3	Demonstrate capability for continuous knowledge and skill development in a changing world	3

5 Teaching and Learning Activities

5.1 Lecture

Topics: Introduction

Topics: Mass & Energy Balance Principles

Topics: Reactors & Chemical Kinetics

Topics: Biochemical Kinetics & Reactors

Topics: Noise

Topics: Equilibrium

Topics: Growth

Topics: Wrap-up, Course Evaluation

5.2 Lab

Topics: Problem Sets

Topics: Batch Reactors

Topics: Problem Sets

Topics: Reactor Systems

Topics: Simulink

Topics: Problem Sets

Topics: Programming

Topics: Problem Sets

5.3 Physical Noise Lab

The Physical Noise Lab experiments will be completed outside of scheduled lab times during the period from March 6th to March 17th.

5.4 Other Important Dates

Other Important Dates

Monday, January 7: Classes commence

Monday, February 18 – Friday, February 22: WINTER BREAK

Friday, April 5: Last day of classes.

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6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Batch Reactor Lab	10
Reactor Systems Lab	25
Noise Lab	10
Midterm	15
Final Exam	35
Tutorials	5
Total	100

6.2 Assessment Details

Batch Reactor Lab (10%)
Date: Two weeks after your lab, at 11:59 pm
Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8
The lab will involve a hands on session regarding rectors and a final report, in which reactors are modeled and the hands-on experience is critically evaluated. The report will be used to assess the knowdlege aquired by the students.

The assessment is linked to the following graduate attributes: A knowledge base for engineering (1), Problem analysis (2), Investigation (3), Use of engineering tools (3), (Team) Individual and teamwork (6), (Comm.) Communication skills (7).

Reactor Systems Lab (25%)

Date: Due three weeks after your hands on lab, at 11:59 pm
Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8
The lab will involve a hands on session regarding rectors and a final report, in which reactors are modeled and the hands-on experience is critically evaluated. The report will be used to assess the knowdlege aquired by the students.

The assessment is linked to the following graduate attributes: A knowledge base for engineering (1), Problem analysis (2), Investigation (3), Use of engineering tools (3), (Team) Individual and teamwork (6), (Comm.) Communication skills (7).

Noise Lab (10%)

Date: Due two weeks after your hands on lab, at 11:59 pm
Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8
The lab will involve a hands on session during which the students will measure the noise levels in different areas on campus, and map them. The students have to produce a report at the end of the lab, which will be used for their evaluation. In this report, the students have to report their findings, and critically comment how the measured noise levels compare to those measured in other environments and the maximum allowed levels allowed by the Canadian law.

The assessment is linked to the following graduate attributes: A knowledge base for engineering (1), Problem analysis (2), Use of engineering tools (3), (Team) Individual and teamwork (6), (Comm.) Communication skills (7).

Midterm (20%)

Date: Thu, Feb 27, 11:30 AM
Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8
Midterm 1 - February 27 (In-Class)

During the midterm, the students will be asked to solve numerical problems and answer theory questions.

The assessment is linked to the following graduate attributes: A knowledge base for engineering (1), Problem analysis (2), Use of engineering tools (3), (Comm.) Communication skills (7).

Final Exam (35%)

Date: Mon, Apr 20, 7:00 PM - 9:00 PM
Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8
During the final exam, the students will be asked to solve numerical problems and answer theory questions.

The assessment is linked to the following graduate attributes: A knowledge base for engineering (1), Problem analysis (2), Use of engineering tools (3), (Comm.) Communication skills (7).

Paper based tutorial and computer tutorials (5%)

Learning Outcome: 1, 2, 3, 4

There will one paper based tutorial per week, except during the weeks during which there will be hands-on labs or computer labs (12 tutorials). The students are required to be active partecipants in the class, i.e. to work on the assigned problems during the tutorials (either individually or in teams).

The mark percentage for each tutorial is 0.04%. The students will receive 5% if they attend all the 12 tutorials and are actively involved in solving problems. If the students miss one or more tutorial without a valid reason, the mark received will be scaled accordingly (the students will lose 0.04% for each missed tutorial).

The tutorials are linked to the following graduate attributes: A knowledge base for engineering (1), Problem analysis (2), Use of engineering tools (3), (Comm.) Communication skills (7).

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7 Course Statements

7.1 Communication & Email Policy

Communication associated with course material is delivered by a combination of the lectures, lab/tutorials and the Courselink site. It is your responsibility to receive communication from ALL of these sources – there will be some mutual reinforcement between these sources but they are not completely redundant. 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.

7.2 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

Passing grade: To pass the course students must obtain a grade of 50% or higher.

Missed test: If you miss the test due to grounds for granting academic consideration or religious accommodation, the weight of the missed test will be added to the final exam.

Lab Work: You must pass the laboratory safety quiz to be permitted to complete the hands on laboratories. You must attend and complete the hands on laboratory in order to be eligible to complete the required written laboratory report.

Late Lab Reports: Late submissions (without instructor permission based on suitable grounds and documentation) will be penalized. The penalty will depend on how late: 10% for 1-12 hours; 25% for 12-48 hours; 50% for 48-96 hours and 100% after 96 hours.

Teamwork: Teamwork is required for the completion of the three labs in the course. It is expected that you are an active member of the team and provided an approximately equal contribution to the submitted work. If it becomes apparent that this is not the case then the instructor may assign a substantially different (lower) grade for a member of the team.

7.3 Relationships with other Courses & Labs

Previous Courses:

CHEM*1040/1050: Chemicals are generally pollutants. Chemical properties are key to pollutant impacts and pollutant treatment and prevention and resource recovery.

CIS*1500: Programming logic.

ENGG*1500: Manipulating variables and equations is an essential skill.

MATH*2270: Applied Differential Equations: Mathematics employed to solve mass transfer problems.

Follow-on Required Courses:

ENGG*3180: Air Quality (required for EE's only). Chemical behaviour in the atmosphere relies on ENGG*2560, Fluid Mechanics and Thermodynamics.

ENGG*3590: Water Quality. Chemical behaviour in water relies on ENGG*2560.

ENGG*3470: Mass transfer operations (required for EE's only). An extension of the principles of ENGG*2560 to systems with mass transfer limitations between phases (i.e. non-equilibrium).

ENGG*4340: Solid & Hazardous Waste Management (required for EE's only).

Follow-on Elective Courses:

ENGG*4070: Life Cycle Assessment for Sustainable Design

ENGG*4240: Site Remediation

ENGG*4760: Biological Wastewater Treatment Design

ENGG*4770: Physical & Chemical Wastewater Treatment Design

ENGG*4810: Control of Atmospheric Particulates

ENGG*4820: Atmospheric Emission Control – Combustion Systems

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
