

CHEE 342–ENVIRONMENTAL BIOTECHNOLOGY

Course Syllabus – Fall 2022

This is your course syllabus. Please download the file and keep it for future reference.


LAND ACKNOWLEDGEMENT

Queen's University is situated on traditional Anishinaabe and Haudenosaunee Territory.
See: <http://www.queensu.ca/encyclopedia/t/traditional-territories>

INCLUSIVITY STATEMENT

Queen's students, faculty, and staff come from every imaginable background – small towns and suburbs, urban high rises, Indigenous communities, and from more than 100 countries around the world. You belong here: <https://www.queensu.ca/inclusive/>.

TEACHING TEAM

<p>COURSE INSTRUCTOR</p> <p>Ehssan Koupaie, PhD Department of Chemical Engineering</p> <p>E-mail: ehssan.koupaie@queensu.ca Office hours: By appointment</p>	
<p>TEACHING ASSISTANTS</p> <p>Maryam Ghazizade Fard E-mail: m.ghazizadefard@queensu.ca Office hours: By appointment</p> <p>Bexi Bustillo E-mail: 18bmb3@queensu.ca Office hours: By appointment</p>	

CHEE 342 (F 3-0-0.5 3.5)

COURSE DESCRIPTION¹

This course gives a broad perspective of the use of microbial systems to treat environmental pollutants and of microorganisms as potential environmental contaminants. The role and types of microorganisms used for environmental remediations will be discussed. Biotechnologies and their applications to processes such as the wastewater treatment, organic waste management, value-added product recovery from organics, and nitrogen and phosphorus removal and recovery will be studied. Microbial waste disposal systems such as composting, anaerobic digestion, and soil bioremediation and the role of biotechnology in waste minimization will be examined (0/0/0/42/0)

(0/0/0/42/0) (Mathematics/Natural Sciences/Complementary Studies/Engineering Science/Engineering Design)

PRE-REQUISITE KNOWLEDGE

This course is designed for learners with some background in biological engineering and/or sciences.

COURSE LEARNING OUTCOMES (CLO)

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

CLO	Description	Indicator
CLO 1	Describe the role of microorganisms in processes such as wastewater treatment, organic waste treatment and value-added recovery, anaerobic digestion, fermentation, soil and groundwater bioremediation.	KB-ES (Biochemical)
CLO 2	Explain how environmental and operating conditions can be manipulated to enhance or retard the above processes.	KB-ES (Biochemical)
CLO 3	Summarize the significance of the biorefinery concept and explain how organic waste and plant biomass can be converted to fermentable substrates and subsequently microbially transformed into biochemicals, biopolymers and biofuels.	KB-ES (Biochemical)
CLO 4	Critically analyze relevant journal articles, discuss results, and generate literature review of the above concepts.	KB-ES (Biochemical) CO-Written

This course develops the following attributes at the 3rd year level:

Knowledge base, Engineering Science (KB-ES): Applies foundations of science and engineering to analyze and solve biological, physiological, pharmaceutical, and/or environmental problems or processes.

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CO-Written: Produce clear, concise, precise, and well-organized written and oral communication with language appropriate for the audience.

COURSE EVALUATION

ASSESSMENT WEIGHTING

Assessment Tool	Due Date	Weight	Alignment with CLOs
Assignments		15%	
No. 1	TBA	5%	CLO1, CLO2, CLO4
No. 2	TBA	5%	CLO1, CLO2, CLO4
No. 3	TBA	5%	CLO1, CLO3, CLO4
Quizzes		20%	
No. 1	TBA	5%	CLO1, CLO2, CLO4
No. 2	TBA	5%	CLO1, CLO2, CLO4
No. 3	TBA	10%	CLO1, CLO3, CLO4
Final Group Project (Literature Review)	Last Day of Classes	15%	CLO1, CLO2, CLO3, CLO4
Final Exam	TBA	50%	CLO1, CLO2, CLO3, CLO4

ASSESSMENT DESCRIPTIONS

Assignments

There are **3 assignments** in this course. Each assignment will require you to answer/solve a series of questions. The assignments are designed to cover specific topics covered in the course.

Quizzes

There are **3 quizzes** in this course. These quizzes are designed to provide learners with feedback on their knowledge. The questions may be multiple choice or short answer questions and may need calculations.

Final Group Project (Literature Review)

Students will work with their teammates to generate a literature review article on a topic of their choice (related to the course). Details about the term project will be provide throughout the course.

Final Exam

The final exam will be closed book. Students must write their exam on the day and time scheduled by the University. You should not schedule vacations, travel, etc. during the exam period. The [Term and Session Dates](#) will indicate the final exam period session dates in each term.

GRADING

All assessments in this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to the established [Grade Point Index](#).

Feedback on Assessments

The teaching team will provide feedback on graded activities. You can expect feedback on your assessments within seven days of the due date.

Accessing Your Final Grade

Your final grades will show on SOLUS. Official transcripts showing final grades will be available on the Official Grade Release Date. Please note that in official transcripts, a mark of IN (incomplete) is considered a grade, and your transcript is released with this grade.

COURSE MATERIALS

Textbook

There won't be any mandatory textbook in this course. The materials required for study will be posted on onQ. However, the following two eBooks that can be accessed online through Queen's library is highly recommended for self-study:

- 1- [Environmental Biotechnology \(queensu.ca\)](#)
- 2- [Environmental Biotechnology - Knovel \(queensu.ca\)](#)
- 3- [Environmental Biotechnology: Principles and Applications 2nd edition](#)

Other Material

All other course material is accessible via OnQ. Lectures will be in-person. PowerPoint slides (pdf) of the lectures will be posted on onQ.

Required Calculator

A Casio 991 is required. **ONLY** this type of non-programmable, non-communicating calculator will be allowed during tests and exams.

Required Hardware/Software

Students must have a reliable internet connection and hardware that are compatible with online learning and remote proctoring system requirements. **MS TEAMS will be used if needed for online delivery of lectures.**

Suggested Time Commitment

This course represents a study period of one semester spanning 12 weeks. Learners can expect to invest on average 7-9 hours per week in this course. Learners who adhere to a pre-determined study schedule are more likely to successfully complete the course.

COURSE OUTLINE

Schedule	Learning Outcomes	Assessments/Quizzes
Week 1 & 2	Introduction, overview of principles of microbial metabolism & bacterial growth <ul style="list-style-type: none"> • Composition/classification of microorganisms • Cell components • Environmental factors • Use of molecular tools to identify microorganisms in • Bacterial yield 	Assignment No.1 Quiz No. 1 CLO1, CLO2, CLO4
Week 3 & 4	Aerobic bioreactors for liquid waste treatment <ul style="list-style-type: none"> • Activated Sludge process with and without recycle • Sequencing batch Reactor • Biological nutrient removal (BNR) 	
Week 5	Attached growth biological processes <ul style="list-style-type: none"> • Principles of biofilm growth • Design of attached-growth bioreactors (trickling filters, rotating biological contactors, moving-bed biofilm processes) 	Assignment No.2 Quiz No. 2 CLO1, CLO3, CLO4
Week 6 & 7	Anaerobic conversion of organic solid waste <ul style="list-style-type: none"> • Feedstock characterization • Acidogenic Fermentation • Anaerobic Digestion • Stoichiometry of anaerobic biotransformation • Pretreatment of Organic solid waste • Theoretical vs. actual production yield • Anaerobic co-digestion 	

Schedule	Learning Outcomes	Assessments/Quizzes
Week 8 &9	Biofuel production from lignocellulosic biomass <ul style="list-style-type: none"> • Biorefinery concepts and benefits • Lignocellulosic biomass characterization • Conversion of cellulose • Process design and characterization for biofuel production (ethanol, xanthan, etc.) 	Assignment No.3 Quiz No. 3
Week 10 &11	Biotechnology for soil and groundwater remediation <ul style="list-style-type: none"> • Emerging contaminants • In situ vs ex situ remediation • Factors affecting biodegradation rate • Biological fate of pollutants 	CLO1, CLO3, CLO4

COURSE COMMUNICATION

NETIQUETTE

In this course, you may be expected to communicate with your peers and the teaching team through electronic communication. You are expected to use the utmost respect in your dealings with your colleagues or when participating in activities, discussions, and online communication.

Following is a list of netiquette guidelines. Please read them carefully and use them to guide your online communication in this course and beyond.

1. Make a personal commitment to learn about, understand, and support your peers.
2. Assume the best of others and expect the best of them.
3. Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4. Recognize and value the experiences, abilities, and knowledge each person brings.
5. Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6. It's alright to disagree with ideas, but do not make personal attacks.
7. Be open to be challenged or confronted on your ideas and challenge others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.

QUESTIONS ABOUT COURSE MATERIAL

Questions or comments regarding the course material that can be of benefit to other students should be posted in the Q&A forum on the class website. The instructor, TAs, and students are encouraged to answer these questions directly in the discussion forum for the benefit of everyone in the course.

COURSE ANNOUNCEMENTS

The instructor will routinely post course news in the Announcements section on the main course homepage on OnQ. Please sign up to be automatically notified by email when the instructor posts new information in the Announcements section. Instructions on how to modify your notifications are found in the **Begin Here** section of the onQ course site.

OFFICE HOURS

In addition to interaction in the Q&A discussion forums, you will have the opportunity to interact with either a TA or the instructor through office hours. The office hours are by appointment. Please try email the instructor or TAs at least 48 hours ahead of the time to schedule an appointment.

CONFIDENTIAL MATTERS

If you have a confidential matter you would like to discuss with your instructor, their contact details are on the first page of this document. Expect email replies within 48 hours.

STANDARD FEAS INFORMATION

COURSE POLICIES

Please review the following policies concerning copyright, academic integrity, absences and academic accommodations:

COPYRIGHT

Course materials created by the course instructor, including all slides, presentations, synchronous and asynchronous course recordings, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor's *express consent*. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights and, with respect to recordings, potentially privacy violations of other students.

ACADEMIC INTEGRITY

As an engineering student, you have made a decision to join us in the profession of engineering, a long-respected profession with high standards of behaviour. As future engineers, we expect you to behave with integrity at all times. Please note that Engineers have a duty to:

- Act at all times with devotion to the high ideals of personal honour and professional integrity.
- Give proper credit for engineering work

The standard of behaviour expected of professional engineers is explained in the [Professional Engineers Ontario Code of Ethics](#). Information on policies concerning academic integrity is available in the [Queen's University Code of Conduct](#), in the [Senate Academic Integrity Policy Statement](#), on the [Faculty of Engineering and Applied Science website](#), and from your instructor.

Departures from academic integrity include plagiarism, use of unauthorized materials or services, facilitation, forgery, falsification, unauthorized use of intellectual property, and collaboration, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the University.

In the case of online or remotely proctored exams, impersonating another student, copying from another student, making information available to another student about the exam questions or possible answers, posting materials to online services, communicating with another person during an exam or about an exam during the exam window, or accessing unauthorized materials, including internet sources and using unauthorized materials, including smart devices, are actions in contravention of academic integrity.

LATE POLICY

Any applicable late penalties are described in the details for each assessment. In the event of extenuating circumstances, you must follow the policies for requesting an academic consideration (please see below). Note that unacceptable reasons include extra-curricular activities, travel plans, generally behind on schoolwork, etc. In the absence of an approved consideration request, the normal late penalty will apply as described in the assignment or any course/departmental policies.

INVALID EXAMS

An exam may be declared invalid in case of an interruption in an in-person examination; if the instructions in a remote or online exam were not followed; if the student uploads wrong materials; or if a situation arises where the integrity of the exam cannot be verified. If an exam is declared invalid, the student may be granted a re-write.

ABSENCES (ACADEMIC CONSIDERATIONS) AND ACADEMIC ACCOMMODATIONS

For absences and academic accommodations please review the information on the [FEAS website](#).

ACADEMIC AND STUDENT SUPPORT

Queen's has a robust set of supports available to you including the [Library](#), [Student Academic Success Services \(Learning Strategies and Writing Centre\)](#), and [Career Services](#). Learners are encouraged to visit the Faculty of Engineering and Applied Science [Current Students](#) web portal for information about various other policies such as academic advisors, registration, student exchanges, awards and scholarships, etc.

INDIVIDUAL NEEDS AND SUPPORT

If you have a disability or health-related condition that may require academic accommodations, please approach the [Queen's Accessibility Services](#). The staff at Accessibility Services are available by appointment to develop individualized accommodation plans, provide referrals, and assist with advocacy. The sooner you let us know your needs, the better we can assist you in achieving your learning goals. For questions or assistance with requesting Academic Consideration or Accommodation, contact the FEAS Academic Accommodation Coordinator at engineering.aac@queensu.ca

Every effort has been made to provide course materials that are accessible. For further information on accessibility compliance of the educational technologies used in this course, please consult the links below.

EDUCATIONAL TECHNOLOGY	ACCESSIBILITY COMPLIANCE INFORMATION
onQ (Brightspace Learning Management System by D2L)	https://www.d2l.com/accessibility/standards/
MS-Teams	https://support.microsoft.com/en-us/office/accessibility-support-for-microsoft-teams-d12ee53f-d15f-445e-be8d-f0ba2c5ee68f
Zoom	https://zoom.us/accessibility

If you find any element of this course difficult to access, please discuss with your instructor how you can obtain an accommodation.

RELIGIOUS OBSERVANCE

Students in need of accommodation for religious observance are asked to speak to their professor within a week of receiving their syllabus. Note also that alternative assignments are considered a "reasonable accommodation" under the Ontario Human Rights Code. Students with questions about their rights and responsibilities regarding religious accommodation should contact the Chaplain via Chaplain@queensu.ca.

TECHNICAL SUPPORT

Some basic comfort level with basic hardware and software skills are required for this course. If you require technical assistance, please contact [Technical Support](#).

SUPPORTIVE PERSONAL COUNSELLING

If at any time you find yourself feeling overwhelmed, anxious, sad, lonely, or distressed, consider confidential supportive counselling offered by the [embedded counselors](#) at the Student Wellness Service Faculty of Engineering and Applied Science.