Western Engineering

DEPARTMENT OF *CHEMICAL AND BIOCHEMICAL* ENGINEERING

CBE 3307 – ENERGY AND ENVIRONMENT

Course Outline Fall/Winter 2025-2026

INSTRUCTORS:

Dr. Dimitre Karamanev (TEB 445); Tel. 661-2111 ext. 88230; email: dkaraman@uwo.ca

Dr. Franco Berruti (ICFAR, TEB 373); Tel. 661-2111 ext 88771; email: fberruti@uwo.ca

TEACHING ASSISTANT:

Reem Safwan Shomal rshomal@uwo.ca

LECTURE:	Mondays 4:30pm to 5:30pm Wednesdays 3:30pm to 5:30pm
LAB or TUTORIAL:	Mondays 5:30pm to 6:30pm
OFFICE HOURS *if applicable	Upon request
ANTIREQUISITE(s):	N/A
PREREQUISITE(s):	N/A
CEAB Academic Units:	Basic Science 30% Engineering Science 38% Engineering Design 32%
TEXT / Course Resources / References **Suggested reading resources:**	PowerPoint Presentations provided through OWL Brightspace Environmental Engineering Science by William W. Nazaroff, Lisa Alvarez-Cohen, 1st Edition, 2000, Wiley. Principles of Environmental Engineering & Science, Mackenzie L Davis and Susan J Masten, McGraw-Hill Education; 3rd edition, 2013.
DESCRIPTION (50 words max) This course is an introduction to the issues specific to energy and environment relationship. The energy fundamentals, transformations and basic process design in energy industry will be taught. In this course, we explore traditional and emerging sustainable energy generation and storage technologies. The course will also cover the aspects of air-, water-, soil- pollution related to the energy sector and control technologies to treat the pollution.	

General Learning Objectives (CEAB Graduate Attributes)

Knowledge Base		Engineering Tools		Impact on Society	**X**
Problem Analysis		Individual & Teamwork		Ethics and Equity	**X**
Investigation		Communication		Economics and Project Mgmt.	
Design		Professionalism	**X**	Life-Long Learning	

Rating: I – The instructor will introduce the topic at the level required. It is not necessary for the student to have seen the material before. D – There may be a reminder or review, but the student is expected to have seen and been tested on the material before taking the course. A – It is expected that the student can apply the knowledge without prompting (e. g. no review).

Learning Outcomes	**(CAEB) Graduate Attribute**
Professionalism: The student will recognize the roles and responsibilities of professional engineers in society, especially the primary role of protection of the public and the public interest.	PR2 (Developed)
Impact of Engineering on Society and the Environment (IE): The student will demonstrate understanding of the concept of sustainable design and development. An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.	IESE2 (Developed)
Ethics and Equity (E&E): The student will demonstrate the knowledge of professional ethics and the ability to apply professional ethics, accountability, and equity.	EE1 (introductory)

Assessment

Name	**% Worth**	**Due Date**	**Learning Outcomes**
2 Assignments (Energy)	10%	September 24, 2025 October 8, 2025	The importance of energy in the society Energy fundamentals Main primary energy sources: renewable and fossil-fuel based Basics of energy conversion Primary, intermediate and end-use forms of energy Design of energy transformation devices

2 Assignments (Environment)	10%	November 12, 2025 November 26, 2025	Types of pollutions generated in energy sector Water and air chemistry Acid-basic chemistry, stoichiometry, equilibrium, kinetics, oxidation-reduction/redox reactions related to inorganic and organic pollutants Fate and transformation processes Air dispersion, treatment technologies based on particles sedimentation and filtration, phase changes (sorption, absorption, volatilization) and chemical reaction (incineration and chemical precipitation) Applications in designing of air, water pollution control devices.
1 Project (Energy)	40%	October 22, 2025	Design of an energy conversion system. Recognizing the role of protection of public. Demonstrating knowledge of professional ethics
1 Project (Environment)	40%	December 3, 2025	Design of a pollution control/prevention system. Recognizing the role of protection of public.

EXTRA COURSE INFORMATION

Energy and environmental problems are closely related, as significant environmental impact occurs to produce, transport, and convert different forms of energy. The environmental problems directly related to the production and use of useful forms of energy include air-, water-, soil- pollution, and solid waste disposal. To ensure sustainable growth and development, the generation of different forms of energy has to be environmentally benign. This course will address these issues from both upstream (production and use of different energy vectors) and downstream perespectives (environmental pollution). This course will address all the issues in an introductory level with both fundamental and application aspects.

The energy part of the course will deal with the thermodynamic fundamentals of energy, the availability of different primary forms of energy and their environmental footprint. The conversion of different forms of energy will be discussed. The students will design energy-related technologies, underlining their environmental effect.

The environment section will cover a general overview of environmental engineering science, water, air and their impurities, transformation and transport processes in natural and engineering systems, air and water quality engineering, basics of solid and hazardous waste management, related to energy production. The course provides overview of the principles and practices of environmental engineering. Specifically, the course will address:

The general objectives are for the student to become able to:

- Become familiar with the basics of energy: forms, units, conversions, availability
- Identify and estimate the environmental footprint of the main primary energy sources
- Learn about traditional and emerging sustainable technologies for power generation and storage
- Design a basic energy transformation unit, includung the analysis and reduction of environmental pollution
- Identify water, air and soil pollutants from energy sector
- Learn relevant chemistry and chemical engineering principles to the analysis of fate and transport of these pollutants.
- Learn treatment techonologies for air, water and soil pollutants generated from energy generation and transportation.

I. Missed/Late Accommodation Policy

1. Students missing a test/assignment/lab or examination you will report the absence by submitting Academic Consideration Request form through STUDENT ABSENCE PORTAL.
2. **Documentation must be provided as soon as possible.**

II. Exam Accommodation

1. If you are unable to write a final examination, report your absence using the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a

final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.

3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department and the Associate Dean and in order to apply you must submit an the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
   PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

III. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (prior to the due date of the assignment).
2. Be prepared to submit the Academic Consideration Request Form and provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. The assignments/projects deadlines can be found above in the course outline. For each assignment, students are expected to submit the assignment by the deadline listed. Should illness or extenuating circumstances arise, your written assignments and projects have a no-questions-asked 2-day grace period. This means that you can submit any of these assignments up to 2 days past the posted deadline without penalty. As such, requests for academic consideration for assignments and projects will be denied.
5. If you have a long-term academic consideration or an accommodation for disability that allows greater flexibility than provided here, please reach out to your instructor at least one week prior to the posted deadline.
6. Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.

   Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

IV. Medical Accommodation

1. Requests for Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
2. Requests for academic consideration must include the following components:
   a. Self-attestation signed by the student (*This is only accepted for the first/one absence*)
   b. Medical note
   c. Indication of the course(s) and assessment(s) affected by the request
   d. Supporting documentation as relevant
3. Requests without supporting documentation are limited to one per term per course.
4. **Students must request academic consideration as soon as possible and no later than 48 hours after the missed assessment.**
5. Once the request and supporting documents have been received and reviewed, appropriate academic consideration, if granted, shall be determined by the instructor in consultation with the academic advisor, in a manner consistent with the course outline.

   Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements. Some forms of academic consideration, such as arranging Special Examinations, assigning a grade of Incomplete, or granting late withdrawals without academic penalty, may only be granted by the Academic Advising office of

the Faculty of Registration.

V. Religious Accommodation

When scheduling unavoidably conflicts with religious holidays, which (a) require an absence from the University or (b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate Department Chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning the work done in classes from which they are absent and to take appropriate action.

VI. Academic Integrity

In the Faculty of Engineering, we encourage students to create a culture of honesty, trust, fairness, respect, responsibility, and courage, befitting the professional degree you are pursuing.

Please visit Academic Integrity Western Engineering for more information

VII. Academic Offences

Plagiarism means using another's work without giving credit. The university has rules against plagiarism and other scholastic offences. Western Engineering has a zero-tolerance policy on plagiarism. The minimum penalty is zero on the course work and a repeat offence will earn you zero on the course. A third offence may lead to expulsion from the university.
Scholastic Discipline for Undergraduate Students & Cheating, Plagiarism and Unauthorized Collaboration: What Students Need to Know

Students must write their reports, essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (http://www.turnitin.com). Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

VIII. Faculty of Engineering AI Policy

The use of generative Artificial intelligence (GenAI) tools won't be discouraged in the Faculty of Engineering. As we pride ourselves on building the future we can't hide from the use of GenAI tools to

contribute to the understanding of the course materials. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed, as a resource.

GenAI tools use won't be permitted in any type of examination, design projects or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

IX. Use of English Policy

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally, poorly written work except for the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

X. Accessibility

Western is committed to achieving barrier free accessibility for persons with disabilities studying, visiting and working at Western. As part of this commitment, there are a variety of services, groups and committees on campus devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. To help provide the best experience to all members of the campus community, please visit the Accessibility Western University for information on accessibility-related resources available at Western.

Students with disabilities may arrange for academic accommodation at Western. For a more detailed explanation, please visit Academic Support & Engagement -Academic Accommodation.

XI. Inclusivity, Diversity, and Respect

The Faculty of Engineering at Western University is committed to creating equitable and inclusive learning environments that value diverse perspectives and experiences. We recognize that university courses often marginalize students based on social identity characteristics such as, but not limited to, Indigeneity, race, ethnicity, nationality, ability, gender identity, gender expression, sexuality, age, language, religion, and socioeconomic status. Understanding this, we strive to facilitate equitable experiences and inclusion within the classroom by respecting and integrating multiple ways of knowing, being, and doing. Please visit the Office of Equity, Diversity and Inclusion.

XII. Health and Well-Being

- Health & Wellness Services – Students - Offers appointment-based medical clinic for all registered part-time and full-time students.
- Mental Health Support - Provides professional and confidential services, free of charge, to students needing assistance to meet their personal, social and academic goals. Services include consultation, referral, groups and workshops, as well as brief, change-oriented psychotherapy.
- Crisis Support - For immediate assistant, please visit Thames Hall Room 2170 or call 519-661-3030. The crisis clinic operates between 11:00 am - 4:30 pm. For after-hours crisis support, click here.
- Gender-Based Violence and Survivor Support - Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, here. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Important Contacts

Engineering Undergraduate Services	SEB 2097	519-661-2130	engugrad@uwo.ca

Chemical and Biochemical Engineering	TEB 477	519-661-2131	cbechair@uwo.ca
Office of the Registrar/Student Central	WSSB 1120	519-661-2100	

Important Links

- WESTERN ACADEMIC CALENDAR
- ACADEMIC RIGHTS AND RESPONSIBILITIES
- ENGINEERING PROGRESSION REQUIREMENTS AND ACADEMIC REGULATIONS
- UNIVERSITY STUDENTS' COUNCIL (USC) - SERVICES
- IMPORTANT DATES AND DEADLINES
- ACADEMIC CONSIDERATION FOR MEDICAL ILLNESS - UNDERGRADUATE STUDENTS
- ACCOMMODATIONS FOR RELIGIOUS HOLIDAYS
- SCHEDULING OF ASSIGNMENTS, TESTS, AND EXAMINATIONS
- STUDENT FORMS
- OFFICE OF THE REGISTRAR
- RETENTION OF ELECTRONIC VERSION OF COURSE OUTLINES (SYLLABI)
- ACADEMIC APPEALS
- STUDENT ABSENCE PORTAL