

## **ENBUS 204 Principles of Industrial Ecology**

**FALL 2019**

Mondays and Wednesdays 11:30 am - 12:50 pm, EV3 1408

Instructor: Dr. Komal Habib ([komal.habib@uwaterloo.ca](mailto:komal.habib@uwaterloo.ca))

Dr. Habib's Office: EV3 4247

Dr. Habib's Office hour: Wednesdays 1:00 – 2:00 pm

### **COURSE DESCRIPTION**

Industrial ecology is the systematic analysis of global, regional and local material and energy flows that are associated with products, processes, industrial sectors, and economies. Included in these analyses are energy consumption, non-renewable and renewable materials consumption, air pollutant emissions, waterborne pollutant effluents and solid waste generation associated with human activities. These analyses are the foundation of industrial ecology, which seeks to design and manage products and services that meet human needs in a more sustainable manner. This course will familiarize you with the vocabulary and analysis techniques used to assess and improve product systems.

### **LEARNING OUTCOMES**

By the end of this course, you should:

- Be able to assess/evaluate environmental impacts of a product system
  - Understand and quantify material and energy flows
  - Calculate performance metrics
  - Critique/evaluate claims
  - Locate and select appropriate data to construct flow diagram for a simple product system
  - Interpret flow diagrams
- Acquire skills necessary for professional competence
  - Demonstrate facility with disciplinary vocabulary
  - Demonstrate facility with data and their manipulation

### **READINGS**

As there is no textbook for this course, all readings will be assigned during the term through LEARN. These readings come from a combination of peer-reviewed academic literature and 'grey' (not peer-reviewed) literature and web sites. Complete citations or web links will be provided for all readings. It will be demonstrated how to search on electronic journal databases to obtain readings in lecture.

## COURSE COMPONENTS & EVALUATION

There will be three quizzes during the term on the readings and lectures, which will count 30% towards your course grade. Quizzes will take place at the beginning of class, will be designed to take no longer than 45 minutes to complete, and will focus on material (readings & class) that has been covered since the previous quiz. The midterm exam will be given during class time (on Oct 30<sup>th</sup>, 2019) and will cover all material up to that point (class presentations, readings, quizzes 1 and 2). The classroom for the midterm exam will be announced later. The final exam is comprehensive (i.e. it covers material from the entire course) and integrative (i.e. asks you to put together ideas covered separately during the term). The date, time, and location of the final exam will be determined by the registrar later in the fall term, so it is recommended that you DO NOT make holiday travel arrangements until you have consulted the examination schedule, as you are expected to be present to write the exam.

Course element	% of final grade
Quizzes (3 in-class)	30%
Midterm Examination	25%
Final Examination	45%

### *Teaching Assistants (TAs)\*:*

1. Yi Yang: [y465yang@uwaterloo.ca](mailto:y465yang@uwaterloo.ca)
2. Marsha Lynn Paley: [marsha.paley@uwaterloo.ca](mailto:marsha.paley@uwaterloo.ca)
3. Stephen Bernasconi: [sbernasconi@uwaterloo.ca](mailto:sbernasconi@uwaterloo.ca)

*\*The TAs will have one hour per week as their office hours (location and time TBD), where the students can schedule meetings with the TAs by appointment by contacting them by the email addresses provided above.*

## COURSE MATERIAL IS INTELLECTUAL PROPERTY FOR YOUR USE ONLY

All materials included in the course (e.g., PowerPoint slides) are made available digitally for your convenience, and are accessible through the LEARN course page. THIS IS NOT A RIGHT BUT A PRIVILEGE. Please note that the use of these materials is intended for students currently enrolled in ENBUS 204 only. Recording of the lectures (i.e. audio or video) is prohibited without the express written consent of the instructor. The distribution of PDF file, PowerPoint slides, or any other media, either to individuals or to third-party websites (e.g., CourseHero) is strictly prohibited. If there is any evidence that students have distributed said materials, the instructor will remove posted, and cease posting intellectual property (e.g., PowerPoint slides) online and may pursue disciplinary action against the students in question.

### ***Class Schedule\*:***

\*Lectures' schedule is subject to change depending on guest lecturer's availability.

No.	Date	Lecture	
1	04-09-2019	Introduction	Course Introduction
2	09-09-2019		Metabolism of Anthroposphere
3	11-09-2019		Fundamental concepts – units, conversions
4	16-09-2019		Tutorial
5	18-09-2019		Quiz I
6	23-09-2019	Material & Energy Flow Analysis	Material Flow Analysis - I
7	25-09-2019		Material Flow Analysis - II
8	30-09-2019		Energy Flow Analysis
9	02-10-2019		Tutorial
10	07-10-2019		Quiz II
11	09-10-2019	Life Cycle Assessment	Life Cycle Assessment - I
12	21-10-2019		Life Cycle Assessment -II
13	23-10-2019		Reading exercise
14	28-10-2019	Mid- term	Mid-term exam discussion
15	30-10-2019		Mid-term
16	04-11-2019	Waste Management	Waste Management - I
17	06-11-2019		Waste Management - II
18	11-11-2019		Guest lecture
19	13-11-2019		Quiz III
20	18-11-2019		Documentary
21	20-11-2019	Current Industrial Ecology topics	Guest lecture (TBD)
22	25-11-2019		Circular economy
23	27-11-2019		Biomimicry
24	02-12-2019		Concluding the course and Final exam discussion
			Final exam

### **Intellectual Property:**

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual

property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository). Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

### **Academic Integrity:**

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. The University's guiding principles on academic integrity can be found here:

<http://uwaterloo.ca/academicintegrity/>

ENV students are strongly encouraged to review the material provided by the university's Academic Integrity office specifically for students:

<http://uwaterloo.ca/academicintegrity/Students/index.html>

Students are also expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for their actions. Student who are unsure whether an action constitutes an offense, or who need help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. Students may also visit this webpage:

<https://uwaterloo.ca/library/get-assignment-and-research-help/academic-integrity/academicintegrity-tutorial>

When misconduct has been found to have occurred, disciplinary penalties will be imposed under **Policy 71 – Student Discipline**. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline,

<https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-71>

Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to **Policy #70, Student Grievance**:

<https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-70>

### **Note for students with disabilities:**

*AccessAbility Services* (<https://uwaterloo.ca/accessability-services/>) located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If

you require academic accommodations to lessen the impact of your disability, please register with *AccessAbility Services* at the beginning of each academic term.

### **Mental Health:**

The University of Waterloo, the Faculty of Environment and our Departments consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. Please note that help is available. Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services 7 <http://www.uwaterloo.ca/counselling-services>

is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

### **Religious Observances:**

Student needs to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

**Grievance:** A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. See Policy 70 - Student Petitions and Grievances, Section 4, [www.adm.uwaterloo.ca/infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm). When in doubt please contact your Undergraduate Advisor for details.

**Appeals:** A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 – (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm)

### **Communications with Instructor and Teaching Assistants:**

All communication with students must be through either the student's University of Waterloo email account or via LEARN. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.

### **Recording lectures:**

- Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course.
- If allowed, video recordings may only include images of the instructor and not fellow classmates.
- Posting of videos or links to the video to any website, including but not limited to social media sites such as: facebook, twitter, etc., is strictly prohibited.