

# ENGG\*4340 Solid and Hazardous Waste Management

## Fall 2013



(Revision 0: September 5, 2013)

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## 1 INSTRUCTIONAL SUPPORT

### 1.1 Instructor

Instructor: Brajesh Dubey, Ph.D  
Office: RICHS 3511, ext. 52506  
Email: [bdubey@uoguelph.ca](mailto:bdubey@uoguelph.ca)  
Office hours: Tuesdays (10 AM to 12 Noon) or by appointment

### 1.2 Teaching Assistants

<b>GTA</b>	<b>Email</b>	<b>Office Hours</b>
Nishat Nourin	<a href="mailto:nnourin@uoguelph.ca">nnourin@uoguelph.ca</a>	None (meeting time during the tutorial hours)
Koripella Vidya	<a href="mailto:kvidya@uoguelph.ca">kvidya@uoguelph.ca</a>	None (meeting time during the tutorial hours)

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## 2 LEARNING RESOURCES

### 2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG\*4340 Course link site. You are responsible for checking the site regularly.

### 2.2 Required Resources

1. William A Worrell and P. Aarne Vesilind Solid Waste Engineering, 2<sup>nd</sup> Edition (SI Edition) Cengage Learning, 2012 (ISBN-13: 978-1-4390-6217-3)

## 2.3 Recommended Resources

Not Applicable

## 2.4 Additional Resources

**Lecture Information:** All the lecture notes will be posted on the web page (week #1-#12).

**Tutorial Information:** The handouts for all the tutorial sessions will be posted within the Tutorial section. All types of resources regarding tutorials, links to web pages can be found in this section.

**Project Assignments:** The details of the project assignment will be posted on the course site.

**Reading Materials:** Several reading materials, relevant news articles etc. will be posted on the course website from time to time during the duration of the semester.

## 2.5 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** 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 student.

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# 3 ASSESSMENT

## 3.1 Dates and Distribution

**Quizzes:** 15% (best 4 of 5)

Sept 26, in class

Oct 3, in class

Oct 24, in class

Nov 7, in class

Nov 19, in class

**Project:** 25%

Submission 1: Tues Sep 24, in class

Submission 2: Thurs Oct 31, in class

Presentations: Thurs: Nov 21, Mon: Nov 25, and Thurs: Nov 26 in lecture and tutorial class

Final Deliverable: Mon Dec 9

**Note:** Both paper and electronic copies are to be submitted

**Midterm test 1:** 20%

Tues Oct 8, in class

**Final Exam:** 40%

Thurs Dec 12, 7:00-9:00PM, Room TBA on Web advisor

### 3.2 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:** In order to pass the course, you must obtain a grade of 50% or higher on aggregate from all the assessments.

**Missed midterm tests or quizzes:** If you miss a test due to grounds for granting academic consideration or religious accommodation, the weight of the missed test will be added to the final exam. There will be no makeup midterm tests or quizzes.

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## 4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

### 4.1 Calendar Description

Solid waste generation rates and waste composition; Integrated waste management: collection, recovery, reuse, recycling, energy-from-waste, and landfilling. Biological treatment of the organic waste fraction - direct land application, composting, anaerobic digestion. Environmental impact of waste management and sustainable development. Cross media issues related to solid waste disposal. An introduction to hazardous waste management and treatment methods.

*Prerequisite(s):* ENGG\*2560 or ENGG\*2660

### 4.2 Course Aims

Completion of this course will provide students with an understanding of (i) waste generation and composition of solid waste; (ii) physical and chemical properties of solid waste; (iii) solid waste treatment and disposal alternatives; (iv) positive and negative impacts associated with treatment and disposal alternatives and (v) cross-media issues related to solid and hazardous waste treatment and disposal. Students will also become familiar with the technical literature dealing with solid and hazardous waste management.

### 4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Understand the concept of integrated waste management framework

2. Able to characterize the waste components for different components and properties and use the characteristics to make suitable decision on waste management options
3. Design the refuse collection system, transfer station basics, economics of using transfer station in waste collection and transfer systems
4. Evaluate different methods of processing municipal solid waste for its beneficial reuse, recycling, materials separation, treatment, and disposal
5. Perform preliminary design calculations for combustion and energy recovery systems and biochemical processes.
6. Design landfill systems: siting issues, leachate collection system, gas collection system.
7. Evaluate integrated waste management system from a life cycle analysis perspective.

#### 4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

<b>Graduate Attribute</b>	<b>Learning Objectives</b>	<b>Assessment</b>
1. Knowledge Base for Engineering	1, 2, 4, 7	Quizzes, Exams
2. Problem Analysis	-	Quizzes, Exams, Project
3. Investigation	2, 4, 7	Project
4. Design	4, 5,6	Project, Exams
5. Use of Engineering Tools	3, 4,5,6	Exams, Project
6. Communication	3, 4, 5	Exams, Project
7. Individual and Teamwork	-	Project
8. Professionalism	-	Project
9. Impact of Engineering on Society and the Environment	1, 7	Project
10. Ethics and Equity	-	-
11. Environment, Society, Business, & Project Management	1, 7	Project, Exams
12. Life-Long Learning	1, 7	-

#### 4.5 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/D2L but these are not intended to be stand-alone course notes. 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 project.

## 4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. 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.

## 4.7 Relationships with other Courses & Labs

### Previous Courses:

**ENGG\*2560:** Environmental Engineering Systems: The fundamental concepts of engineered systems including chemical, physical and biological processes taught in this course will be used a lot in the present course.

**Or**

**ENGG\*2660:** Biological Engineering Systems: The fundamental concepts of engineered systems including chemical, physical and biological processes taught in this course will be used a lot in the present course.

### Follow-on Courses:

**ENGG\*41X:** Environmental Engineering Design

**ENGG\*4260:** Water and Wastewater Design

**ENGG\*4070:** Life Cycle Technique for Sustainable Design

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# 5 TEACHING AND LEARNING ACTIVITIES

## 5.1 Timetable

### Lectures:

Tuesday		8:30 – 9:50	THRN 1307
Thursday		8:30 – 9:50	THRN 1307

### Tutorials:

Monday	Sec 01	14:30 – 16:20	ROZH 105
Friday	Sec 02	14:30 - 16:20	MACK 233

## 5.2 Lecture Schedule

Weeks	Lecture Topics	References	Learning Objectives
1	Integrated Solid Waste Management	Chapter 1	1
2	Municipal Solid Waste Characteristics and	Chapter 2	1,2

	Quantities & Intro to Haz Waste		
3	Solid Waste Collection	Chapter 3	1,3
4	Processing of Municipal Solid Waste	Chapter 5	2,4
5	Materials Separation	Chapter 6	2,4
6-7	Combustion and Energy Recovery	Chapter 7	2,4,5
7-8	Biochemical Processes	Chapter 8	2,4,5
9	Landfill Disposal	Chapter 4	2,3,4,6
10	Current Issues in Solid Waste Management	Chapter 9	1,7
11	Special Wastes (e.g. Electronic Waste Issues)	Lecture Material	1,7
12	Student Project Presentations		1,7

### 5.3 Lab Schedule

Not applicable.

### 5.4 Other Important Dates

Thursday, 5 September 2013: First class

Monday, 14 October 2013: Thanks giving holiday

Thursday, 31 October 2013: drop date – 40th class

Thursday, 28 November 2013: last class (Monday Schedule in effect).

## 6 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.

## 7 ACADEMIC MISCONDUCT

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 discourages misconduct. 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.

## 7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:

<http://www.academicintegrity.uoguelph.ca/>

Please also review the section on Academic Misconduct in your [Engineering Program Guide](#).

The School of Engineering has adopted a Code of Ethics that can be found at:

<http://www.uoguelph.ca/engineering/undergrad-counselling-ethics>

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## 8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible. For more information, contact CSD at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: <http://www.csd.uoguelph.ca>